ADMINISTRATIVE RECORD

1395520 - R8 SDMS

ENVIRONMENTAL PROTECTION AGENCY
JUN 06 1991
MONTANA OFFICE

**FINAL DRAFT**

# REMEDIAL INVESTIGATION/FEASIBILITY STUDY

# FLUE DUST OPERABLE UNIT

## VOLUME II, FEASIBILITY STUDY

**June 4, 1991**

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**TABLE OF CONTENTS**
**VOLUME II**


7.0 FEASIBILITY STUDY INTRODUCTION . . . . . 1
7.1 Feasibility Study . . . . . 3
7.2 General Response Actions . . . . . 5

8.0 FS PHASE I . . . . . 6
8.1 Technology Identification and Screening . . . . . 6
8.1.1 No Action . . . . . 7
8.1.2 Containment . . . . . 7
8.1.2.1 Capping . . . . . 9
8.1.2.2 Vegetation . . . . . 10
8.1.2.3 Liners . . . . . 10
8.1.3 Partial or Complete Removal . . . . . 11
8.1.3.1 Excavation . . . . . 12
8.1.3.2 Transportation . . . . . 13
8.1.4 Permanent Onsite Disposal . . . . . 13
8.1.5 Offsite Disposal . . . . . 14
8.1.6 Onsite or Offsite Treatment . . . . . 15
8.1.6.1 Stabilization/Fixation . . . . . 15
8.1.6.2 Hydrometallurgical Processes . . . . . 15
8.1.6.3 Pyrometallurgical Processes . . . . . 21
8.1.6.4 Gravity Separation . . . . . 23
8.1.6.5 Commercial Hydrometallurgical/ Pyrometallurgical Processing . . . . . 24
8.1.7 In Situ Treatment . . . . . 25
8.1.8 Interim Onsite Storage . . . . . 25
8.1.9 Surface-Water Controls . . . . . 26
8.1.10 Dust Controls . . . . . 27
8.1.11 Institutional Controls . . . . . 28
8.2 Summary . . . . . 28

9.0 FS PHASE II IASD . . . . . 30
9.1 Alternative Development Approach . . . . . 31
9.2 Selection of Representative Technologies . . . . . 31
9.2.1 Capping, Establishing Vegetation, and Liners . . . . . 32
9.2.2 Excavation and Transportation . . . . . 33
9.2.3 Stabilization/Fixation . . . . . 34
9.2.4 Hydrometallurgical Process Technologies . . . . . 34
9.2.5 Pyrometallurgical Process Technologies . . . . . 35
9.2.6 Onsite and Offsite Disposal . . . . . 36
9.2.7 Dust Controls . . . . . 36
9.2.8 Institutional Controls . . . . . 37
9.3 Common Elements Among Alternatives . . . . . 37
9.3.1 Excavation With Dust Control . . . . . 37
9.3.2 Mass Flowrates . . . . . 38
9.3.3 Debris Handling . . . . . 39
9.3.4 Onsite Transportation . . . . . 39
9.3.5 Offsite Transportation . . . . . 40
9.3.6 Onsite Disposal Facilities . . . . . 40

9.3.7 Central Onsite Location . . . . . 41
9.4 Description of Candidate Remedial Alternatives . . . . . 42
9.4.1 Alternative No. 1 - No Action . . . . . 44
9.4.2 Alternative No. 2 - Institutional Controls . . . . . 44
9.4.3 Alternative No. 3 - Onsite Disposal of Untreated Flue Dust . . . . . 44
9.4.4 Alternative No. 4 - Offsite Disposal of Untreated Flue Dust . . . . . 45
9.4.5 Alternative No. 5 - Onsite Cement/Silicate-based Stabilization/Fixation Treatment . . . . . 45
9.4.6 Alternative No. 6 - Onsite Hydrometallurgical Treatment . . . . . 46
9.4.7 Alternative No. 7 - Onsite Pyrometallurgical Treatment . . . . . 47
9.5 Screening of Remedial Alternatives . . . . . 48
9.5.1 Effectiveness Evaluation . . . . . 48
9.5.1.1 Alternative No. 1 - No Action . . . . . 48
9.5.1.2 Alternative No. 2 - Institutional Controls . . . . . 49
9.5.1.3 Alternative No. 3 - Onsite Disposal of Untreated Flue Dust . . . . . 49
9.5.1.4 Alternative No. 4 - Offsite Disposal of Untreated Flue Dust . . . . . 50
9.5.1.5 Alternative No. 5 - Onsite Stabilization/ Fixation Treatment . . . . . 51
9.5.1.6 Alternative No. 6 - Onsite Hydrometallurgical Treatment . . . . . 52
9.5.2 Implementability Evaluation . . . . . 53
9.5.2.1 Alternative No. 1 - No Action . . . . . 53
9.5.2.2 Alternative No. 2 - Institutional Controls . . . . . 53
9.5.2.3 Alternative No. 3 - Onsite Disposal of Untreated Flue Dust . . . . . 54
9.5.2.4 Alternative No. 4 - Offsite Disposal of Untreated Flue Dust . . . . . 56
9.5.2.5 Alternative No. 5 - Onsite Stabilization/ Fixation Treatment . . . . . 56
9.5.2.6 Alternative No. 6 - Onsite Hydrometallurgical Treatment . . . . . 57
9.5.3 Cost Evaluation . . . . . 58
9.5.4 Evaluation of Applicable or Relevant and Appropriate Requirements . . . . . 58
9.6 Screening Summary and Alternative Selection . . . . . 59

10.0 FS PHASE III . . . . . 64
10.1 Methodology . . . . . 64
10.1.1 Detailed Analysis Process . . . . . 65
10.1.2 Comparative Analysis of Alternatives . . . . . 67
10.2 Remedial Alternative Descriptions . . . . . 68
10.3 Detailed Analysis of Alternatives . . . . . 76
10.3.1 Overall Protection of Human Health and the Environment . . . . . 76

10.3.1.1 Alternative No. 1 - No Action . . . . . 76
10.3.1.2 Alternative No. 2 - Onsite Disposal of Untreated Flue Dust . . . . . 77
10.3.1.3 Alternative No. 3 - Offsite Disposal of Untreated Flue Dust . . . . . 77
10.3.1.4 Alternative No. 4 - Onsite Cement-Based Stabilization/Fixation . . . . . 78
10.3.1.5 Alternative No. 5 - Cashman Process . . . . 78
10.3.1.6 Alternative No. 6 - Ambient Acid Leach Process . . . . . 79
10.3.2 Compliance with Applicable or Relevant and Appropriate Requirements (ARARs) . . . . . 80
10.3.2.1 Alternative No. 1 - No Action . . . . . 82
10.3.2.2 Alternative No. 2 - Onsite Disposal of Untreated Flue Dust . . . . . 91
10.3.2.3 Alternative No. 3 - Offsite Disposal of Untreated Flue Dust . . . . . 91
10.3.2.4 Alternative No. 4 - Onsite Cement-Based Stabilization/Fixation . . . . . 91
10.3.2.5 Alternative No. 5 - Cashman Process . . . . 92
10.3.2.6 Alternative No. 6 - Ambient Acid Leach Process . . . . . 92
10.3.3 Long-Term Effectiveness and Permanence . . . . . 93
10.3.3.1 Alternative No. 1 - No Action . . . . . 93
10.3.3.2 Alterntative No. 2 - Onsite Disposal of Untreated Flue Dust . . . . . 95
10.3.3.3 Alternative No. 3 - Offsite Disposal of Untreated Flue Dust . . . . . 96
10.3.3.4 Alternative No. 4 - Onsite Cement-Based Stabilization/Fixation . . . . . 97
10.3.3.5 Alternative No. 5 - Cashman Process . . . . 98
10.3.3.6 Alternative No. 6 - Ambient Acid Leach Process . . . . . 100
10.3.4 Reduction of Toxicity, Mobility, or Volume through Treatment . . . . . 101
10.3.4.1 Alternative No. 1 - No Action . . . . . 102
10.3.4.2 Alternative No. 2 - Onsite Disposal of Untreated Flue Dust . . . . . 102
10.3.4.3 Alternative No. 3 - Offsite Disposal of Untreated Flue Dust . . . . . 103
10.3.4.4 Alternative No. 4 - Onsite Cement-Based Stabilization/Fixation . . . . . 103
10.3.4.5 Alternative No. 5 - Cashman Process . . . . 104
10.3.4.6 Alternative No. 6 - Ambient Acid Leach Process . . . . . 106
10.3.5 Short-Term Effectiveness . . . . . 107
10.3.5.1 Alternative No. 1 - No Action . . . . . 108
10.3.5.2 Alternative No. 2 - Onsite Disposal of Untreated Flue Dust . . . . . 108
10.3.5.3 Alternative No. 3 - Offsite Disposal of Untreated Flue Dust . . . . . 109
10.3.5.4 Alternative No. 4 - Onsite Cement-Based Stabilization/Fixation . . . . . 110
10.3.5.5 Alternative No. 5 - Cashman Process . . . . 110

10.3.5.6 Alternative No. 6 - Ambient Acid Leach Process . . . . . 111
10.3.6 Implementability . . . . . 112
10.3.6.1 Alternative No. 1 - No Action . . . . . 112
10.3.6.2 Alternative No. 2 - Onsite Disposal of Untreated Flue Dust . . . . . 113
10.3.6.3 Alternative No. 3 - Offsite Disposal of Untreated Flue Dust . . . . . 113
10.3.6.4 Alternative No. 4 - Onsite Cement-Based Stabilization/Fixation . . . . . 114
10.3.6.5 Alternative No. 5 - Cashman Process . . . . 115
10.3.6.6 Alternative No. 6 - Ambient Acid Acid Leach Process . . . . . 118
10.3.7 Cost . . . . . 119
10.3.7.1 Alternative No. 1 - No Action . . . . 120
10.3.7.2 Alternative No. 2 - Onsite Disposal of Untreated Flue Dust . . . . . 120
10.3.7.3 Alternative No. 3 - Offsite Disposal of Untreated Flue Dust . . . . . 123
10.3.7.4 Alternative No. 4 - Onsite Cement-Based Stabilization/Fixation . . . . . 123
10.3.7.5 Alternative No. 5 - Cashman Process . 127
10.3.7.6 Alternative No. 6 - Ambient Acid Leach Process . . . . . 128
10.3.7.7 Net Present Worth Cost Summary . . . . 134
10.3.8 Detailed Analysis Summary . . . . . 139
10.4 Comparative Analysis . . . . . 144
10.4.1 Overall Protection of Human Health and the Environment . . . . . 146
10.4.2 Compliance with ARARs . . . . . 147
10.4.3 Long-Term Effectiveness and Permanence . . . . . 147
10.4.4 Reduction of Toxicity, Mobility, or Volume through Treatment . . . . . 149
10.4.5 Short-Term Effectiveness . . . . . 150
10.4.6 Implementability . . . . . 151
10.4.7 Cost . . . . . 152

REFERENCES . . . . . 154

**APPENDICES**

Appendix A Institutional Controls

Appendix B EPA Final ARARs

Appendix C Cost Estimate Backup Analysis

## LIST OF TABLES AND FIGURES


| | | |
|---|---|---|
| Table 8.1-1 | General Response Actions and Associated Remedial Technologies | 8 |
| Table 8.1-2 | Summary of Hydrometallurgical Treatment Methods | 17 |
| Table 8.1-3 | Summary of Pyrometallurgical Treatment Processes | 22 |
| Table 8.2-1 | Summary of Technology Identification and Screening and Evaluation of Institutional Controls | 29 |
| Table 9.4-1 | Summary of Candidate Remedial Alternatives | 43 |
| Table 9.6-1 | Summary of Screening Evaluation Results | 60 |
| Table 9.6-2 | Summary of Remedial Alternative Selection | 62 |
| Table 10.3.1 | Summary of Screening Analysis of Federal and State ARARs, Flue Dust Operable Unit | 83 |
| Table 10.3-2 | Risks to Humans Associated With the No Action Alternative | 95 |
| Table 10.3-3 | Alternative No. 2 Cost Summary Capital and O&M Costs | 122 |
| Table 10.3-4 | Alternative No. 3 Cost Summary Capital Costs | 124 |
| Table 10.3-5 | Alternative No.4 Cost Summary Capital and O&M Costs | 126 |
| Table 10.3-6 | Alternative No. 5A - Cashman Process Capital Cost Summary | 129 |
| Table 10.3-7 | Alternative No. 5B - Ambient Acid Leach Process Capital and O&M Cost Summary | 132 |
| Table 10.3-8 | Estimated Net Present Worth Analysis | 135 |
| Table 10.3.9 | Cost Sensitivity Analysis Net Present Value Cost at 10% Discount | 137 |
| Table 10.3.10 | Individual Evaluation of Final Alternative | 140 |
| Table 10.4.1 | Comparative Analysis of Alternatives | 145 |
| Figure 8.1-1 | General Flow Sheet Hydromatallurgical Process No. 13 | 18 |
| Figure 8.1-2 | General Flow Sheet Hydrometallurgical Process No.14 | 20 |

## ACRONYMS

| | |
|---|---|
| ANS | American Nuclear Society |
| BP | Bradley Ponds |
| CERCLA | Comprehensive Environmental Response, Compensation and Liability Act |
| CKD | Cement Kiln Dust |
| CLP | Contract Laboratory Program |
| CPT | Coal Pile Tracks |
| DI | Distilled De-ionized Water |
| DOT | Department of Transportation |
| DQO | Data Quality Objectives |
| EAF | Electric Arc Furnace |
| EA/PHE | Endangerment Assessment/Public Health Evaluation |
| EPA | Environmental Protection Agency |
| EP Toxicity | Extraction Procedure Toxicity |
| FDS | Flue Dust Storage |
| HL | Hydrated Lime |
| HSL | Hazardous Substance List |
| IP | Iron Ponds |
| LAP | Laboratory Analytical Plan |
| LCS | Laboratory Control Sample |
| MSL | Mean Sea Level |
| NPL | National Priorities List |
| PC | Portland Cement |
| QAPP | Quality Assurance Project Plan |
| QA/QC | Quality Assurance/Quality Control |
| RCRA | Resource Conservation & Recovery Act |
| RI/FS | Remedial Investigation/Feasibility Study |
| RPD | Relative Percent Difference |
| SAP | Sampling and Analytical Plan |
| SX-EW | Solvent Extraction Electrowinning |
| TCLP | Toxicity Characteristic Leaching Procedure |
| TDS | Total Dissolved Solids |
| TSD | Transportation Storage & Disposal |
| TSP | Total Suspended Particulates |
| UCS | Unconfined Compressive Strength |

## 7.0 FEASIBILITY STUDY INTRODUCTION

Volume II of the Preliminary Draft Remedial Investigation/Feasibility Study (RI/FS) presents the feasibility study for the Flue Dust Operable Unit specified in the Flue Dust RI/FS Final Work Plan (Environmental Protection Agency (EPA), 1988a). The Flue Dust RI/FS Final Work Plan was prepared pursuant to Administrative Order on Consent (Docket No. CERCLA-VIII-88-16). This FS Report consists of: (1) a summary and update of the previously submitted and approved FS Phase I Technology Identification and Screening Document (Dames & Moore, 1989a); (2) the FS Phase II Initial Alternatives Screening Document (IASD, Dames & Moore, 1989b); and (3) the FS Phase III detailed analysis of alternatives which is in part based upon information obtained from FS Phases I and II and from the RI Phase II Treatability Testing Report (Dames & Moore, 1990a).

Due to the chronology of the RI/FS process for the Flue Dust Operable Unit, both the FS Phase I and Phase II reports were prepared in accordance with the EPA Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (Guidance Document, EPA, 1988b). The FS Phase III detailed analysis of alternatives was prepared in a manner consistent with the requirements of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 CFR Part 300 et seq., Federal Register (March 8, 1990).

The FS Phase I Report (Technology Identification and Screening Document):

- identified remedial action objectives;
- identified general response actions to satisfy the remedial action objectives;
- identified and preliminarily screened potential remedial technologies;

- evaluated institutional controls; and
- identified process options for each treatment technology type.

The FS Phase II IASD:

- carried forward screened technologies from the FS Phase I;
- assembled the technologies into candidate remedial alternatives; and
- further screened remedial alternatives against set criteria identified in the Final Work Plan and the Guidance Document.

Treatability testing of the screened remedial technologies from FS Phase I was carried out in the RI Phase II (Dames & Moore, 1990a). During the RI Phase II Treatability Testing Phase, four additional remedial technologies were identified that had not been presented in the submitted and approved FS Phase I and II reports. As a result, the FS Phase I and Phase II report summaries given in this document include an evaluation of these additional technologies. The four additional technologies were evaluated using the same criteria as used for the technologies listed in the original FS Phase I and II reports dated May 25, 1989 and August 7, 1989, respectively.

The FS Phase II IASD information has also been updated to reflect the further evaluation and screening of certain alternatives relative to the newly available RI Phase II treatability testing data. The new treatability testing data was used to screen further previously identified remedial technologies and to re-evaluate developed alternatives prior to consideration in the FS Phase III alternatives analysis. The addition of new technologies and relevant treatability testing information summaries have been included in the summaries of the

FS Phase I and Phase II reports as given in Sections 8 and 9, respectively.

The FS Phase III Report (Section 10.0 of this document) contains the detailed analysis of each screened remedial alternative. These analyses are based on the nine evaluation criteria established in the NCP. The nine criteria are:

- overall protection of human health and the environment;
- compliance with ARARs;
- long-term effectiveness and permanence;
- reduction of toxicity, mobility, or volume;
- short-term effectiveness;
- implementability;
- cost;
- State acceptance; and
- community acceptance.

Analysis of the first seven evaluation criteria are presented in this RI/FS report while the latter two are to be performed after the public comment period on the RI/FS. Based on the Feasibility Study sequence described above, a preferred remedial alternative has been identified and presented by EPA in the Proposed Plan.

## 7.1 FEASIBILITY STUDY

The fundamental purpose of the Flue Dust Operable Unit feasibility study is to identify and evaluate potential remedial options that eliminate, reduce, or control risks to human health and the environment to the extent necessary to select a remedy. To achieve this goal, CERCLA requires the development and

evaluation of remedial alternatives to ensure that an appropriate remedy is selected. CERCLA requires that remedial alternatives be developed and screened in a process which establishes remedial action objectives for the operable unit, identifies and evaluates potentially suitable technology, including innovative technologies, assembles suitable technologies into alternative remedial actions and conducts a detailed analysis of a limited number of alternatives that represent viable approaches to remedial action after evaluation of the alternatives in the screening stage.

The development and evaluation of alternatives must reflect the scope and complexity of the remedial action under consideration and the site problems being addressed. The scope of the Flue Dust Operable Unit is limited to the present flue dust locations and potential treatment and disposal of the flue dust and/or any treated residue. Flue Dust RI/FS Final Work Plan, Jacobs Engineering Group 1988, p. 8. The action is not intended to address current problems associated with the geographical areas on which flue dust is located. Furthermore, the scope of the remedial action does not address the cleanup of ground water or surface water located at or near these areas, or final compliance with air standards within these areas after remediation (EPA, 1991). Rather, these issues will be addressed during the Smelter Hill Operable Unit RI/FS.

Within this framework, the following remedial objectives have been established for the Flue Dust Operable Unit:

- A health-based remedial action objective has been defined such that remedial action alternatives will be developed that reduce the excess cancer risk to within a range of $10^{-4}$ to $10^{-6}$. Health-based objectives consider flue dust particle inhalation and ingestion through direct contact and airborne transport exposure pathways.

- A regulatory-based remedial action objective has been defined such that remedies will be evaluated for their ability to meet or exceed the applicable or relevant and appropriate Federal and State standards, requirements, and criteria (ARARs).

- An action level-based remedial action objective has been defined such that remedial alternatives involving excavation of flue dust from the current site locations will assume excavation of material to equivalent concentrations of arsenic and heavy metals in surrounding Anaconda Smelter site soils. The surrounding Anaconda Smelter site soils are being addressed through the Smelter Hill RI/FS.

## 7.2 GENERAL RESPONSE ACTIONS

General response actions were identified in the FS Phase I based on the remedial action objectives using engineering judgment following the guidelines presented in the Guidance Document, the Handbook for Remedial Action at Waste Disposal Sites (EPA, 1985), and the Technology Screening Guide for Treatment of CERCLA Soils and Sludges (EPA, 1988c). Applicable general response actions include those presented in a preliminary list provided in the Work Plan and those that address remedial measures including source control, management of migration, and institutional controls. General response actions identified for the Flue Dust Operable Unit include the following:

| Measure | General Response Action |
|---|---|
| No Action | No Action |
| Source Control | Containment<br>Partial or Complete Removal<br>Onsite or Offsite Treatment<br>In Situ Treatment<br>Onsite or Offsite Disposal<br>Onsite Storage |
| Management of Migration | Surface-Water Controls<br>Dust Controls |
| Exposure Control | Institutional Controls |

Technologies associated with these general response actions are presented, described, and evaluated in Section 8.0.

## 8.0 FS PHASE I

Four additional remedial technologies (or process options) were identified during the RI Phase II treatability testing that were not included in the original FS Phase I Report (Dames & Moore, 1989a). The following summary of the FS Phase I differs from the original submittal in that evaluation of Hydrometallurgical Process No. 13, Sulfide Precipitation; Hydrometallurgical Process No. 14, Ambient Acid Leach; Pyrometallurgical Process No. 6, Arsenic Volatilization; and Gravity Separation have been included. In addition, Pyrometallurgical Process No. 5, the Flame Reactor process, originally described in the FS Phase II IASD, is now summarized in the FS Phase I Technology Identification and Screening.

### 8.1 TECHNOLOGY IDENTIFICATION AND SCREENING

In the originally submitted and approved FS Phase I report remedial technologies applicable to each general response action category were identified and evaluated against set criteria, as specified in the Guidance Document. The effectiveness of remedial technologies was evaluated based on site and flue dust characteristics and technology limitations. Physical characteristics of the flue dust locations, and the physical and chemical characteristics of the flue dust materials have been considered in the evaluation of remedial technologies. Technology limitations that have been considered in the evaluation include: level of technology development; performance record; and potential difficulties associated with required construction, operation, or maintenance activities.

Technologies that appear to be ineffective were considered to fail the technology screening and were dropped from further consideration in the FS. Technologies that are representative of a specific technology type were selected from those that passed

the technology screening. These technologies have been combined to form candidate remedial alternatives for further evaluation. Selection of representative technologies and assembling of candidate remedial alternatives was conducted under FS Phase II IASD, and the results are presented in Section 9.0 of this document. General response actions and associated remedial technologies are listed in Table 8.1-1.

### 8.1.1 No Action

The No Action response is a stand-alone remedial response that is used as a baseline against which candidate remedial alternatives will be compared. The No Action response does not include continuance of activities which are currently being implemented at the Flue Dust Operable Unit. These activities are:

- Development and implementation of a fugitive dust control plan;
- Biannual applications of surfactants; and
- Daily visual inspections and documentations.

The No Action response is carried through the FS as a candidate remedial alternative.

### 8.1.2 Containment

Containment technologies are used as source control measures. Potentially implementable containment technologies for the Flue Dust Operable Unit include capping, establishing vegetation, and use of liners. These technologies are discussed below. Containment activities would be associated with one or

**Table 8.1-1**

**GENERAL RESPONSE ACTIONS AND ASSOCIATED REMEDIAL TECHNOLOGIES**

| General Response Action | Remedial Technology |
|---|---|
| No Action | None |
| Containment | Capping<br>Establishing Vegetation<br>Liners |
| Partial or Complete Removal | Excavation and Transportation |
| Permanent Onsite Disposal | Secure Onsite Repository<br>FDS Facility |
| Offsite Disposal | Sanitary Landfill<br>RCRA Landfill |
| Onsite or Offsite Treatment | Solidification/Stabilization<br>Hydrometallurgical Processing<br>Pyrometallurgical Processing |
| In Situ Treatment | Chemical Treatment<br>Biological Treatment |
| Interim Onsite Storage | FDS Facility |
| Surface-Water Controls | Capping, Grading, Establishing Vegetation,<br>Diversion, and Collection |
| Dust Controls | Dust Suppressants<br>Water Spraying<br>Synthetic Covers<br>Enclosed Conveyors<br>Negative Pressure Air System |
| Institutional Controls | Access Control<br>Land Use Control |

more candidate remedial alternatives as a component of the alternative.

#### 8.1.2.1 Capping

Capping technologies are used to cover material and isolate it from the surface environment. Caps are designed to be of low hydraulic conductivity to reduce infiltration of water. They can be constructed of soils, concrete, asphalt, and synthetic membrane or geotextile materials, used alone or in combination. Caps may be of single or multiple layer construction.

Soil caps will be considered for applications, such as installation as part of an engineered interim storage facility or permanent disposal repository. In these applications, caps can reduce mobility of flue dust materials without the added difficulties of site constraints and excessive maintenance requirements of multiple locations.

Capping technologies are currently being used at the Flue Dust Operable Unit. The Main Flue site location is equipped with a compacted soil cap containing a binding agent. Installation of caps at the eight remaining flue dust site locations will not be considered in the FS as the effectiveness of this approach would be limited by the physical characteristics of the site locations, and the difficulties presented in installing and maintaining caps at the nine pile locations.

Capping is a demonstrated technology that is proven to be effective in a wide variety of applications, including uses similar to those considered in the FS. Capping technologies pass the remedial technology screening and are further considered as a component of the assembled of candidate remedial alternatives in FS Phase II.

#### 8.1.2.2 Vegetation

Vegetation is used to cover and stabilize surface materials, thereby reducing erosion by wind and water. Vegetation can also reduce infiltration of water into surface materials through interception of water by plant root systems and transpiration mechanisms. Vegetation can also provide improvements in the aesthetic appearance of a site.

Establishing vegetation directly on flue dust materials at the current site locations will not be effective, due to the chemical characteristics of the flue dust materials, and are not considered further in the FS. Elevated metals concentrations present in flue dust materials are phytotoxic to plant life.

Alternately, establishing vegetation can be effective in enhancing the stability and permanence of capping systems. In these applications, vegetation generally can be established and maintained easily using conventional agricultural equipment.

Establishing vegetation is a proven technology that has been demonstrated to be effective for applications similar to those considered in the FS. Establishing vegetation passes the technology screening and is considered as a component of the assembled candidate remedial alternatives conducted under Phase II of the FS.

#### 8.1.2.3 Liners

Liners are used to contain material and isolate it from the subsurface environment. Liners are designed to be of low hydraulic conductivity so that ground water cannot percolate up through the liner, and contained material or leachate cannot seep down into underlying strata. Liners can be of single or multiple

layer construction, and may be equipped with leachate detection/interception systems.

Liners are currently being used at the Flue Dust Operable Unit. The Flue Dust Storage (FDS) facility is equipped with a compacted soil liner, and the Thickener site location has a concrete bottom with a clay-lined center. The Main Flue was carved from bedrock and uses a brick liner (Anaconda, 1938). Liners will be considered for applications in the design and construction of a permanent onsite disposal repository for flue dust materials or onsite treatment process residuals. In these applications, liners can reduce mobility of materials without the added difficulties of implementation at multiple locations.

Installation of liners at the six remaining flue dust site locations will not be considered in the FS as the effectiveness of this approach would be limited by the difficulty of implementation. Installation of liners beneath the flue dust site locations would require removal and temporary storage of flue dust materials until liners are installed, and subsequent replacement of materials within lined areas. Additionally, lined areas would require further remedial action such as capping to effectively stabilize and isolate lined areas from the surface environment.

Liners are proven technologies that are demonstrated to be effective in applications similar to those considered in the FS. Liners pass the remedial technology screening and are considered as components of the assembled of candidate remedial alternatives conducted under Phase II of the FS.

### 8.1.3 Partial or Complete Removal

Partial or complete removal technologies are used as source control measures. They involve the physical removal of materials

from their respective locations with subsequent transport to a new location. Potentially applicable removal technologies for the Flue Dust Operable Unit include excavation and transport. These technologies are discussed below. Removal activities would be associated with one or more candidate remedial alternatives as a component of the alternative.

#### 8.1.3.1 Excavation

Excavation technologies involve the use of conventional or specialized earthmoving/construction equipment. Conventional equipment such as backhoes, dozers, loaders, and scrapers appear to be satisfactory for use in excavating flue dust materials from the site locations. No specific physical constraints to excavation are associated with each of the flue dust site locations except the Main Flue. Excavation of the Main Flue will require specialized techniques. For purposes of this study, excavation of the Main Flue is considered to be performed as a separate activity, with the flue dust being stockpiled at the base of the flue. Constraints associated with the physical characteristics of the flue dust material, namely the small particle size, add complexity to the implementation of flue dust excavation, such that dust control measures will be required in areas where the materials are dry. Additional excavation difficulties may be encountered during windy periods, or during winter months when the material may be frozen and/or snow covered.

Excavation is a proven technology that is demonstrated to be effective in applications similar to those considered in the FS. Excavation passes the technology screening and is further considered as a component of the assembled candidate remedial alternatives of the FS Phase II.

#### 8.1.3.2 Transportation

Transportation technologies involve the use of conventional or specialized materials handling equipment. Conventional materials handling equipment such as conveyors, trucks, and railcars, and specialized equipment such as enclosed conveyors and slurry pipelines appear to be satisfactory for transporting flue dust materials from their respective site locations to other onsite or offsite locations. No specific physical constraints are associated with the flue dust site locations. Constraints associated with the physical characteristics of the flue dust material, namely the small particle size, add complexity to the implementation of flue dust transportation actions, such that dust control measures will be required when dry materials are encountered.

Transportation is a proven technology that is demonstrated to be effective for applications similar to those considered in the FS. Transportation passes the technology screening and is further considered as a component of the assembled candidate remedial alternatives of the FS Phase II.

### 8.1.4 Permanent Onsite Disposal

Permanent onsite disposal is used as a source control measure. Onsite disposal involves placement of material in an engineered repository located within the boundaries of the site. Permanent onsite disposal can be applied to untreated flue dust materials, flue dust that has undergone stabilization/fixation treatment, or by-products resulting from hydrometallurgical or pyrometallurgical treatment. The design configuration of a new onsite repository would be dependent upon the quantity and type of material requiring disposal. Repository design could range in complexity from unlined impoundment areas to double-lined

impoundments equipped with leachate detection and collection systems.

No physical constraints to implementing onsite disposal are associated with the nine flue dust site locations, nor are there constraints associated with the physical or chemical characteristics of the flue dust material.

Permanent onsite disposal passes the technology screening and is considered in the assembled candidate remedial alternatives in the FS Phase II. More detailed information concerning the siting and conceptual design of a new onsite repository is provided in the screening of candidate remedial alternatives presented in the FS Phase II.

### 8.1.5 Offsite Disposal

Offsite disposal is used as a source control measure, and involves placement of material in an engineered containment facility located outside of the boundaries of a site. Offsite disposal options may include but are not limited to disposal in an offsite RCRA-permitted treatment, storage, and disposal (TSD) facility, and disposal in a facility that is in compliance with other applicable laws.

No specific constraints to implementation are associated with the nine site locations or the flue dust materials. Removal of flue dust material from the site and transport over public roadways or railways presents a general constraint to implementation, with concern for protection of public health and the environment when materials are removed from the site.

Offsite disposal passes the technology screening and is considered in the assembled candidate remedial alternatives in FS Phase II. Offsite disposal in a sanitary landfill is not

considered further in the FS. More detailed information concerning potential use of existing offsite facilities are presented in the FS Phase II IASD.

### 8.1.6 Onsite Or Offsite Treatment

Process options have been identified for 10 technology types to treat flue dust. These process options are considered for implementation at either an onsite or offsite facility.

#### 8.1.6.1 Stabilization/Fixation

Stabilization/fixation technologies are used to treat contaminated materials by physically trapping them in an inert matrix (stabilization), and/or by chemically altering them to reduce the mobility and/or toxicity of their constituents (fixation). These technologies involve mixing materials with binding agents under prescribed conditions to form a stable solid matrix. Potentially applicable stabilization/fixation technologies for the Flue Dust Operable Unit include cement-based or silicate-based stabilization/fixation, thermoplastic stabilization, surface encapsulation, and vitrification. Solid materials such as flue dust which contain metals and inorganic salts are generally amenable to stabilization/fixation treatment.

#### 8.1.6.2 Hydrometallurgical Processes

Hydrometallurgical processes are used to treat materials by chemically reacting them in an aqueous or solvent-based medium. They are typically used to extract and recover metals from ores, concentrates, and other metal-bearing materials. Some hydrometallurgical processes also chemically react to fix or stabilize certain toxic constituents. Hydrometallurgical processes identified in the FS Phase I are presented in Table 8.1-2. Detailed descriptions of these technology descriptions

were given in the original FS Phase I (Dames & Moore, 1989a). Hydrometallurgical Process Nos. 1, 2, 4, 8, 9, 11, and 12 passed the original technology identification and screening process. Hydrometallurgical Process Nos. 1, 2, and 14 were selected as representative process options for hydrometallurgical treatment. These process were considered sufficiently similar to the other passing process options.

Hydrometallurgical Process Nos. 13 and 14 were not identified in the originally submitted and approved FS Phase I report. Descriptions of these two hydrometallurgical process options are given in this summary, based on results of the RI Phase II treatability testing.

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## Table 8.1-2

## SUMMARY OF HYDROMETALLURGICAL TREATMENT METHODS

| Process Number | Process Name | Process Characteristics | Level of Development |
|---|---|---|---|
| 1 | Dowa | Selective precipitation of lead sulfate, copper sulfide, ferric arsenate, sponge cadmium, and zinc hydroxide. | Commercial |
| 2 | Cashman | Selective precipitation based on chloride chemistry. | Pilot Plant |
| 3 | Kennecott | Aerobic pressure leach with sulfuric acid. | Patent Application |
| 4 | Shenyang | Anaerobic pressure leach with sulfuric acid. | Bench Tests |
| 5 | Ammonium Leach | Ammonium carbonate-ammonium hydroxide system for recovery of metals. | Patent Application |
| 6 | Bureau of Mines Alkaline Leach | Hot alkaline leach followed by copper-lead cementation and zinc oxide precipitation. | Conceptual |
| 7 | Metallhute Carl Fabusch | Dechlorination followed by copper precipitation and zinc electrowinning. | Commercial |
| 8 | Anaconda Research | Similar to Dowa. Copper recovery by solvent extraction and electrowinning. | Bench Tests |
| 9 | Anaconda Modified Dowa | Similar to Dowa. Arsenic precipitation as arsenic sulfide. Arsenic sulfide conversion to arsenic trioxide. | Conceptual |
| 10 | Chloride Leach | Chloride leach followed by cycline separation and selective recovery of copper, silver, cadmium, and zinc. | Bench Tests |
| 11 | Sulfur Dioxide Leach | Stabilization of arsenic, recovery of arsenic trioxide, final adsorption of arsenic on hydrated titanium dioxide. | Patent Application |
| 12 | Con Mine | Hot, weak acid leach and arsenic trioxide recovery by crystallization. | Commercial |
| 13 | Sulfide Precipitation | Selective precipitation based on sulfide chemistry. | Bench Tests |
| 14 | Ambient Acid Leach | Ambient leaching to selectively recover copper through solvent extraction and electrowinning. | Commercial. |

Figure 8.1-1

GENERAL FLOWSHEET HYDROMETALLURGICAL PROCESS NO. 13

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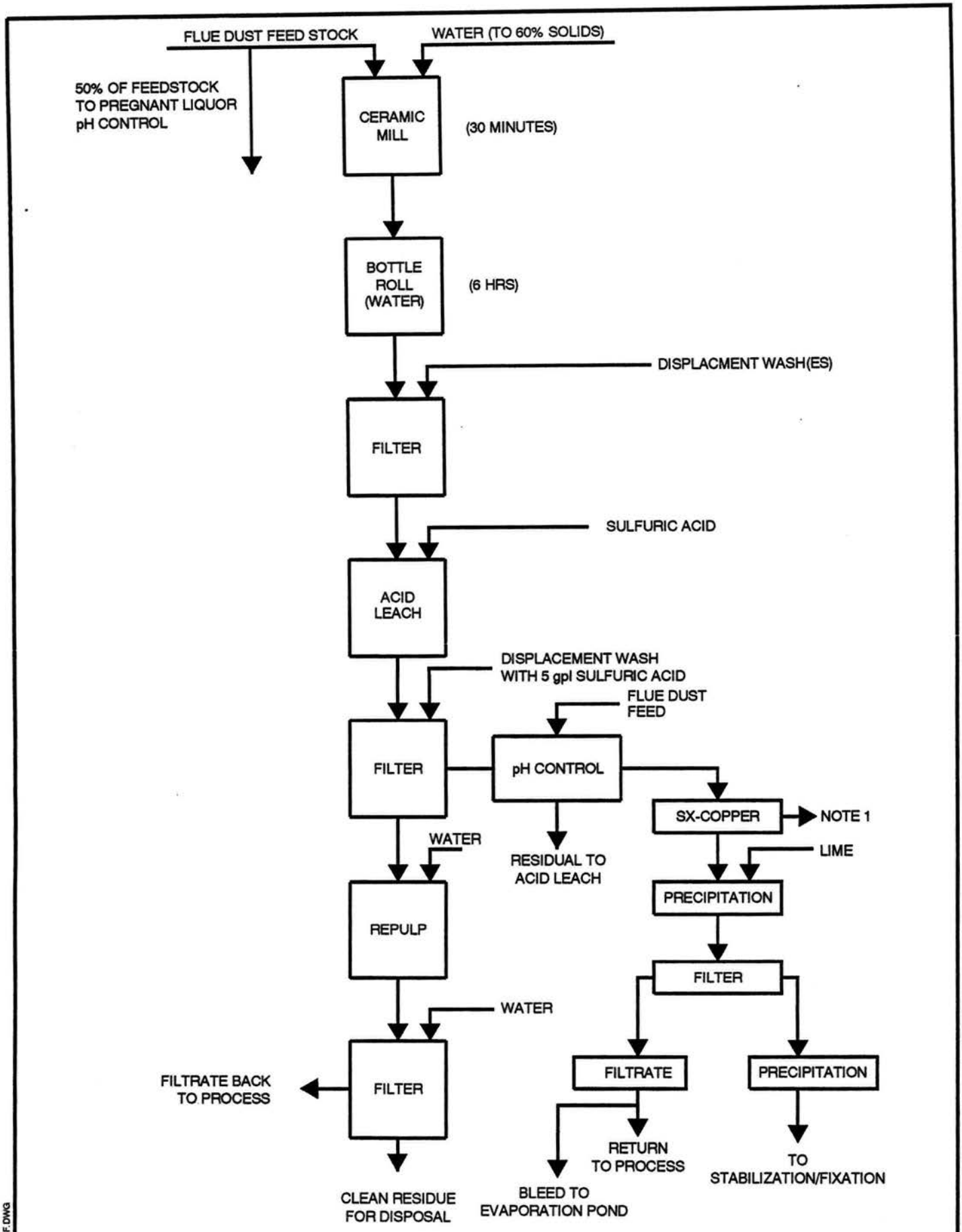
Hydrometallurgical Process No. 14: Hydrometallurgical Process No. 14 is known as the Ambient Acid Leach process and is an addition to the process options under the hydrometallurgical treatment technology type given in the original FS Phase I. The process involves sulfuric acid leaching of flue dust at ambient temperature and pressure conditions, followed by filtering the leach solution, filter cake washing, copper solvent extraction (SX) of the pregnant filtrate, and recovery of extracted copper through electrowinning (EW). Hydrated lime is added to the raffinate (barren) solution from the SX step in order to precipitate dissolved metals. This solution is then filtered, where the filtrate can be recycled back to the acid leach step. The acid leach residue and the raffinate lime precipitate would be disposed of either in an on-site or off-site repository, or treated further prior to disposal if the materials exhibit toxicity characteristics. Required process reagents include sulfuric acid, LIX-984 organic solvent, and hydrated lime. The process is a proven technology at the commercial level for a variety of metal-bearing materials, and at a bench-scale level




NOTE 1: Electrowinning from an SX Solution is Standard Technology for Producing Marketable Copper, and There was No Need to Test It.

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# General Flow Sheet Hydrometallugical Process No. 14

**Dames & Moore**

Figure 8.1-2

for the Smelter Hill flue dust materials (Metcon 1990a). A general flowsheet for the process is shown in Figure 8.1-2.

Hydrometallurgical Process No. 14 passes the technology screening and is considered in the assembled candidate remedial alternatives conducted in the FS Phase II. Treatability testing indicates that process residues may require further treatment prior to disposal.

#### 8.1.6.3 Pyrometallurgical Processes

Pyrometallurgical processes are used to treat materials by exposing them to elevated temperatures under controlled conditions. They are typically used for extraction and separation of metals. Table 8.1-3 lists the pyrometallurgical process options evaluated for treating flue dust materials. A detailed description of several pyrometallurgical processes were given in the original FS Phase I Report. Pyrometallurgical Process Nos. 1 and 3 passed the original technology identification and screening process; these processes were considered further in the FS. Pyrometallurgical Process Nos. 5 and No. 6 were not presented in the originally submitted and approved FS Phase I, and will be summarized in this section.

Pyrometallurgical Process No. 5: Pyrometallurgical Process No. 5 is the Flame Reactor process. The process uses a two-stage flash smelting system to recover zinc, lead, and cadmium from Electric Arc Furnace (EAF) dust. The process is a proven technology at the pilot-scale level in treating EAF dusts. The process has not been tested on arsenic-bearing copper smelter flue dust materials.

The process consists of a two-stage flame reactor, a slag separator, an off-gas cooling/heat recovery system, and a baghouse particulate recovery system. The flame reactor uses oxygen-enriched air to obtain process temperatures of 1500°C to 1800°C. The two-stage reactor consists of a pilot stage and a

## Table 8.1-3

## SUMMARY OF PYROMETALLURGICAL TREATMENT PROCESSES

| Process Number | Process Name | Furnace Type | Level of Development |
|---|---|---|---|
| 1 | Elkem | Electric Arc Furnace | Pilot-Scale Demonstration |
| 2 | PLASMADUST | Plasma Arc Furnace | Conceptual |
| 3 | Rotary Kiln | Inclined Rotary Kiln | Pilot-Scale |
| 4 | Cyclone Smelting | CONTOP Cyclone Smelting Furnace | Pilot-Scale Demonstration |
| 5 | Flame Reactor | Two-Stage Flame Reactor | Pilot-Scale for BAF Dusts |
| 6 | Arsenic Volatilization | Closed Tube Furnace | Bench-Scale |

reactor stage. Both stages are conducted in water-jacketed steel cylinders. Dry, pulverized coal or coke fines, entrained in air, are mixed with oxygen-enriched air in the pilot stage, producing an exothermic carbon-oxygen reaction and a high temperature reducing environment. Dry flue dust materials are injected into the reactor stage and mixed with the hot reducing gas, producing molten metal and slag which flow into a refractory-lined water-cooled horizontal cyclone separator. Molten metal is separated at this stage from the molten slag. The slag Figure 8.1-2 is granulated using high pressure water sprays. Metal oxide particulates generated by the process are recovered in a baghouse.

The flame reactor process may be effective in removing arsenic, cadmium, and lead from flue dust material, but generation of the arsenic-cadmium-lead-containing dust may reduce the effectiveness of this process. Further process optimization and by-product stability testing would be required prior to incorporating this process into the final design of a selected remedy.

Pyrometallurgical Process No. 5 was eliminated from the technology screening due to insufficient data related to treatment of flue dust materials, and because of concerns related

to potential arsenic volatilization during flue dust processing. As such, Pyrometallurgical Process No. 5 is dropped from further consideration in the FS.

Pyrometallurgical Process No. 6: Pyrometallurgical Process No. 6 is known as Arsenic Volatilization. The process involves heating the flue dust materials in a closed tube furnace with a carbon monoxide atmosphere under negative pressure. The arsenic is vaporized and condensed into arsenic trioxide by passing the furnace vapors through a cooling chamber. Removal of arsenic from the flue dust provides a more acceptable raw material for a conventional smelter. Reducing agents such as carbon or pyrite and sulfur are needed in the process.

Pyrometallurgical Process No. 6 fails the technology screening because treatability testing conducted on this process during the RI Phase II indicated insufficient arsenic removal through volatilization. As such, Pyrometallurgical Process No. 6 is dropped from further consideration in the FS.

#### 8.1.6.4 Gravity Separation

Gravity separation processes can be used to selectively separate and concentrate certain metals from metal-bearing materials. The feed material is subjected to wet grinding and is passed through a ball mill to produce a uniform slurry. The slurry is then advanced to a separation chamber where metals of differing specific gravities are separated by gravity. The resulting concentrate can then be used in a conventional smelting process to complete the metal recovery.

Gravity separation fails the technology screening because treatability testing conducted during the RI Phase II showed that physical separation of specific metal values (e.g., copper and lead) was not achieved for the Smelter Hill flue dust materials. As such, gravity separation is dropped from further consideration in the FS.

#### 8.1.6.5 Commercial Hydrometallurgical/Pyrometallurgical Processing

Commercial metallurgical processing can potentially be used to treat flue dust materials. Similar process techniques to those described above would be used. Flue dust would need to be excavated and transported to a receiving facility for treatment. Salable products would be maintained by the process facility, as well as waste by-products.

This alternative involves excavation of flue dust from the nine site locations, transport to an offsite commercial processing facility, and processing as a commercial feedstock at the selected facility. Two types of representative commercial treatment processes have been considered as subalternatives. Several existing commercial facilities have been identified under each subalternative, as presented below:

- Subalternative 8A: Offsite Commercial Hydrometallurgical Processing

| Options | Facilities |
|---|---|
| 8A-1: | Kosaka Smelter, Dowa, Japan |
| 8A-2: | Nerco Con Mine Arsenic Plant, Yellowknife, Northwest Territory, Canada |
| 8A-3: | Kidd Creek, Timmins, Ontario, Canada |

- 

| Options | Facilities |
|---|---|
| 8B-1: | Kidd Creek, Timmins, Ontario, Canada |
| 8B-2: | Metallurgy Hoboken-Overpelt, Olen, Belgium |
| 8B-3: | Norddeutsche Affinerie, Hamburg, Germany |
| 8B-4: | Outokompu Oy, Harjavalta, Finland |

During the RI Phase II treatability testing process, all facilities identified in the two subalternatives listed above were contacted regarding treatability testing of the flue dust materials. The Kidd Creek facility in Timmins Ontario, Canada, was the only facility to respond favorably to proceeding with testing of the flue dust.

A 55-gallon drum of flue dust material was shipped to the Kidd Creek facility for treatability testing. The material was processed with conventional metallurgical technologies. Results of the treatability testing were not made available for review, although a proposal for treating the flue dust was developed by the Kidd Creek facility. Based on the information collected during the RI Phase II, offsite commercial processing was dropped from furtehr consideration in the FS. Two reasons for dropping this alternative included: (1) unavailablity of process-specific data related to flue dust treatability; and (2) treatment of flue dust at Kidd Creek would require transporting hazardous materials over international boundaries.

### 8.1.7 In Situ Treatment

In situ treatment technologies are used as source control measures. They involve treatment of materials at their current locations, without implementing removal actions. Potentially applicable in situ treatment technologies for the Flue Dust Operable Unit include chemical and biological treatments.

In situ treatment fails the technology screening due to site constraints and incompatibilities with physical and chemical characteristics of the flue dust material. Implementation of in situ treatment at the nine flue dust site locations would be difficult to control. In situ treatment would be of questionable and uncertain effectiveness, and is dropped from further consideration in the FS.

### 8.1.8 Interim Onsite Storage

Interim onsite storage is used as a source control measure. It involves placement of material in an engineered interim storage facility located within the boundaries of the site. Onsite storage must be implemented in such a manner as to be

protective of human health and the environment over the period of interim storage. Onsite storage options that are potentially applicable to the Flue Dust Operable Unit include storage of untreated flue dust materials in the existing FDS facility, with ultimate removal at a later date. No specific constraints to implementation are associated with the nine flue dust site locations or the flue dust materials.

### 8.1.9 Surface-Water Controls

Surface-water controls are used as management of migration measures. They are used to prevent, minimize, or otherwise control the contact between materials and surface water. Surface-water controls that may be applicable to the Flue Dust Operable Unit include capping, establishing vegetation, grading, diversion, and collection.

Capping and establishing vegetation can be used to reduce infiltration of surface water into capped materials through mechanisms previously discussed (see Sections 8.1.2.1 and 8.1.2.2). Grading is used to alter the surface contour of an area such that surface-water runoff is directed away from materials along a desired route. Diversion structures include ditches, channels, and berms. These structures are similarly used to direct or divert surface-water flow along a desired route. Collection systems are used to intercept and contain surface water at a specific location of a site. Surface-water control is a proven technology that has been demonstrated to be effective in a wide variety of applications.

As previously discussed, capping technologies are currently being used at the Main Flue site location. Grading is also being used at the Main Flue. The compacted soil cap that is present at the Main Flue site location was graded into a crown configuration to promote drainage of surface water to the sides and off of the

cap. Diversion berms and ditches are also being used at the Main Flue, Coal Pile Tracks, and FDS facility flue dust site locations.

Surface-water controls pass the technology screening and are considered in the assembled candidate remedial alternatives conducted in FS Phase II. They are considered for both interim and permanent applications, and may be included in conceptual design of onsite disposal repositories as appropriate.

#### 8.1.10 Dust Controls

Dust control technologies are used as management of migration measures. They are used to prevent, minimize, or otherwise control the transport of materials through the action of wind. They can be applied to materials at their existing locations, or used during material excavation and handling actions. Dust controls that may be applicable to the Flue Dust Operable Unit include the use of dust suppressants, water sprays, synthetic covers, enclosed conveyors, and negative pressure air systems. These are proven technologies that have been demonstrated to be effective in a wide variety of applications.

Dust suppressant surfactant materials are currently being used at the flue dust site locations. The suppressant is applied to the surface of the materials on a biannual basis, and based on recorded daily visual observations, appears to be effective in control of windblown dust from the covered areas. Water sprays, synthetic covers, enclosed conveyors, and negative pressure air systems are not currently being used, but could have potential applicability as interim controls being implemented during excavation and material handling actions.

Dust controls pass the technology screening and are considered in the assembled candidate remedial alternatives

conducted in the FS Phase II. They are considered primarily for interim control during the implementation of remedial alternatives.

### 8.1.11 Institutional Controls

A complete description of the institutional controls for the Flue Dust Operable Unit was given in the original FS Phase I report. An analysis of institutional controls, including an addendum describing recent developments, is provided in Appendix A of the RI/FS Volume II.

## 8.2 SUMMARY

The results of the FS Phase I identification and screening of remedial technologies and the evaluation of institutional controls are summarized in Table 8.2-1. Remedial technologies and institutional controls that passed the screening were considered in assembling candidate remedial alternatives conducted in the FS Phase II. Representative technologies were selected from each technology type. These representative technologies and controls were assembled into candidate remedial alternatives that were screened further in the FS Phase II IASD.

## Table 8.2-1

## SUMMARY OF TECHNOLOGY IDENTIFICATION AND SCREENING AND EVALUATION OF INSTITUTIONAL CONTROLS

| General Response Action | Remedial Technology | Screening Result | Reason for Failure |
|---|---|---|---|
| No Action | None | Pass | Retain for Comparison |
| Containment | Capping | Pass | --- |
| | Establishing Vegetation | Pass | --- |
| | Liners | Pass | --- |
| Partial/Complete Removal | Excavation | Pass | --- |
| | Transportation | Pass | --- |
| Onsite/Offsite Treatment | Solidification/Fixation | | --- |
| | Cement/Silicate | Pass | --- |
| | Thermoplastic | Pass | --- |
| | Surface Encapsultation | Pass | --- |
| | Vitrification | Pass | --- |
| | Hydrometallurgical Processes | | --- |
| | No. 1, 2, 14 | Pass | Level of Development May Not be Effective Nos. 1, 2, and 14 are representative. |
| | No. 3 through 13 | Fail | --- Not Demonstrated to be Effective |
| | Pyrometallurgical Processes | Pass | Hard to Implement |
| | No. 1,3 | Fail | Not Effective |
| | No. 2,4,5,6 | | |
| | Commercial Offsite Processing | Fail | Hard to Implement, insufficient data. |
| In Situ Treatment | Chemical | Fail | --- |
| | Bilogical | Fail | --- |
| Onsite Disposal | New Repository | Pass | --- |
| | FDS | Pass | --- |
| Offsite Disposal | RCRA Facility | Pass | --- |
| | Landfill | Pass | --- |
| Onsite Storage | FDS | Pass | --- |
| Surface-Water Controls | Diversion | Pass | --- |
| | Collection | Pass | --- |
| Dust Controls | Suppressants | Pass | --- |
| | Water Sprays | Pass | --- |
| | Synthetic Cover | Pass | --- |
| | Enclosed Conveyors | Pass | --- |
| Institutional Controls | Restrictive Covenants | | |
| | Land Use Zoning Restrictions | Pass | |
| | Maintenance | Pass | |
| | Drinking Water Bans | Pass | |
| | | Pass | |

## 9.0 FS PHASE II IASD

The Initial Alternatives Screening Document (IASD, Dames & Moore, 1989b) which constitutes the Phase II Feasibility Study Report for the Flue Dust Operable Unit, is summarized in this section. In the IASD, technologies carried forward from the FS Phase I screening were assembled into candidate remedial alternatives that were also screened against set criteria in accordance with the Flue Dust RI/FS Final Work Plan (EPA, 1988a) and the Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, (Guidance Document, EPA, 1988b).

The original FS Phase II IASD was submitted and approved prior to treatability testing work conducted for RI Phase II investigations. Data collected during the treatability testing has been used to update the results of the remedial alternative screening. During treatability testing, Hydrometallurgical Process No. 14, the Ambient Acid Leach process, was identified as a potential remedial technology to treat flue dust materials. However, Hydrometallurgical Process No. 14 was not described in the original FS Phase II IASD. This process option has passed the FS Phase I technology screening and is considered a representative process option for the hydrometallurgical treatment technology type. This section revises and summarizes the FS Phase II IASD to reflect the addition of Hydrometallurgical Process No. 14.

Eight remedial alternatives, and associated subalternatives, were developed from the general response actions and associated technologies presented in the FS Phase I report. The eight remedial alternatives were then screened to a total of six remedial alternatives for the FS Phase III detailed analysis. The approach taken in developing the alternatives, selecting representative technologies and common elements of remedial

alternatives, and describing the six remedial alternatives is described below.

## 9.1 ALTERNATIVE DEVELOPMENT APPROACH

Technologies that passed the FS Phase I screening process have been combined to form candidate remedial alternatives. These remedial alternatives were developed in the original IASD in accordance with the Guidance Document.

The remedial alternatives developed include a No Action alternative and a containment alternative involving little or no treatment. Remedial alternatives involving treatment include representative process options that reduce the toxicity and mobility of flue dust constituents, but which may increase the total volume of processed material.

## 9.2 SELECTION OF REPRESENTATIVE TECHNOLOGIES

General response actions and associated remedial technologies were identified and screened during FS Phase I of the FS (see Table 8.1-1). Based on the results of the FS Phase I screening and subsequent treatability testing, representative technologies have been selected for use in the development of candidate remedial alternatives discussed in this section.

Generally, at least one process option was selected to be representative of each general technology type. In cases where more than one process option was associated with a general technology type, representative process options were selected for the different processes. For example, cement-/silicate-based stabilization/fixation and vitrification were selected as representative process options for chemical and thermochemical stabilization/fixation treatment technology types.

Representative process options were selected based on the potential effectiveness and level of development of the process option, with consideration of site and material characteristics. Selection of representative process options was made using engineering judgment. Innovative and recycling technologies were considered as appropriate during selection of representative process options.

The purpose of selecting representative process options is to simplify the FS Phase II and Phase III evaluations by limiting the number of remedial alternatives to be considered without reducing the range of options. Final selection of specific technologies and process options is typically performed during development of final remedial design.

### 9.2.1 Capping, Establishing Vegetation, and Liners

Single-layered soil caps and multi-layered soil/synthetic membrane caps have been selected as representative process options for the capping technology. Soil caps were selected for use in conjunction with onsite repositories for disposal of nonhazardous waste. Multi-layered caps were selected for use in conjunction with disposal of materials in an onsite repository designed to attain applicable or relevant and appropriate RCRA Subtitle C requirements. Both cap designs are conventional technologies that are widely used and demonstrated to be effective in isolating materials from the surface environment. They also are effective when used in conjunction with liners. Final design may combine these representative options, depending on the nature of the waste material to be disposed of in the repository.

Establishment of grassy vegetation has been selected as the representative process option for vegetation technology. Grasses can become established quickly on desired areas, providing an effective means of mitigating erosional and surface-water

infiltration effects. Additionally, grasses are generally more easily maintained than more diverse vegetation options and have less potential for root breach of caps and liners.

Compacted soil liners and synthetic membrane liners have been selected as representative process options for liner technology. Compacted soil liners were selected for use in conjunction with onsite repositories meeting applicable or relevant and appropriate requirements for disposal of solid waste. A combination of compacted soil and synthetic membrane liners was selected for use in conjunction with onsite repositories designed to attain applicable or relevant and appropriate RCRA Subtitle C requirements. Both types of liners are conventional technologies that are widely used and demonstrated to be effective in isolating materials from the environment under conditions similar to those anticipated to be encountered at the Flue Dust Operable Unit. A final design may combine these representative process options for liner technology depending on the nature of the waste material to be disposed of in the repository.

### 9.2.2 Excavation and Transportation

Loaders and excavators have been selected as representative process options for the excavation technology. Both are conventional earthmoving equipment that are widely used, and have been demonstrated to be effective in removing material from above-ground piles and below-grade structures similar to those of the Flue Dust Operable Unit. A Transportation Study (Dames & Moore, 1990c) was conducted to evaluate conventional excavation and transportation methods when applied to flue dust. Results indicate that conventional equipment, in conjunction with standard dust control measures, would be effective for flue dust excavation and transportation.

As stated in the original IASD, truck, railroad, and ocean freighter transport have been selected as representative process options for the transportation technology. Truck transport was selected for use in conjunction with onsite transportation of excavated flue dust and debris, and process residuals. Either truck or rail transport was selected for offsite transportation within the continent of North America, with selection of the specific mode of transportation being dependent on the final destination. Ocean freighter transport, in conjunction with truck and/or rail transport, was selected for intercontinental transportation. These conventional modes of transportation are widely used and demonstrated to be effective methods of relocating materials with physical and chemical characteristics similar to flue dust materials of the operable unit.

### 9.2.3 Stabilization/Fixation

Cement-/silicate-based stabilization/fixation has been selected as the representative process option for the stabilization/fixation technology type. Cement-/silicate-based stabilization/fixation represents a chemical fixation process.

The process option has been demonstrated to be effective in reducing the toxicity and mobility of metals-containing materials similar to the flue dust of the operable unit, and has been tested using Smelter Hill flue dust materials. The cement-/silicate-based process option is a widely used treatment of toxic materials.

### 9.2.4 Hydrometallurgical Process Technologies

Hydrometallurgical Process Nos. 1, 2, and 14 have been selected as representative process options for the hydrometallurgical treatment technology. Hydrometallurgical Process No. 1 is the Dowa process. It is a proven technology at

the commercial scale, and has been demonstrated to be effective in treating flue dust from a copper flash smelter furnace at the Kosaka Smelter in Japan.

Hydrometallurgical Process No. 2 is the Cashman process. The Cashman process is a proven technology at the bench-scale level, and has been demonstrated to be effective in treating flue dust from the Smelter Hill site through bench-scale batch testing. Additional evaluation of the Cashman process was warranted to determine effectiveness. The Cashman process was developed at a pilot-scale level for flue dust treatment during the RI Phase II.

Hydrometallurgical Process No. 14 is the Ambient Acid Leach process. Ambient acid leaching of metals from a variety of metal-bearing materials is a proven technology at the commercial scale. The process has also been used to treat flue dust materials in European commercial operations. The Ambient Acid Leach process was developed at a bench-scale level for flue dust treatment during the RI Phase II. Results of treatability testing indicate that copper can be effectively recovered through acid leaching, followed by solvent extraction-electrowinning (SX-EW).

### 9.2.5 Pyrometallurgical Process Technologies

Pyrometallurgical Process Nos. 1 and 3 have been selected as representative process options for the pyrometallurgical treatment technology type. Pyrometallurgical Process No. 1 is the Elkem process. The Elkem process is a proven technology that has been demonstrated to be effective at the pilot-scale level for treating of electric arc furnace (EAF) dust. The process uses an EAF in its design.

Pyrometallurgical Process No. 3 is the Rotary Kiln process. The Rotary Kiln process is an unproven technology, but has been demonstrated at the pilot-scale level to be moderately effective for treating of copper smelter flue dusts. The process is believed to produce an inert arsenic-iron species.

### 9.2.6 Onsite and Offsite Disposal

Use of the existing FDS facility and construction of new repositories have been selected as representative process technologies for the onsite disposal technology. The FDS facility has been considered for use without modification, and with modification to meet applicable or relevant and appropriate RCRA treatment, storage, and disposal (TSD) facility standards. New onsite repositories for untreated flue dust would be designed to attain applicable or relevant and appropriate RCRA Subtitle C requirements.

RCRA-permitted TSD facilities were selected as the only representative process option for offsite disposal of untreated flue dust. Flue dust materials requiring offsite disposal under each of the remedial alternatives are assumed to be disposed in an offsite RCRA TSD facility.

### 9.2.7 Dust Controls

Suppressants and water sprays have been selected as representative process options for the dust control technology. Both are conventional technologies that are widely used in applications similar to those anticipated to be encountered at the Flue Dust Operable Unit. These technologies would primarily be considered for use in conjunction with flue dust excavation, handling, and transportation activities associated with implementation of remedial actions.

### 9.2.8 Institutional Controls

Institutional controls identified in Section 5 and Appendix B of the FS Phase II IASD (Dames & Moore, 1989b) have been selected as representative options for institutional controls. They are considered for use as a sole remedy, as an interim measure, and as components to enhance the effectiveness of other remedial alternatives.

## 9.3 COMMON ELEMENTS AMONG ALTERNATIVES

This section discusses elements that are common to several candidate remedial alternatives. Common elements include excavation and dust control, handling and disposal of screened debris, onsite and offsite transport of material, onsite disposal, and potential locations for an onsite treatment facility. Assumptions concerning these common elements that were used in the development of remedial alternatives are discussed below.

### 9.3.1 Excavation With Dust Control

For the purposes of remedial alternative development, excavation of flue dust from the site locations has been assumed for remedial alternatives that incorporate movement of materials. Exclusive of the Main Flue, excavation of flue dust materials, associated rubble, and debris can be accomplished using front-end loaders. Subgrade excavation of the Main Flue can be accomplished using an excavator. Dust control is important during excavation of flue dust with heavy equipment.

The Assessment of Health Effects Associated with Airborne Transport of Hazardous Substances from the Anaconda Smelter Site (CDM, 1985) indicated that during transport of flue dust to the Thickener area, and in spite of efforts to control dust emissions

by water, significant emissions of dust material resulted. Additional transport studies (Dames & Moore 1990c) during the RI Phase II indicated that excavation and transport of flue dust could be accomplished without significant release of dust by using standard dust preventions methods (i.e., water sprays and covers).

Based on screening quality data obtained from the RI Phase I SAP implementation (Dames & Moore, 1988), the overall average moisture content of the flue dust is approximately 25 percent. Due to this relatively high moisture content, dust control requirements during excavation are not anticipated to be extensive.

### 9.3.2 Mass Flowrates

Individual remedial alternatives have been developed based on one of two assumed mass flowrates. Alternatives involving onsite stabilization/fixation or offsite or onsite disposal have been developed using an approximate mass flowrate of 200 tons per hour. This rate has been selected based on preliminary determinations of optimal sizing of conventional earthmoving equipment. Alternatives for onsite hydrometallurgical treatment have been developed using an approximate mass flowrate of eight tons per hour. This rate has been selected based on preliminary determinations of optimal sizing of an onsite hydrometallurgical treatment facility.

Use of these two mass flowrates for FS Phase II alternative development and screening, and the FS Phase III detailed analysis, allows for a more direct comparison of alternatives. Rates have been based on preliminary determinations and thus may not accurately reflect true optimal rates in all cases. Optimal mass flowrates of a recommended remedial alternative will be

determined after completion of the RI/FS, during final remedial design.

### 9.3.3 Debris Handling

For the purposes of remedial alternative development, approximately 36,000 cubic yards of miscellaneous debris and rubble are assumed to be intermixed with flue dust materials at the nine flue dust site locations of the operable unit including the Main Flue. This study assumed that the intermixed debris would be processed through a crusher unit and incorporated into the selected treatment process. For onsite or offsite disposal without treatment, the debris would be disposed of with the flue dust. However, should large debris be present that is not conducive to crushing, this debris may require separation to avoid potential damage to repository liner systems.

### 9.3.4 Onsite Transportation

For the purposes of remedial alternative development, it is assumed that flue dust materials would be transported from the nine site locations to a central onsite location using 25 ton off-road haul trucks. The function of a central onsite location would vary for each alternative, e.g., an onsite repository, a treatment plant, or a loading facility used to prepare flue dust for offsite transport.

Existing roadways of the Smelter Hill site would be used for onsite transportation of flue dust. Trucks would be covered with canvas covers immediately after loading to minimize the potential for fugitive airborne emissions during transport. Exteriors of the trucks would be decontaminated prior to leaving an excavation site and after unloading, minimizing the potential for transport of flue dust from the site. Other decontamination measures may be specified for periods of inclement weather.

### 9.3.5 Offsite Transportation

As stated in the original IASD, for the purposes of remedial alternative development, it is assumed that flue dust materials would be transported from the central onsite location to an offsite destination using either highway trucks or railroad container cars, depending on the shipping location. Ocean freighter transport is assumed for remedial alternatives involving intercontinental flue dust transport.

Conventional 20 ton end-dump highway trucks equipped with plastic liners and canvas covers have been assumed for offsite truck transport. For the purpose of remedial alternative development, it is assumed that specialized shipping containers would be required for offsite transport via rail and ocean freighter. Rail-to-truck transfers are included in remedial alternatives where the final destinations are not serviced by rail. Similarly, overland transport using railways to a port of departure is included in remedial alternatives involving offsite transport via ocean freighter.

### 9.3.6 Onsite Disposal Facilities

For the purposes of remedial alternative development, several options have been considered for onsite disposal of debris, flue dust materials, and/or treatment process residuals. Size and design of onsite repositories are based on the anticipated volume and characteristics of materials requiring disposal under each alternative.

A repository designed to attain applicable or relevant and appropriate requirements for solid waste disposal, with an approximate volume of 375,000 cubic yards is assumed to be used for onsite disposal of non-characteristic waste process residuals produced by an onsite stabilization/fixation treatment process.

Other solid waste repositories of different volumes and designs may be considered for onsite disposal of treated process residuals. Applicable or relevant and appropriate requirements (ARARs) would be considered in determining the design requirements of a repository for treated materials. This issue is further evaluated in the final analysis of the FS.

A repository designed to attain applicable or relevant and appropriate RCRA Subtitle C requirements with an approximate volume of 316,500 cubic yards is assumed to be used for onsite disposal of untreated flue dust material from the nine flue dust site locations.

Common elements for all onsite disposal options include installation and maintenance of a vegetated soil cap. Repositories are assumed to be equipped with a soil cap which provides positive surface drainage incorporating a stable, grassy vegetation would be established and maintained. Institutional controls would also be implemented for the purpose of protecting the engineered containment system.

### 9.3.7 Central Onsite Location

As stated in the original IASD, for purposes of remedial alternative development, a central onsite location has been assumed to be located in an area southeast of the Iron Ponds site location and north of the FDS location. This location has been assumed because it is centrally located, relatively level, outside of floodplains, within a reasonable distance of existing utilities, and sufficiently distant from populated areas. A detailed study describing the preferred repository location was prepared by Special Resources Management (SRM, 1990) and approved by the EPA. The final draft of the SRM repository siting document will be provided as an addendum to this document, and will be attached as an appendix.

The central onsite location would be used for different purposes under different remedial alternatives. It can be assumed to be the location of an onsite treatment plant, an onsite repository, or a materials staging area for the preparation of flue dust material for offsite transport. Selection of the location for the actual treatment plant, repository, or a staging area would be performed during final remedial design of a selected remedial alternative. Assumption of a central onsite location allows for development of remedial alternatives using consistent assumptions for such components as average haul distances for onsite transportation.

Existing utilities near the central onsite location include a natural gas distribution pipeline located approximately 1 mile north of Smelter Hill and running parallel to Montana State Highway 1; a 100-kV power line operated by Montana Power Company which passes through the center of Smelter Hill. A centrally located private water supply has been assumed for alternatives requiring large volumes of water.

## 9.4 DESCRIPTION OF CANDIDATE REMEDIAL ALTERNATIVES

Eight candidate remedial alternatives were developed in the originally submitted and approved IASD for the Flue Dust Operable Unit. The remedial alternatives summarized in Table 9.4-1 have been developed and refined in accordance with the Guidance Document.

The listed remedial alternatives have been developed such that they represent a range of protectiveness of public health, welfare, and the environment; the range of protectiveness addresses the set of remedial action objectives set forth in the FS Phase I Report, from the baseline No Action alternative to treatment and disposal alternatives. Alternatives have been refined with respect to volumes and/or areas of contaminated

## TABLE 9.4-1
## SUMMARY OF CANDIDATE REMEDIAL ALTERNATIVES

| Alternative Number | Alternative Name |
|---|---|
| 1 | No Action |
| 2 | Institutional Controls |
| 3 | Onsite Disposal |
| 3A | Use of Existing FDS Facility |
| 3B | Upgrade Existing FDS Facility |
| 3C | Construction of a New Repository |
| 4 | Offsite Disposal at RCRA TSD Facility |
| 5 | Onsite Cement-/Silicate Based Stabilization/Fixation |
| | Disposal Options: |
| | 1) Onsite Disposal in Solid Waste Repository |
| | 2) Offsite Disposal in RCRA TSD Facility |
| 6 | Onsite Hydrometallurgical Treatment |
| 6A | Hydrometallurgical Process No. 1: Dowa Process |
| 6B | Hydrometallurgical Process No. 2: Cashman Process |
| 6C | Hydrometallurgical Process No. 14: Ambient Acid Leach process |
| | Disposal Options: |
| | 1) Onsite Disposal in Solid Waste Repository |
| | 2) Offsite Disposal in RCRA TSD Facility |
| 7 | Onsite Pyrometallurgical Treatment |
| 7A | Pyrometallurgical Process No. 1: Electric Arc Furnace |
| 7B | Pyrometallurgical Process No. 3: Rotary Kiln Process |
| | Disposal Options: |
| | 1) Onsite Disposal in Solid Waste |
| | 2) Offsite Disposal in RCRA TSD Facility |

media, size and configuration of systems and/or structures, time for achievement of remediation goals, mass flowrates, spatial requirements, and distances for transport, as well as newly available information on specific technologies.

### 9.4.1 Alternative No. 1 - No Action

This alternative, as required by 40 CFR Sec. 300.430 (e)(6), involves no action with respect to the Flue Dust Operable Unit. Current maintenance and land access controls would not be continued under this alternative. The no action alternative serves as a baseline against which other remedial alternatives can be compared. No time restraints exist for implementation of this alternative.

### 9.4.2 Alternative No. 2 - Institutional Controls

This alternative involves use of institutional controls such as restrictive covenants or land use zoning restrictions to establish maintenance and access control at the flue dust site locations as a sole remedy. Future land use and other restrictions would also be implemented through the use of institutional controls such as restrictive covenants and zoning restrictions. These institutional controls are discussed in greater detail in Appendix A.

### 9.4.3 Alternative No. 3 - Onsite Disposal of Untreated Flue Dust

This alternative involves the use of an onsite repository for disposal of untreated flue dust materials from the nine site locations of the operable unit. Under this alternative, flue dust would be excavated from each of the nine site locations, using conventional equipment, transported and placed in an onsite repository meeting applicable or relevant and appropriate RCRA Subtitle C requirements. Debris would be disposed of with the

flue dust. Large debris not capable crushed may require separation to ensure damage to repository liner systems does not occur. The repository would be capped and vegetated upon completion of disposal activities. The engineered containment facility would be protected through use of institutional controls to provide access control, maintenance, monitoring, and future use restrictions.

### 9.4.4 Alternative No. 4 - Offsite Disposal

This alternative involves excavation of flue dust materials from the nine site locations, offsite transportation to a RCRA-permitted TSD facility, and disposal in that facility. Under this alternative, flue dust would be excavated from the nine site locations and transported to a hopper which would be used to load the trucks or railroad container cars. Debris would be disposed of in the offsite repository.

### 9.4.5 Alternative No. 5 - Onsite Cement/Silicate-based Stabilization/Fixation Treatment

This alternative involves excavation of flue dust materials from the nine site locations, onsite transport to a central location, separation and onsite disposal of debris, treatment of the flue dust using one of two representative stabilization/ fixation treatment technologies, and either onsite or offsite disposal of the stabilized/fixed material. Under this alternative, stabilized/fixed flue dust materials would be rendered non-characteristic (non-TCLP toxic) as a result of treatment. Process- and material-specific treatability data obtained during the RI Phase II support this intent. Optimization of specific stabilization/fixation formulations would be needed for a final remedial design using this treatment alternative. Onsite cement-/silicate-based stabilization/

fixation has been considered to represent the onsite stabilization/ fixation technology type.

The original FS Phase II IASD submittal included a vitrification subalternative for the stabilization/fixation technology type. Treatability testing conducted in the RI Phase II subsequent to the IASD showed that arsenic present in the flue dust materials will volatilize at temperatures of 650°C or higher. As a result of concerns over arsenic volatilization during the vitrification process this process option is dropped from further consideration in the FS.

### 9.4.6 Alternative No. 6 - Onsite Hydrometallurgical Treatment

This alternative involves excavation of flue dust from the nine site locations, transport to a central onsite location, and hydrometallurgical treatment at that location. Three representative hydrometallurgical process options have been considered as subalternatives:

- Subalternative 6A: Hydrometallurgical Process No. 1 - Dowa Process
- Subalternative 6B: Hydrometallurgical Process No. 2 - Cashman Process
- Subalternative 6C: Hydrometallurgical Process No. 14 - Ambient Acid Leach Process

These treatment processes extract and selectively recover metals from flue dust materials by chemically reacting them in an aqueous medium. The Dowa and Ambient Acid leach processes are based on a sulfuric acid leach. The Cashman process is based on a chloride leach. In addition, the Cashman process is designed to chemically react with materials to fix or stabilize certain toxic constituents. Initial bench-scale tests indicate that the residue material could meet EP-Toxicity regulatory limits. The

processes generate potentially salable products and a process residual requiring disposal and having a volume approximately equal to the original flue dust volume. However, numerous inquiries made to the owners of the Dowa process treatability testing failed to secure an arrangement for pilot-scale testing of the process. Thus, the Dowa process was dropped from further consideration in the FS.

As stated previously, the Cashman process and the Ambient Acid Leach process produce potentially saleable products along with an acid leach residue requiring disposal. In addition, Ambient Acid Leaching also generates a lime precipitate residue which also requires disposal. Based on the RI Phase II treatability data, all of the above residues may be TCLP toxic and could ultimately require stabilization/fixation prior to disposal at an onsite or offsite facility. Spatial requirements for a processing facility would be expected to be similar under either subalternative.

### 9.4.7 Alternative No. 7 - Onsite Pyrometallurgical Treatment

This alternative involves excavation of flue dust from the nine site locations, transport to a central onsite location, and pyrometallurgical treatment at that location. Two representative pyrometallurgical process options have been considered as subalternatives:

- Subalternative 7A: Pyrometallurgical Process No. 1 - Electric Arc Furnace (Elkem Process)
- Subalternative 7B: Pyrometallurgical Process No. 3 - Rotary Kiln

Information collected on the two pyrometallurgical subalternatives during the RI Phase II treatability testing

indicated that the Elkem process was not sufficiently developed for treatment of flue dust materials, and the Rotary Kiln process was not as amenable to treating flue dust as the Flame Reactor process. The Flame Reactor process did not pass the FS Phase I Screening due to non-technical reasons. As such, these process options would be dropped from further consideration in the FS.

## 9.5 SCREENING OF REMEDIAL ALTERNATIVES

This section describes the process of screening the six selected remedial alternatives that was conducted during the IASD preparation. The screening process involves an effectiveness evaluation, an implementability evaluation, a cost evaluation, and an ARARs evaluation. Remedial alternatives which passed the screening are further developed and evaluated more fully in the detailed analysis of alternatives.

### 9.5.1 Effectiveness Evaluation

Results of the evaluation of short- and long-term effectiveness of each remedial alternative in protecting public health and the environment are presented below. The evaluation examines the potential effectiveness of each remedial technology to treat the estimated volume of flue dust, their potential impacts on human health and the environment during construction and implementation, and the status of the technology with regard to its proven ability and reliability to treat the flue dust materials.

#### 9.5.1.1 Alternative No. 1 - No Action

Alternative No. 1 would not provide short- or long-term protectiveness of public health or the environment. Since the current maintenance and land access control would not be in place under this alternative, potential increases in flue dust

migration through the actions of wind and water, and potential increases in human exposure through direct contact may occur.

No treatment of flue dust materials would be conducted under this alternative. The volume and toxicity of the material would not change, but the mobility may increase through various physical and chemical mechanisms.

#### 9.5.1.2 Alternative No. 2 - Institutional Controls

Alternative No. 2 can provide short-term protectiveness of public health and the environment, but may not provide sufficient long-term protectiveness as a sole remedy for the Flue Dust Operable Unit based on concentrations of arsenic, cadmium, and lead contained in flue dust. Implementation of institutional controls presented in Appendix B of the original FS Phase II IASD may reduce the extent of flue dust migration and direct exposure to human receptors through controlled actions such as stabilization of exposed flue dust surfaces and access control.

The volume, toxicity, and mobility of the material would not change from existing conditions at the operable unit. However, because of the existing dust control program, the mobility of flue dust materials would be lower than the mobility under the No Action alternative.

#### 9.5.1.3 Alternative No. 3 - Onsite Disposal of Untreated Flue Dust

Three subalternatives have been considered under Alternative No. 3. Each subalternative provides a level of protection of public health and the environment above that of the No Action and Institutional Controls alternatives. Implementation of each of the three subalternatives may result in short-term impacts through flue dust excavation, transport, loading, and compaction

activities. Subalternatives have been developed to be protective during implementation by including provisions for dust control, truck decontamination, and worker health and safety. All three subalternatives will provide short-term protectiveness during their implementation period.

Subalternatives 3A (use existing FDS facility), 3B (upgrade existing FDS facility), and 3C (new repository construction) may provide different levels of long-term protectiveness. Subalternative 3A involves use of the existing FDS facility without modification, and as such it considers use of a containment facility that is equipped with a single compacted soil/clay liner. Subalternatives 3B and 3C both involve use of a double-lined onsite repository designed to meet applicable or relevant and appropriate RCRA Subtitle C TSD design standards. Subalternatives 3B and 3C include repositories that provide greater engineering safeguards than Subalternative 3A. All three subalternatives may provide long-term protectiveness of public health and the environment.

No treatment of flue dust materials would be conducted under Alternative No. 3. Toxicity and volume of the flue dust would not change under this alternative, but mobility would be reduced through containment in lined, capped, onsite repositories.

#### 9.5.1.4 Alternative No. 4 - Offsite Disposal of Untreated Flue Dust

Alternative No. 4 would provide both short-term and long-term protection of public health and the environment. Under this alternative, appropriate dust control measures have been included so that short-term impacts associated with excavation, loading, and offsite transportation of flue dust materials are minimized. Long-term protection at the Anaconda Smelter site is achieved through removal of flue dust materials from the site.

However, protectiveness at the selected offsite RCRA TSD facilities cannot be determined at this time without further evaluation of the offsite disposal facilities. For purposes of this analysis, it is assumed that the selected offsite RCRA disposal facility would be in compliance with applicable laws and is protective of human health and the environment. Treatment of flue dust materials would not be conducted under this alternative. Mobility of the flue dust materials would be reduced, but the volume and toxicity would remain unchanged.

#### 9.5.1.5 Alternative No. 5 - Onsite Stabilization/Fixation Treatment

Alternative No. 5 would provide both short- and long-term protection of public health and the environment. Under this alternative, appropriate dust control measures have been included so that short-term impacts associated with excavation, loading, and onsite transportation of flue dust materials are minimized. Long-term protection is provided through treatment and use of either an onsite or offsite repository for disposal of treated process residual materials. Disposal Option 1, onsite disposal in an engineered repository, does not provide equivalent engineering safeguards as Disposal Option 2, offsite disposal at a RCRA TSD facility. Disposal Option 2 provides greater safeguards through enhanced design requirements.

Cement-/silicate-based stabilization is a treatment technology that changes the chemical and physical properties of the flue dust material. Toxicity of the flue dust materials would be reduced by binding arsenic and heavy metals in a stable, chemical, matrix which reduces the release of contaminants. Toxicity and mobility of flue dust would be reduced through the formation of the stable, chemical matrix and the disposal of treated process residual material in an engineered repository. The total volume of material would increase by approximately 20

percent under this due to the addition of stabilizing/fixing agents.

#### 9.5.1.6 Alternative No. 6 - Onsite Hydrometallurgical Treatment

Two subalternatives have been considered under Alternative No. 6. Both Subalternatives 6A (Cashman process) and 6C (Ambient Acid Leach process) may provide short- and long-term protection of public health and the environment. Under this alternative, appropriate dust control measures have been included so that short-term impacts associated with excavation, loading, and onsite transportation of flue dust materials are minimized. Long-term protection is provided through use of either onsite or offsite repositories for disposal of treated process residual materials. Disposal Option 1, onsite disposal in an engineered repository, does not provide equivalent engineering safeguards as Option 2, offsite disposal at a RCRA TSD facility. Disposal Option 2 provides greater safeguards through repository maintenance and monitoring efforts.

Both Hydrometallurgical Process No. 2 - Cashman process (Subalternative No. 6A) and Hydrometallurgical Process No. 14 - Ambient Acid Leach process (Subalternative No. 6C) are treatment processes that change the chemical and physical properties of the flue dust material. Both technologies may reduce the toxicity of the flue dust material through treatment. Both Cashman and Ambient Acid Leach produce an arsenic-bearing process residual material. The Cashman process would remove bismuth, cadmium, copper, lead, silver, and zinc from the flue dust as potentially saleable products. The Ambient Acid Leach process is expected to recover only copper, as cathode grade, from the flue dust. The arsenic-bearing residual material may have a lower toxicity than the untreated flue dust because arsenic and cadmium is present in more stable and less toxic, complexed forms. Based on

treatability testing data from the RI Phase II, the TCLP characteristic may not be eliminated under either subalternative, and further treatment of process residuals would be required. Mobility of flue dust would be reduced through the disposal of process residuals in engineered containment facilities. Total volume of material requiring disposal is dependent on whether additional treatment of the process residuals would be required.

### 9.5.2 Implementability Evaluation

The implementability evaluation given in the original IASD was prepared in accordance with the Guidance Document. Emphasis is given to the availability of treatment, storage, and disposal services, and if necessary, equipment and workers to implement the alternative.

#### 9.5.2.1 Alternative No. 1 - No Action

Technical and administrative implementability have no relevance to this alternative, as no actions would be taken at the operable unit.

#### 9.5.2.2 Alternative No. 2 - Institutional Controls

Technical implementability under this alternative primarily concerns the complexity of operation and maintenance (O&M) activities associated with maintenance and access control actions. Biannual application of surfactant, daily visual observation of the nine flue dust site locations, and maintenance of access control fences and posted signs are all easily implemented. These actions are not complex and do not require specialized equipment or personnel. The actions may be considered reliable on this basis.

Administrative implementability under this alternative primarily concerns mechanisms for instituting controls identified in Appendix B of the FS Phase II IASD (Dames & Moore, 1989b). These actions can be implemented using mechanisms including deed restrictions and zoning ordinances. Cooperation of, or coordination with third parties or local government would be required for the implementation of institutional controls, depending on the nature of the institutional control and the ownership of the property. These institutional controls and mechanisms are also considered in conjunction with other alternatives for the protection of onsite engineered containment systems, and conclusions stated here also apply to other alternatives.

#### 9.5.2.3 Alternative No. 3 - Onsite Disposal of Untreated Flue Dust

Technical implementability of this alternative primarily concerns the equipment and practices used for flue dust excavation, handling, and onsite transport; the modification or installation of onsite repositories; and the reliability of long-term repository care.

Excavation, handling, and onsite transport of flue dust can be conducted using conventional earthmoving equipment. Dust control measures would be required. This would add complexity to the flue dust handling activities, but their reliability is estimated to be high.

Use of the existing FDS facility (Subalternative 3A) can be easily implemented. This alternative was the existing facility with no modification. The vegetated soil cap can be constructed using conventional earthmoving and agricultural equipment.

Modification and use of the existing FDS facility (Subalternative 3B) would be more difficult to implement than Subalternative 3A. Subalternative 3B would involve excavation and temporary stockpiling of the flue dust that is currently contained within the FDS facility, additional site preparation work at and around the facility, installation of liners, a leachate detection/collection system, and monitoring wells, and installation of the top liner and vegetated cap upon completion of disposal activities. Although these activities are more complex, modification of the FDS facility for use as a RCRA TSD facility can be technically implemented with moderate difficulty.

Construction and use of a new onsite repository designed to meet applicable or relevant and appropriate RCRA Subtitle C requirements (Subalternative 3C) would have similar constructability to Subalternative 3B, as they both involve construction of an equivalent repository.

Reliability of onsite repositories would be dependent in part on the nature and extent of actions conducted to provide long-term repository care. For onsite repositories that have not been designed to meet applicable or relevant and appropriate RCRA Subtitle C TSD facility standards, e.g., Subalternative 3A, long-term care involves maintenance and repair of the vegetated cap and monitoring activities. These actions can be easily implemented through the use of conventional means of construction, and on this basis onsite non-RCRA equivalent and/or solid waste repositories can be considered reliable.

Monitoring of onsite repositories meeting RCRA Subtitle C standards is more complex than that of non-RCRA equivalent repositories, and includes additional monitoring and leachate collection system maintenance activities. Although long-term care is more complex, the additional activities can be easily

implemented. On this basis, onsite repositories meeting RCRA Subtitle C standards can be considered reliable.

Administrative implementability generally would not be difficult for Alternative No. 3. No significant difficulties are anticipated in obtaining required approvals for constructing, modifying, and maintaining permanent onsite repositories.

#### 9.5.2.4 Alternative No. 4 - Offsite Disposal of Untreated Flue Dust

Technical implementability under this alternative primarily concerns flue dust excavation, handling, unloading and disposal for offsite transport, and transport to a RCRA-permitted TSD facility. Technical implementation of flue dust excavation and handling has been discussed under Alternative No. 3.

Offsite transport of flue dust material can be accomplished using conventional truck or rail methods. Commercial RCRA-permitted TSD facilities have adequate capacity to receive the volume of flue dust material anticipated to be disposed under this alternative.

As stated in the original IASD administrative implementability of this alternative would not be difficult. It is anticipated that approvals can be obtained for offsite transportation and disposal in an offsite RCRA-permitted TSD facility.

#### 9.5.2.5 Alternative No. 5 - Onsite Stabilization/Fixation Treatment

Technical implementability of this alternative primarily concerns the excavation and onsite transport of flue dust materials, stabilization/fixation treatment, and onsite disposal

of process residual materials. Technical implementability of flue dust excavation and handling, and onsite/offsite disposal has been previously discussed under Alternative Nos. 3 and 4.

Chemical stabilization/fixation using cement-/silicate-based materials can be implemented using conventional mixing and blending equipment that is readily available. As stated in the original IASD administrative implementability of this alternative would not be difficult. It is anticipated that approvals can be obtained for implementing onsite stabilization/fixation treatment and onsite/offsite disposal activities.

#### 9.5.2.6 Alternative No. 6 - Onsite Hydrometallurgical Treatment

Technical implementability of this alternative primarily concerns the excavation and onsite transport of flue dust materials, treatment using a multi-stage hydrometallurgical extraction process, and either onsite or offsite disposal of process residual materials. Technical implementability of flue dust excavation and handling, and onsite/offsite disposal has been previously discussed under Alternatives Nos. 3 and 4.

Both the Cashman process (Subalternative 6A) and the Ambient Acid Leach process (Subalternative 6C) are extractive metallurgical processes, involving multiple reaction steps. Under both subalternatives, a treatment plant would be constructed at a central onsite location. This is expected to be a complex construction project. Specialized reactors, and other equipment may be required for the Cashman process. More common hydrometallurgical process equipment could be used for the Ambient Acid Leach process. Operation and maintenance requirements for both subalternatives would be complex, involving repair and replacement of pumps and piping, maintenance of process control equipment, and continued supply of process

reagents and supporting utilities. However, the Cashman process is more complex and would require several additional unit processes than for the Ambient Acid Leach process. It should be noted that significant uncertainty is associated with developing such large scale facilities for either process from bench- or pilot-scale studies.

As stated in the original IASD administrative implementability of this alternative would not be difficult. It is anticipated that approvals can be obtained for implementing onsite hydrometallurgical treatment and associated onsite/offsite disposal activities.

### 9.5.3 Cost Evaluation

Preliminary cost estimates were developed and presented for each remedial alternative in the IASD. However, these estimates have been refined in the FS Phase III detailed analysis for selected alternatives. To avoid redundancy, IASD cost estimates are not included here, but can be found in the original IASD submittal. Detailed cost estimates for the final group of remedial alternatives are given in Section 10 of this document. Results of the preliminary cost analysis given in the IASD have been incorporated into Table 9.6-1 using a net positive or net negative ranking.

### 9.5.4 Evaluation of Applicable or Relevant and Appropriate Requirements

The EPA provided ARCO with a preliminary screened list of ARARs on April 3, 1989. The EPA screened list of potential ARARs is not specific to remedial alternatives. The Flue Dust RI/FS Final Work Plan requires that ARCO evaluate the effectiveness of alternatives in meeting or exceeding ARARs in the IASD. The screened list of ARARs was evaluated specific to each of the

alternatives described in the previously submitted and approved IASD. ARCO provided the EPA with an ARARs Scoping Document on August 31, 1989 (ARCO, 1989). The EPA provided ARARs in January, 1991 (Appendix B, Screening and Description of Potential Applicable or Relevant and Appropriate Requirements for the Flue Dust Operable Unit, Anaconda Smelter NPL Site, EPA, 1991). These ARARs are evaluated in the detailed analysis of alternatives. To avoid redundancy, the IASD ARARs analysis is not included in this document, but can be found in the original IASD submittal. Results of the ARARs analysis are, however, incorporated into the screening evaluation and are summarized in Table 5.4-1 of the IASD.

## 9.6 SCREENING SUMMARY AND ALTERNATIVE SELECTION

Based on the results of the screening evaluations presented in Section 9.5 which were summarized from the original IASD, remedial alternatives were selected from the initial list of candidate remedial alternatives for further consideration during the detailed evaluations of the FS Phase III.

Results of the screening evaluations have been summarized and presented in Table 9.6-1. Results of the screening evaluations are presented using a "+" and "-" designation. Plus signs are used to denote that a screening criterion can be met, minus signs indicate that the alternative would fail to adequately meet the screening criterion. Plus signs also are used when screening criteria are marginally met, and associated performance of the remedial alternative is anticipated to be poor. Results of the effectiveness, implementability, and the original ARARs evaluations are presented using this designation. Results of the original cost evaluation are presented in Table 6.1-1 of the IASD. An overall composite evaluation is presented using a ranking of poor, fair, or good categories.

## ALTERNATIVE NUMBER

| | SCREENING CRITERION | 1 | 2 | 3 | | | 4 | 5 | | | | 6 | | | | 7 | | | | | | 8 | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 3A | 3B | 3C | | 5A-1 | 5A-2 | 5B-1 | 5B-2 | 6A-1 | 6A-2 | 6B-1 | 6B-2 | 7A-1 | 7A-2 | 7B-1 | 7B-2 | 7C-1 | 7C-2 | 8A-1 | 8A-2 | 8A-3 | 8B-1 | 8B-2 | 8B-3 | 8B-4 |
| EFFECTIVENESS | Provides Short-Term Protection | – | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| EFFECTIVENESS | Provides Long-Term Protection | – | – | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | – | + | + | + | + | + |
| EFFECTIVENESS | Reduces Toxicity | – | – | – | – | – | – | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| EFFECTIVENESS | Reduces Mobility | – | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| EFFECTIVENESS | Reduces Volume | – | – | – | – | – | – | – | – | – | – | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| IMPLEMENTABILITY | Ease of Construction | NA[a] | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | – | – | + | + | + | + | + | + | + | + | + |
| IMPLEMENTABILITY | Reliability | NA | + | + | + | + | + | + | + | – | – | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| IMPLEMENTABILITY | Use of Conventional Equipment/Personnel | NA | + | + | + | + | + | + | + | – | – | – | – | – | – | – | – | – | – | – | – | + | + | + | + | + | + | + |
| IMPLEMENTABILITY | Ease of Obtaining Approvals | NA | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| COST | Present Worth Cost ($1000) | 0 | 1,000 | 2,195 | 2,000 | 2,000 | 26,027 | 24,879 | 79,140 | 46,000 | 87,035 | 27,417 | 45,700 | NE[b] | NE[b] | 24,044 | 42,300 | 44,001 | 25,240 | 46,033 | 87,004 | 46,016[c] | 26,144[c] | 24,007[c] | 24,007[c] | 26,027[c] | 22,193[c] | 22,193[c] |
| ARARs | Ability to Meet ARARs | – | – | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| ALL | Composite Evaluation | POOR | POOR | FAIR | GOOD | GOOD | GOOD | GOOD | FAIR | FAIR | FAIR | GOOD | FAIR | GOOD | FAIR | GOOD | FAIR | FAIR | POOR | GOOD | FAIR | FAIR | POOR | FAIR | FAIR | FAIR | FAIR | FAIR |

**EXPLANATION:**

- a Not Applicable
- b Not Estimated
- c Estimates Do Not Include Costs and/or Revenues Associated with Offsite Commercial Processing
- \+ Meets Screening Criterion
- – Does Not Meet Screening Criterion

# Summary of Screening Evaluation Results

DAMES & MOORE

TABLE 9.6-1

Remedial alternatives that have received favorable evaluations during the FS Phase II screening have been selected for further consideration in the detailed evaluations conducted under Phase III of the FS. These alternatives are listed in Table 9.6-2. Table 9.6-2 also lists remedial alternatives that failed this screening and identifies the reason for failure. Failure of a remedial alternative to pass the screening procedure was based on failure to meet the set screening criteria, and/or poor anticipated performance in one or more screening criteria categories.

Based on results of the alternative RI Phase II treatability testing information, the following six alternatives will be subject to the detailed analysis:

- No action;
- Onsite disposal of untreated flue dust in a RCRA Subtitle C designed repository;
- Offsite disposal of untreated flue dust at RCRA TSD facility;
- Onsite cement/silicate-based stabilization/fixation, disposal in an onsite repository;
- Onsite hydrometallurgical treatment (metal removal/ chemical fixation) using the Cashman process, residue disposal in an onsite repository; and
- Onsite hydrometallurgical treatment (metal removal), cement/silicate-based stabilization/fixation residue disposal in an onsite repository.

The cement-based stabilization/fixation, Cashman and Ambient Leach processes are the representative processes for the cement/silicate-based stabilization, hydrometallurgical treatment [metal removal/chemical fixation], and hydrometallurgical treatment [metal removal] alternatives respectively; these alternatives will be evaluated in the detailed analysis.

## TABLE 9.6-2

## SUMMARY OF REMEDIAL ALTERNATIVE SELECTION

| Remedial Alternative | Screening Result | Comments |
|---|---|---|
| 1 - No Action | Fail | Retain for Comparison |
| 2 - Institutional Controls | Fail | May not provide sufficient long-term protectiveness of the environment as a sole remedy based on the unique characteristics of flue dust. Retain as component of alternatives |
| 3A - FDS | Fail | |
| 3B - Modify FDS | Fail | |
| 3C - New Repository | Pass | Retain as Representative |
| 4 - Offsite Disposal | Pass | Offsite RCRA TSD Disposal |
| 5A-1 - Stabilization/ Fixation | Pass | |
| 5A-2 | Fail | Higher Cost/Equivalent Benefit |
| 6A-1 - Dowa Process | Fail | No Treatability Test Data |
| 6A-2 - Dowa Process | Fail | No Treatability Test Data |
| 6B-1 - Cashman Process | Pass | |
| 6B-2 - Cashman Process | Fail | HigherCost/Equivalent Benefit |
| 6C-1 - Ambient Acid Leach | Pass | |
| 6C-2 - Ambeint Acid Leach | Fail | Higher Cost/Equivalent Benefit |
| 7A - EAF Process | Fail | Low Level of Development |
| 7B - Rotary Kiln Process | Fail | No Treatability Test Data |

The onsite hydrometallurgical treatment [metal removal/chemical fixation] alternative (Cashman process) will be evaluated with and without additional cement/silicate-based stabilization/fixation.

Alternative designations as listed in Table 9.6-2 have been revised for the detailed analysis to reflect the final numbering of remedial alternatives.

## 10.0 FS PHASE III

This section presents the results of the detailed analysis of remedial alternatives which were developed and have passed screening in the FS Phase II Initial Alternatives Screening Document (IASD) (Section 9.0). The detailed analysis has been conducted in accordance with the recently promulgated National Oil and Hazardous Substances Pollution Contingency Plan (NCP, 40 CFR Part 300, 55 Fed. Reg. 8686, March 8, 1990) The detailed analysis assesses individual alternatives against nine evaluation criteria and compares the relative performance of each alternative against the criteria. The nine evaluation criteria are: (1) overall protection of human health and the environment; (2) compliance with ARARs; (3) long-term effectiveness and permanence; (4) reduction of toxicity, mobility, or volume; (5) short-term effectiveness; (6) implementability; (7) cost; (8) State acceptance; and, (9) community acceptance. Analyses of the first seven evaluation criteria are presented for each remedial alternative in this section. Evaluation of the final two criteria will be performed after the public comment period on the RI/FS document.

### 10.1 METHODOLOGY

The FS Phase III includes two components. The first component is a detailed analysis of each of the screened remedial alternatives. The detailed analysis evaluates each remedial alternative using the first seven criteria listed above. The second component is a comparative analysis of each alternative which reviews the relative level of performance among the alternatives.

### 10.1.1 Detailed Analysis Process

For the detailed analysis of the five remedial alternatives from the FS Phase II IASD, each remedial alternative is evaluated independently by the following evaluation criteria from the NCP:

- Overall protection of human health and the environment. Alternatives shall be assessed to determine whether they can adequately protect human health and the environment, in both the short- and long-term, from unacceptable risks posed by hazardous substances, pollutants, or contaminants present at the site by eliminating, reducing, or controlling exposures to levels established during development of remediation goals consistent with § 300.430(e)(2)(i). Overall protection of human health and the environment draws on the assessments of other evaluation criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs.

- ARARs. The alternatives shall be assessed to determine whether they attain applicable or relevant and appropriate requirements under federal environmental laws and state environmental or facility siting laws or provide ground for invoking one of the waivers under paragraph (f)(1)(ii)(C) of this section.

- Long-term effectiveness and permanence. Alternatives shall be assessed for the long-term effectiveness and permanence they afford, along with the degree of certainty that the alternative will prove successful. Factors that shall be considered, as appropriate, include the following: (1) Magnitude of residual risk remaining from untreated waste or treatment residuals remaining at the conclusion of the remedial activities. The characteristics of the residuals should be considered to the degree that they remain hazardous, taking into account their volume, toxicity, mobility, and propensity to bioaccumulate; (2) Adequacy and reliability of controls such as containment systems and institutional controls that are necessary to manage treatment residuals and untreated waste. This factor addresses in particular the uncertainties associated with land disposal for providing long-term protection from residuals; the assessment of the potential need to replace technical components of the alternative, such as a cap, a slurry wall, or a treatment system; and the

potential exposure pathways and risks posed should the remedial action need replacement.

- Reduction of toxicity, mobility, or volume through treatment. The degree to which alternatives employ recycling or treatment that reduces toxicity, mobility, or volume shall be assessed, including how treatment is used to address the principal threats posed by the site. Factors shall be considered, as appropriate include the following: (1) The treatment or recycling processes the alternatives employ and materials they will treat; (2) The amount of hazardous substances, pollutants, or contaminants that will be destroyed, or recycled; (3) The degree of expected reduction in toxicity, mobility, or volume of the waste due to treatment or recycling and the specification of which reduction(s) are occurring; (4) The degree to which the treatment is irreversible; (5) The type and quantity of residuals that will remain following treatment, considering the persistence, toxicity, mobility, and propensity to bioaccumulate of such hazardous substances and their constituents; and (6) The degree to which treatment reduces the inherent hazards posed by principal threats at the site.

- Short-term effectiveness. The short-term impacts of alternatives shall be assessed considering the following: (1) Short-term risks that might be posed to the community during implementation of an alternative; (2) Potential impacts on workers during remedial action and the effectiveness and reliability of protective measures; (3) Potential environmental impacts of the remedial action and the effectiveness and reliability of mitigative measures during implementation; and (4) Time until protection is achieved.

- Implementability. The ease or difficulty of implementing the alternatives shall be assessed by considering the following types of factors as appropriate: (1) Technical feasibility, including technical difficulties and unknowns associated with the construction and operation of the technology, the reliability of the technology, ease of undertaking additional remedial actions, and the ability to monitor the effectiveness of the remedy; (2) Administrative feasibility, including activities needed to coordinate with other offices and agencies and the ability and time required to obtain any necessary approvals and permits from other agencies (for off-site actions); (3) Availability of services and materials, including the availability of adequate off-site treatment, storage capacity, and disposal capacity and services; the

availability of necessary equipment and specialists, and provisions to ensure any necessary additional resources; the availability of services and materials; and availability of prospective technologies.

- Cost. The types of costs that shall be assessed include the following: (1) Capital costs, including both direct and indirect costs; (2) Annual operation and maintenance costs; and (3) Net present value of capital and O&M costs.

- State acceptance. Assessment of state concerns may not be completed until comments on the RI/FS are received but may be discussed, to the extent possible, in the proposed plan issued for the public comment. The state concerns that shall be assessed include the following: (1) The state's position and key concerns related to the preferred alternatives and other alternatives; and (2) State comments on ARARs or the proposed use of waivers.

- Community acceptance. This assessment includes determining which components of the alternatives interested persons in the community support, have reservations about, or oppose. This assessment may not be completed until comments on the proposed plan are received.

Overall protection of human health and the environment and compliance with ARARS (unless a specific ARAR is waived) are threshold requirements that each alternative must meet in order to be eligible for selection as the recommended alternative.

### 10.1.2 Comparative Analysis of Alternatives

The comparative analysis assesses the relative performance among the alternatives against the evaluation criteria. Each alternative is evaluated against the threshold criteria (i.e., overall protection of human health and the environment, and compliance with ARARs), and the primary balancing criteria (i.e., long-term effectiveness and permanence, reduction of toxicity, mobility, or volume, short-term effectiveness, implementability, cost), and modifying criteria (i.e., State acceptance, and

community acceptance) individually. A summary of the comparative analysis is presented which gives a positive, neutral, or negative ranking for each alternative relative to the other alternatives. The summary indicates a net ranking for each alternative in order to aid in identification of a recommended alternative.

## 10.2 DESCRIPTION OF REMEDIAL ALTERNATIVES

The remedial alternatives described in this section passed the FS Phase II IASD screening. A more detailed description of the technologies and alternatives can be found in the previously submitted and approved FS Phase I and FS Phase II reports (Dames & Moore, 1989a; Dames & Moore, 1989b). While the Institutional Controls alternative was described in the FS Phase II IASD as both a sole remedy and as components of other alternatives, this alternative is not considered in the detailed analysis as a sole remedy. Institutional Controls such as land access and use restrictions have been retained as components of the remaining alternatives.

Alternative No. 1: Alternative No. 1 is the No Action alternative and is used as a baseline from which the other alternatives are measured. Maintenance and land access controls currently in place would not be continued under this alternative.

Alternative No. 2: Alternative No. 2 is onsite disposal of untreated flue dust materials. This alternative involves the excavation, transportation, and direct placement of the flue dust from each of the nine pile locations to a centrally located repository meeting applicable or relevant and appropriate RCRA Subtitle C requirements. The repository would be protected with institutional controls which include access control and use restrictions. Long-term maintenance and monitoring of the repository would also be required.

Alternative Nos. 2 through 5 have the common elements of excavation and transportation. Those common elements of equipment and methods are described here and referenced later to avoid redundancy.

The assumption is made for Alternative Nos. 2 through 5 that flue dust from the Main Flue has been excavated and is stockpiled at the base of the Main Flue. For purposes of this study it was also assumed that for Alternatives 2 through 5, excavation to a depth of approximately six inches below the elevation of the flue dust piles would be required to attain metals concentrations similar to those in surrounding soils. Field verification of arsenic and cadmium concentrations in remaining soil would be used to confirm these concentrations are equivalent to background concentrations in surrounding Smelter Hill soils. Remaining soils will be addressed in the Smelter Hill Operable Unit RI/FS.

Conventional earthmoving equipment such as loaders, scrapers, dozers, and off-road haul trucks could be used for the flue dust excavation and transportation portions of remedial Alternative Nos. 2 through 5. Flue dust could be excavated relatively easily from each of the pile locations with the exception of the Main Flue. Excavation below flue dust grade was not assumed for either the Main Flue or the Thickener location, where there is an existing liner. Adjacent soils that contain visually distinct wastes of the same type (i.e., flue dust) and in equivalent concentrations as the flue dust wastes would also be removed. Miscellaneous debris such as metal and wooden scraps would be placed in the repository along with the flue dust. Large debris not capable of being crushed may require separation to prevent potential damage to repository liner systems. Dust suppression on the haul roads and haul truck wheel washes would be required during all flue dust excavation and transportation activities. Untreated flue dust would be placed directly into a repository meeting applicable or relevant and appropriate RCRA

Subtitle C requirements. Placement could be accomplished with conventional earth-moving equipment, which includes using water trucks mounted with water cannons for flue dust suppression.

Alternative No. 2 would take two years to complete, excluding development of engineering design. Work would be seasonal and would continue each year for as long as possible under the given weather conditions. A six month season (May 1 to October 31) was assumed for the detailed analysis. Design and construction of the repository would be completed at the end of the first operating season. Excavation, transportation, and placement of the flue dust materials would occur during the second operating season.

A monitoring program for the repository involves periodic visual inspection, appropriate maintenance activities, and ground water monitoring. Ongoing maintenance activities would include sustaining proper vegetation of the cap material, keeping perimeter ditches free from obstructions, and ensuring proper operation of the leachate detection and collection system.

Institutional controls may be required in conjunction with the former flue dust pile locations and the repository to mitigate potential site access and to restrict use. A detailed discussion of Institutional Controls is provided in Appendix A of this volume.

<u>Alternative No. 3:</u> Alternative No. 3 is offsite Disposal of untreated flue dust materials. The Envirosafe TSD facility in Grandview, Idaho has been evaluated as the receiving site for Smelter Hill flue dust under this alternative. This facility is approximately 500 miles from the site. Requirements under RCRA govern shipping and manifesting the material to the TSD facility.

Flue dust would be excavated and transported within the site similarly to Alternative No. 2. The flue dust would be transferred from the haul trucks through a mobile hopper for conveyance to railroad container cars at the site. Additional dust suppressant activities would be required for the additional transfer steps to and from the rail container cars. Rail transport would occur on lines existing within the site.

Flue dust materials could be expected to be excavated and removed from the site in six months. Maintenance and monitoring requirements for the disposed material would be the responsibility of the facility operators. Institutional Controls may be required in conjunction with the former flue dust pile locations to mitigate potential site access and to restrict use.

Alternative No. 4: Alternative No. 4 is Onsite Cement/silicate-based Stabilization/Fixation. Cement-based stabilization/fixation formulations developed during the RI Phase II treatability testing at MSE, Inc. in Butte, Montana are selected as representative of the stabilization/fixation process. This process involves mixing the flue dust with Portland cement and hydrated lime to produce a stable solid material which passes TCLP toxicity criteria and meets EPA physical testing guidelines.

Alternative No. 4 would excavate and transport the flue dust materials using similar procedures to those described under Alternative No. 2, and would process each of the nine flue dust types at their respective locations with a mobile crusher and batch plant. Dust suppression activities identical to those described previously would be required at each pile location. Approximately six inches of soil from below the crusher/batch plant site at each pile location would be excavated and treated in addition to the soil excavated with the flue dust piles. The processed material would then be transported to the onsite repository for disposal using standard concrete trucks.

Alternative No. 4 would require three years to complete. Work would be seasonal and would continue each year for as long as possible under the given weather conditions. For the detailed analysis, it was assumed that approximately one third of the flue dust would be processed and disposed over a six month period in each of the three years. The repository would be constructed during the first operating season, and would be comprised of three cells. Each cell would contain the processed material from each of the three years of operation.

Design requirements for the repository would meet RCRA Subtitle D requirements and may include a lined excavation with an 80 mil HDPE liner, a leak detection and collection system, ground-water monitoring wells up gradient and down gradient from the repository, and a vegetated clay cap based on best engineering judgment. Final design would be determined in the remedial design phase based on best engineering judgment. Final ARARs for the selected remedial action will be identified in the Record of Decision.

Maintenance and monitoring requirements, such as maintaining vegetation and periodic ground-water monitoring, would be required for the repository, similar to those activities described under Alternative No. 2. Institutional controls may be required in conjunction with the former flue dust pile locations and the repository to mitigate potential site access and to restrict use.

Alternative No. 5: Onsite Hydrometallurgical Treatment [metal removal/chemical fixation] is represented by the Cashman process. Treatability testing of the Cashman process for the RI Phase II report was performed by Hazen Research, Inc. (HRI).

The Cashman process is a patented chloride acid leach which is performed under elevated temperature and pressure to produce

pregnant liquor for subsequent metal recovery and a leach residue which chemically reacts remaining toxic constituents to produce a non-characteristic (non-TCLP) material. The unit operations of the bismuth/lead precipitation, atacamite metathesis/copper recovery, cadmium cementation, and zinc precipitation follow the leaching step to produce potentially saleable precipitate products, as described in Section 6 of the RI/FS. These unit operations are a mixture of standard and innovative hydrometallurgical techniques for metal recovery. Initial bench-scale testing had previously indicated that autoclave leach residue meeting EP-Toxicity characteristic limits could be produced (PTI 1988). The RI Phase II treatability testing further evaluated the Cashman process as a pilot to a full-scale continuous-run facility. Based on RI Phase II treatability testing results, the leach residue from the Cashman process exceeds TCLP characteristic limits. A separate study performed by Artech Resources on the same samples also indicated the autoclave leach residue derived during treatability testing exceeded TCLP characteristic limits (Artech 1990). Artech produced additional autoclave residues at the bench-scale and found materials to meet TCLP characteristic limits. The analytical TCLP testing by Artech was not conducted using CLP documentation and protocols and is not considered enforcement quality data.

Because of the data received to date, it is uncertain as to whether the Cashman process could produce a leach residue meeting TCLP characteristic limits at a full-scale facility. Therefore, for this analysis the Cashman process will be evaluated assuming both that the leach residue will not meet TCLP characteristic limits and will require additional cement-based stabilization/fixation prior to disposal in an engineered onsite repository (Alternative No. 5A), similar to that described under Alternative No. 4, and the leach residue will meet TCLP characteristic limits and be disposed in an engineered onsite

repository Alternative No. 5B). The marketable precipitate products would be sold to various metallurgical processing facilities for subsequent metal recovery. Four precipitate products produced during treatability testing, copper oxide, bismuth oxychloride, lead sulfate and cadmium cement exhibited EP Toxicity characteristics. If these products could not be sold, they would require further treatment prior to disposal in an engineered onsite repository.

For Alternative Nos. 5A and 5B, excavation and transportation of the flue dust to the onsite processing facility would use the same procedures as previously described for Alternatives Nos. 2 and 3. Institutional controls may be required in conjunction with the former flue dust pile locations and the repository to mitigate potential site access and restrict use.

Alternative Nos. 5A and 5B would most likely require a minimum of one year for detailed engineering design and two years to construct the processing facility. A processing rate of eight tons of flue dust per hour, 24 hours per day, seven days per week is assumed for this study. Using this rate the facility would operate for approximately five years. A closure period would also be required after all flue dust materials have been treated.

Alternative 5A would also require that leach residue and unsalable precipitate be additionally treated by cement-based stabilization/fixation as described in Alternative No. 4. A repository similar to that described in Alternative 4 would be constructed during the first year of processing to receive the treated leach residue and unsalable precipitate products.

Alternative 5B would require that leach residues be placed in a repository, to be constructed during the first processing year, as described in Alternative No. 4.

Alternative No. 6: Onsite Hydrometallurgical Treatment [metal removal] is represented by the Ambient Acid Leach process for the RI Phase II report was performed by Metcon Research, Inc. (Metcon). The Ambient Acid Leach process would process the flue dust using the standard technology of acid leaching at ambient temperature and pressure conditions. Ambient leaching, followed by SX-EW, is a proven hydrometallurgical technique and is in operation at the commercial level in several locations. Cathode copper would be produced and sold.

The leached flue dust slurry is filtered to produce a leach residue and pregnant solution containing copper. The pregnant solution is subjected to solvent extraction-electrowinning barren solution from the SX (raffinate) contains trace metals which are precipitated by neutralization with lime prior to recycling the stream to the beginning of the process. The liquid stream from the EW (spent electrolyte) would be recycled back to the SX plant.

Both the acid leach residue and the lime precipitate exceeded TCLP characteristic limits during treatability testing. These materials have been assumed to require cement-based stabilization/fixation prior to disposal in an onsite repository similar to that described in Alternative No. 4.

For Alternative No. 6, excavation and transportation of the flue dust to the onsite processing facility would use the same procedures as previously described for Alternatives Nos. 2 and 3. Institutional controls may be required in conjunction with the former flue dust pile locations and the repository to mitigate potential site access and restrict use.

Alternative No. 6 would most likely require a minimum of one year for detailed engineering design and two years to construct the processing facility. A processing rate of eight tons of flue

dust per hour, 24 hours per day, seven days per week is assumed for this study. Using the rate the facility would operate for approximately five years. A closure period would also be required after all flue dust materials have been treated.

## 10.3 DETAILED ANALYSIS OF ALTERNATIVES

Section 10.3 presents the results of the detailed analysis of each remedial alternative for the Flue Dust Operable Unit based on the evaluation criteria identified in the NCP. As noted in Section 10.1 the evaluation of alternatives reflects the scope of the remedial action under consideration and the site problems being addressed. The scope of the Flue Dust Operable Unit is limited to the present flue dust locations and the potential treatment and disposal of flue dust and/or treatment residues. The Flue Dust Operable Unit is not intended to address surface or ground water cleanup at or near the flue dust locations or final reclamation of these locations.

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

Overall protection of human health and the environment is based on a comprehensive evaluation of each remedial alternative against the previously described evaluation presented in criteria of long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs.

#### 10.3.1.1 Alternative No. 1 - No Action

The No Action alternative does not provide adequate protection to human health or the environment. Since all control activities that apply to the Flue Dust Operable Unit under the Administrative Order on Consent would be terminated, potential flue dust pathways to human receptors through air, surface water,

and groundwater would exist. Based on the Baseline Risk Assessment the flue dust piles would continue to be a source of contamination to the surrounding environment.

#### 10.3.1.2 Alternative No. 2 - Onsite Disposal of Untreated Flue Dust

Onsite disposal of untreated flue dust materials would achieve protection of human health and the environment through flue dust containment in a repository meeting applicable or relevant and appropriate RCRA Subtitle C requirements. Long-term maintenance and monitoring requirements for the repository would be easily implemented and would provide necessary protection of human receptors and the environment. Dust control activities would be implemented during the excavation, transportation, and placement of the untreated flue dust, and would provide necessary short-term protection of human health and the environment. Remedial response objectives would be met after the second year of operation. Onsite disposal would meet the final ARARs submitted by the EPA.

Since treatment of flue dust does not occur with Alternative No. 2, a potential for a release to the environment of untreated flue dust still exists if there were a failure in the monitoring or containment systems.

#### 10.3.1.3 Alternative No. 3 - Offsite Disposal of Untreated Flue Dust

Offsite disposal of the flue dust materials would achieve protection of human health and the environment through the complete removal of flue dust from the site and transportation to an offsite repository. Dust control activities during excavation, transportation and loading of flue dust onto the railroad cars would provide adequate short-term protection for

workers and the environment. However, the additional handling steps present a potential for increased exposure risk until the material is properly disposed of at the TSD facility. Remedial response objectives would be met at the Flue Dust Operable Unit after the first year of operation. Offsite disposal at a RCRA TSD facility would comply with the final ARARs submitted by the EPA.

#### 10.3.1.4 Alternative No. 4 - Onsite Cement-Based Stabilization/Fixation

Onsite cement-based stabilization/fixation using standard, proven treatment technologies achieves protection of human health and the environment through production of a stable non-characteristic material passing TCLP regulatory limits, and subsequent containment in an engineered onsite repository. Dust control activities during excavation and placement of the flue dust into the crusher and batch plant would provide adequate protection of workers and the environment. Remedial response objectives would be met after the third year of operation. Alternative No. 4 would attain ARARs. Placement of the treated flue dust in a repository provides an additional measure of long-term effectiveness by limiting exposure of the treated material to the environment.

#### 10.3.1.5 Alternative No. 5 - Cashman Process

Onsite hydrometallurgical treatment (metal removal/chemical fixation) would consist of either process followed by stabilization/ fixation and disposal of process residuals, or direct disposal of non-characteristic residues. Alternative Nos. 5A and 5B ultimately would achieve protection of human health and the environment through placement of the materials in an engineered onsite repository.

Evaluation of long-term effectiveness is similar for both subalternatives of the Cashman process. Dust control activities during excavation, transportation, and placement of the flue dust into the feed preparation step would be required to provide adequate protection of workers and the environment. Due to the relative complexities of the Cashman process, remedial response objectives would be expected to be met approximately seven to ten years after construction of the processing facility begins. Under this alternative untreated flue dust would remain exposed for the duration of the facility operation. Control of the stockpiled untreated flue dusts prior to processing (e.g., application of surfactants) would be required as an interim activity to limit environmental transport. Plant emissions would require monitoring during facility operation. The Cashman process would attain ARARs.

#### 10.3.1.6 Alternative No. 6 - Ambient Acid Leach Process

Onsite hydrometallurgical treatment (metal removal) would involve hydrometallurgical processing followed by stabilization/ fixation and disposal of process residuals. Alternative No. 6 ultimately would achieve protection of human health and the environment through placement of the materials in an engineered onsite repository, similar to that described for Alternative No. 5A.

Dust control activities during excavation, transportation, and placement of the flue dust into the feed preparation step would be required to provide adequate protection of workers and the environment. The Ambient Acid Leach process contains fewer unit operations than the Cashman process, and remedial response objectives would be expected to be met approximately seven to eight years after construction of the processing facility begins. Untreated flue dust would remain exposed for the duration of the facility operation. Control of the stockpiled untreated flue

dusts prior to processing (e.g., application of surfactants) would be required as an interim activity to limit environmental transport. Plant emissions would require monitoring during facility operation. The Ambient Acid Leach process would attain ARARs.

### 10.3.2 Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

Section 121(d)(2) of CERCLA provides a statutory basis for determining applicable or relevant and appropriate requirements ("ARARs") in a remedial action context. With respect to any hazardous substance, pollutant or contaminant that will remain on site, Section 121(d)(2) of CERCLA provides,

> If any standard, requirement, criteria or limitation under any federal environmental law . . . or any [stringent] promulgated standard, requirement, criteria or limitation under a state environmental or facility siting law . . . is legally applicable to the hazardous substance concerned or is relevant and appropriate under the circumstances of the release or threatened release of such hazardous substance, pollutant or contaminant, the remedial action shall require, at the completion of the remedial action, a level or standard of control for such hazardous substance, pollutant or contaminant which at least attains such legally applicable or relevant and appropriate standard, requirement, criteria or limitation. 42 U.S.C. § 9621(d)(2).

"Applicable requirements" are those

> Cleanup standards, standards of control, or other substantive environmental protection requirements, criteria or limitations promulgated under federal environmental or state environmental or facility siting laws that specifically address a hazardous substance, pollutant or contaminant at a

> CERCLA site. Only those state standards that are identified by a state in a timely manner and that are more stringent than federal requirements may be applicable.

Final NCP, 40 C.F.R. § 300.5; Compliance with Other Laws Manual, p. 1-10.

> "Relevant and appropriate requirements" are those Cleanup standards, standards of control, and other substantive requirements, criteria or limitations promulgated under federal environmental, or state environmental or facility siting laws that, while not applicable to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site so that their use is well suited to the particular site. Only those state standards that are identified in a timely manner and are more stringent than federal requirements may be relevant and appropriate.

Final NCP, 40 C.F.R. § 300.5; Compliance with Other Laws Manual, p. 1-10.

The ARARs are identified in light of site specific circumstances. Compliance with Other Laws Manual, pp. 1-6, 1-13. In its ARARs document EPA explains that "the scope of the remedy [for flue dust] is limited, particularly where compliance with ground and surface water requirements and final compliance with air requirements is concerned. For the most part, final compliance with these requirements will be expected to occur at the time of completion of remedial action on the Smelter Hill Operable Unit." The document further states that the "[remedial] action is not intended to address current problems associated with the geographical areas on which these [flue dust] disposal areas lie."

Table 10.3-1 is the list of Federal and State ARARs identified by EPA for completing the detailed analysis of

alternatives. Appendix B of the FS contains a detailed description of Federal and State ARARs identified by EPA and the State of Montana. The ARARs are divided into Contaminant Specific, Location Specific, and Action Specific requirements. The first column lists the ARAR, and the subsequent columns list the citation, the appropriate alternative for consideration, whether the citation is applicable or relevant/appropriate, and which alternative fails to comply with the ARAR. Final ARARs for the selected remedial action will be identified by EPA in the Record of Decision. With the exception of the No Action alternative, each of the remedial alternatives considered in this report have been developed such that it is expected that ARARs will be attained. For these reasons Alternative Nos. 2 through 6 would attain the listed ARARs with proper final design and execution.

Mineral processing wastes that are no longer retained within the Bevill Exclusion and exhibit a characteristic of a hazardous waste are considered to be "newly identified" wastes and will not have promulgated treatment study under the land disposal restrictions (LDR) until EPA completes a separate LDR rulemaking. No other LDRs apply to newly identified wastes.

#### 10.3.2.1 Alternative No. 1 - No Action

Alternative No. 1 (No Action) would not attain Federal and State ARARs as they are listed in Table 10.3-1. The No Action alternative is listed as a baseline reference. As stated previously, the No Action alternative would not continue the biannual surface sealant application, daily visual inspections, or the current site access control measures.

## Table 10.3-1

## SUMMARY OF SCREENING ANALYSIS OF FEDERAL AND STATE ARARs
## FLUE DUST OPERABLE UNIT

| Standard Requirement Criteria, or Limitation | Citation | Alternatives | Applicable (A) or Relevant/Appropriate (RA) | Failing Alternatives |
|---|---|---|---|---|
| **FEDERAL** | | | | |
| **CONTAMINANT SPECIFIC** | | | | |
| 1. Clean Air Act | | | | |
| National Emission Standards for Hazardous Air Pollutants | 40 CFR Part 61 | All Alternatives | RA | 1 |
| National Primary and Secondary Air Quality Standards | | All Alternatives | RA | 1 |
| 2. RCRA | | | | |
| Identification | 40 CFR Part 261 | All Alternatives | A | 1 |
| Maximum Concentration Limits | 40 CFR Part 264.94 | All Alternatives | RA | 1 |
| 3. Clean Water Act, Water Quality Criteria, Gold Book Water Quality Criteria | 40 CFR Part 131, 125 | All Alternatives | RA | None |
| 4. Safe Drinking Water Act | 40 CFR Part 141.11 - 141.16<br>141.50 - 141.51 | All Alternatives | RA | None |
| 5. OSHA Standards | 29 CFR Part 1910 | All Alternatives | RA | 1 |

## Table 10.3-1 (Cont'd)

## SUMMARY OF SCREENING ANALYSIS OF FEDERAL AND STATE ARARs
## FLUE DUST OPERABLE UNIT

| Standard Requirement Criteria, or Limitation | Citation | Alternatives | Applicable (A) or Relevant/Appropriate (RA) | Failing Alternatives |
|---|---|---|---|---|
| **FEDERAL**<br>**LOCATION SPECIFIC** | | | | |
| 1. National Historic Preservation Act | 16 USC § 470<br>40 CFR § 6.301(b)<br>36 CFP Part 800 | All Alternatives | A | None |
| 2. Historic Sites, Buildings and Antiques Act | 16 USC §§ 461-467<br>40 CFR § 6.301(a) | All Alternatives | A | None |
| 3. Archaeological and Historic Preservation Act | 16 USC § 469<br>40 CFR Part 469<br>40 CFR Part 6.301(c) | All Alternatives | A | None |
| 4. Endangered Species Act | 16 USC §§ 1531 and 1543<br>50 CFR Part 17<br>50 CFR Part 402<br>40 CFR Part 6.302(n) | All Alternatives | A | None |
| 5. Fish and Wildlife Coordination Act | 16 USC §§ 661-666 | All Alternatives | A | None |
| 6. Protection of Wetlands | 40 CFR Part 6, Appendix A<br>Executive Order No. 11990 | All Alternatives | A | None |
| 7. Resource Conservation and Recovery Act | 42 USC §§ 6901 et seq.<br>40 CFR 264.18(a)and(b) | All Alternatives | A | 1 |

## Table 10.3-1 (Cont'd)

## SUMMARY OF SCREENING ANALYSIS OF FEDERAL AND STATE ARARs
## FLUE DUST OPERABLE UNIT

| Standard Requirement Criteria, or Limitation | Citation | Alternatives | Applicable (A) or Relevant/Appropriate (RA) | Failing Alternatives |
|---|---|---|---|---|
| **FEDERAL** | | | | |
| **ACTION SPECIFIC** | | | | |
| 1. Resource Conservation and Recovery Act | 40 CFR Part 260 | 2, 3, 4, 5 | A/RA | None |
| | 40 CFR Part 262 | 2, 3, 4, 5 | A/RA | None |
| Standards Applicable to Generators of Hazardous Waste | 40 CFR Part 263 | 2, 3 | A/RA | None |
| Standards Applicable to Transporters of Hazardous Waste | | | | |
| Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities | 40 CFR Part 264 | 2, 3, 4, 5 | A/RA | None |
| · General Facility Standards | Subpart B | 2, 3, 4, 5 | A/RA | None |
| · Preparedness and Prevention | Subpart C | 2, 3, 4, 5 | A/RA | None |
| · Contingency Plan and Emergency Procedures | Subpart D | 2, 3, 4, 5 | A/RA | None |
| · Releases from Solid Waste Management Units | Subpart F | 2, 3, 4, 5 | A/RA | None |
| · Closure and Post Closure | Subpart G | 2, 3, 4, 5 | A/RA | None |

## Table 10.3-1 (Cont'd)

## SUMMARY OF SCREENING ANALYSIS OF FEDERAL ARARs
## FLUE DUST OPERABLE UNIT

| Standard Requirement Criteria, or Limitation | Citation | Alternatives | Applicable (A) or Relevant/Appropriate (RA) | Failing Alternatives |
|---|---|---|---|---|
| **FEDERAL** | | | | |
| **ACTION SPECIFIC** | | | | |
| · Use and Management of Containers | Subpart I | 2 | A/RA | None |
| · Waste Piles | Subpart L | All Alternatives | A/RA | 1 |
| · Landfills | Subpart N | 2, 3, 4, 5 | A/RA | None |
| Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities | 40 CFR Part 266 Subpart F | 3, 4, 5 | A/RA | None |
| Land Disposal Restrictions | 40 CFR Part 268 | 2, 3, 4, 5 | A/RA | None |
| 2. Surface Mining Control and Reclamation Act | 30 USC §§ 1201-1326, 30 USC §§ 816.11 and 784.13 | 2, 3, 4, 5 | RA | None |
| 3. Occupational Safety and Health Act | 29 USC §§ 651-678<br>29 CFR Part 1910<br>29 CFR Part 1926 | All Alternatives<br>All Alternatives<br>All Alternatives | A<br>A<br>A | 1<br>1<br>1 |
| 4. DOT Hazardous Material Transportation Regulations | 49 CFR Parts 107, 171-177 | 2 | A | None |
| 5. Clean Water Act | | | | |
| Discharge of Effluent | 40 CFR § 125, Subpart-K | 2, 3, 4, 5 | A | None |
| 6. Air Quality | | | | |
| New Source Performance Standards | 40 CFR § 60 | 4, 5 | RA | None |

## Table 10.3-1 (Cont'd)

## SUMMARY OF SCREENING ANALYSIS OF MONTANA ARARs
## FLUE DUST OPERABLE UNIT

| Standard Requirement Criteria, or Limitation | Citation | Alternatives | Applicable (A) or Relevant/Appropriate (RA) | Failing Alternatives |
|---|---|---|---|---|
| **STATE** | | | | |
| **CONTAMINANT SPECIFIC** | | | | |
| 1. Air Quality | MCA 75-2-102 | All Alternatives | RA | 1 |
| The Clean Air Act of Montana | | | | |
| Ambient Air Quality Standards: | | | | |
| Lead | ARM § 16.8.815 | All Alternatives | A | None |
| Ozone | ARM § 16.8.817 | All Alternatives | A | None |
| Settled Particulate Matter | ARM § 16.8.818 | All Alternatives | A | 1 |
| PM-10 | ARM § 16.8.821 | All Alternatives | A | 1 |
| Visibility | ARM § 16.8.822 | All Alternatives | A | None |
| Prevention of Significant Deterioration | ARM § 16.28.925 - 926 | All Alternatives | A | 1 |
| Airborne Particulate Matter | ARM §§ 16.8.1401(4) & (5), 16.8.1403 | All Alternatives | A | None |
| Visible Air Contaminants | ARM § 16.8.1404 | All Alternatives | A | 1 |
| 2. Surface Water Quality Standards | MCA 75-5-303, ARM §§ 16.20.601, 602, 604, 605, 616, 617, 618, 631, 632, 633, 702, 703 | All Alternatives | A | None |
| 3. Groundwater Pollution Control System | ARM §§ 316.20.1002, 1003,1011 | All Alternatives | A | 1 |
| 4. Public Water Supply | MCA 75-6-112, ARM § 16.20.203, 205 | All Alternatives | A | 1 |

## Table 10.3-1 (Cont'd)

## SUMMARY OF SCREENING ANALYSIS OF MONTANA ARARs
## FLUE DUST OPERABLE UNIT

| Standard Requirement Criteria, or Limitation | Citation | Alternatives | Applicable (A) or Relevant/Appropriate (RA) | Failing Alternatives |
|---|---|---|---|---|
| LOCATION SPECIFIC | | | | |
| 1. Floodplain and Floodway Management | | | | |
| The Floodplain and Floodway Management Act | MCA 76-5-402 | All Alternatives | A | None |
| | MCA 76-5-1101 | All Alternatives | RA | None |
| | MCA 76-5-1102 | All Alternatives | RA | None |
| Floodplain Management Regulations | ARM § 36.15.216 | All Alternatives | RA | None |
| | ARM § 36.15.606 | All Alternatives | RA | None |
| | ARM § 36.15.801 | All Alternatives | A | None |
| 2. Streambeds and Stream Protection | | | | |
| The Natural Streambed and Land Preservation Act of 1975 | | | | |
| Minimum Standards and Guidelines for Natural Streambed and Land Preservation Act of 1975 | ARM § 36.2.404 | All Alternatives | RA | 1 |
| 3. Major Facility Siting Act | ARM §§ 36.3.2502, 2502-2505 | All Alternatives | RA | 1 |

## Table 10.3-1 (Cont'd)

## SUMMARY OF SCREENING ANALYSIS OF MONTANA ARARs
## FLUE DUST OPERABLE UNIT

| Standard Requirement Criteria, or Limitation | Citation | Alternatives | Applicable (A) or Relevant/Appropriate (RA) | Failing Alternatives |
|---|---|---|---|---|
| **STATE** | | | | |
| **ACTION SPECIFIC** | | | | |
| 1. Montana Strip and Underground Mine Reclamation Act | MCA 82-4-231, 233 | All Alternatives | RA | 1 |
| Strip and Underground Mine Reclamation Backfilling and Grading Requirements | ARM §§ 26.4.501, 501(A), 505, 520, 631, 633, 634, 636, 638, 639, 640, 641, 642, 643, 642, 644, 703, 711, 713, 714, 716, 719, 723, 730, 751, 761, 1819 | All Alternatives | RA | 1 |
| 2. Hazardous Waste | ARM §§ 16.44.701-703 | | A | 1 |
| 3. Solid Waste | | | | |
| Solid Waste Management Regulations | MCA 75-10-212, ARM §§ 16.14.505, 520, 523 | 4, 5 | A | None |
| 4. Air Quality | | | | |
| The Clean Air Act of Montana | | | | |
| Emissions Control Regulations | | All Alternatives | A | 1 |
| Air Standards | ARM §§ 16.8.1103, 1401 (2) and (3) | | | |
| Carbon Monoxide | | All Alternatives | A | None |
| Hydrogen Sulfide | | All Alternatives | A | None |
| Nitrogen Dioxide | | All Alternatives | A | None |
| Sulfur Dioxide | ARM § 16.8.811<br>ARM § 16,8,814<br>ARM § 16.8.816<br>ARM § 16.8.820 | All Alternatives | A | None |
| 5. Occupational Health and Safety | | | | |
| The Montana Safety Act | MCA 50-71-201 | All Alternatives | A | 1 |

## Table 10.3-1 (Cont'd)

## SUMMARY OF SCREENING ANALYSIS OF MONTANA ARARs
## FLUE DUST OPERABLE UNIT

| Standard Requirement Criteria, or Limitation | Citation | Alternatives | Applicable (A) or Relevant/Appropriate (RA) | Failing Alternatives |
|---|---|---|---|---|
| **STATE**<br>**ACTION SPECIFIC** | | | | |
| Cont'd<br>5. The Employee and Community Hazardous Chemical Information Act | MCA 50-78-202-204, 305 | All Alternatives | A | 1 |
| 6. Water Quality | MCA § 75-5-605 | All Alternatives | A | None |
| | MCA § 85-2-505 | All Alternatives | A | 1 |

#### 10.3.2.2 Alternative No. 2 - Onsite Disposal of Untreated Flue Dust

Alternative No. 2 (onsite disposal of untreated flue dust in an onsite repository meeting RCRA Subtitle C requirements) would meet the ARARs listed in Table 10.3-1 if properly executed. Attainment of these ARARs would be met by construction of a repository meeting applicable or relevant and appropriate RCRA Subtitle C requirements and dust control measures prescribed by the alternative.

#### 10.3.2.3 Alternative No. 3 - Offsite Disposal of Untreated Flue Dust

Alternative No. 3 (offsite disposal of untreated flue dust at a RCRA TSD facility) would meet the ARARs listed in Table 10.3-1 if properly executed. Attainment of these ARARs would be met by the proposed excavation and transportation methods of the alternative.

#### 10.3.2.4 Alternative No. 4 - Onsite Cement-Based Stabilization/Fixation

Alternative No. 4 (stabilization/fixation of the flue dust and disposal in an engineered onsite repository) would meet the ARARs listed in Table 10.3-1 if properly executed. Regulatory requirements promulgated under RCRA Subtitle C would not be applicable to the disposal of treated flue dust assuming that the treated flue dust does not exceed TCLP characteristic limits. Design requirements for the repository would meet all applicable RCRA Subtitle D provisions (40 CFR Sections 256, 257) and certain relevant and appropriate Montana Hazardous Waste Act and RCRA Subtitle C provisions. Selection of relevant and appropriate provisions would be based upon best engineering judgment. Final design would be determined in the remedial design phase based

upon best engineering judgment. Final ARAs for the selected remedial alternative will be issued by EPA in the ROD.

#### 10.3.2.5 Alternative No. 5 - Cashman Process

Alternative Nos. 5A and 5B (the Cashman process, followed by either stabilization/fixation of the autoclave leach residue and disposal in an engineered onsite repository, or direct disposal of the leach residue) would meet ARARs listed in Table 10.3-1 if properly executed. Applicable or relevant and appropriate RCRA Subtitle C requirements would be applicable prior to the treatment of flue dust. Regulatory requirements promulgated under RCRA Subtitle C would not be applicable to the disposal of treated flue dust assuming that the treated flue dust does not exceed TCLP characteristic limits. Design requirements for the repository would meet all applicable RCRA Subtitle D provisions (40 CFR Sections 256, 257) and certain relevant and appropriate Montana Hazardous Waste Act and RCRA Subtitle C provisions. Selection of relevant and appropriate provisions would be based upon best engineering judgment. Final design would be determined in the remedial design phase based upon best engineering judgment. Final ARARs for the selected remedial alternative will be issued by EPA in the ROD.

#### 10.3.2.6 Alternative No. 6 - Ambient Acid Leach Process

Alternative No. 6 (the Ambient Acid Leach process, followed by stabilization/fixation of the acid leach residue and raffinate lime precipitate and disposal in an engineered onsite repository) would meet ARARs listed in Table 10.3-1 if properly executed. RCRA Subtitle C requirements would be applicable prior to treatment of flue dust. Regulatory requirements promulgated under RCRA Subtitle C would not be applicable to the disposal of treated flue dust assuming that the treated flue dust does not

exceed TCLP characteristic limits. Design requirements for the repository would meet all applicable RCRA Subtitle D provisions (40 CFR Sections 256, 257) and certain relevant and appropriate Montana Hazardous Waste Act and RCRA Subtitle C provisions. Selection of relevant and appropriate provisions would be based upon best engineering judgment. Final design would be determined in the remedial design phase based upon best engineering judgment. Final ARAs for the selected remedial alternative will be issued by EPA in the ROD.

### 10.3.3 Long-Term Effectiveness and Permanence

Factors that shall be considered as appropriate under long-term effectiveness and permanence include the following: (1) Magnitude of residual risk remaining from untreated waste or treatment residuals remaining at the conclusion of the remedial activities. The characteristics of the residuals should be considered to the degree that they remain hazardous, taking into account their volume, toxicity, mobility, and propensity to bioaccumulate; and (2) Adequacy and reliability of controls such as containment systems and institutional controls that are necessary to manage treatment residuals and untreated waste. This factor addresses in particular the uncertainties associated with land disposal for providing long-term protection from residuals; the assessment of the potential need to replace technical components of the alternative, such as a cap, a slurry wall, or a treatment system; and the potential exposure pathways and risks posed should the remedial action need replacement.

#### 10.3.3.1 Alternative No. 1 - No Action

Long-term effectiveness and permanence is not achieved by the No-Action alternative. No exposure controls or other long-term management activities are included under this alternative. Risks currently associated with the nine flue dust locations may increase if spraying of surfactant and other maintenance activities were not continued.

An Endangerment Assessment (EA) for the Flue Dust Operable Unit was prepared under contract to the EPA (Life Systems, Inc. 1990). The EA evaluated risks to humans associated with the No Action Alternative. Table 10.3-2 shows cancer risks associated with the No Action Alternative as given in the EA. The complete EA prepared for the Flue Dust Operable Unit is provided in Appendix D of Volume I. Given the scope of the Flue Dust Operable Unit, assessment of post remedial risk is limited to risks posed by the former flue dust locations and the ultimate treatment and disposal of the flue dust. Risks associated with surrounding areas will be addressed by other operable units of the Anaconda Smelter site.

#### 10.3.3.2 Alternative No. 2 - Onsite Disposal of Untreated Flue Dust

Onsite disposal of untreated flue dust materials provides for long-term prevention of exposure to human receptors or the environment using proven technology. Untreated flue dust would be disposed of in a repository meeting applicable or relevant and appropriate RCRA Subtitle C requirements. Maintenance and monitoring controls required for the repository are adequate and reliable to confirm that releases to the environment do not occur. The degree of permanence would be dependent upon maintaining the integrity of the repository over time. Institutional controls may be required in conjunction with the former flue dust pile locations and the repository to mitigate potential site access and restrict use.

The magnitude of the risk remaining with implementing this option for the onsite disposal alternative was not quantified in the EA. However, through source removal the exposure pathways to potential receptors are interrupted. The EPA (1989) defines an exposure pathway as including a source, a release from a source, an exposure point, and an exposure route. Successful excavation and placement of the flue dust in a repository meeting applicable

## TABLE 10.3-2

## SUMMARY OF LIFETIME EXCESS CANCER RISKS*

| POPULATION | SCENARIO | CHEMICAL | LIFETIME CANCER RISK |
|---|---|---|---|
| Dirt-Bike Rider | Ingestion of Soil | Arsenic | 9E-3 |
| | Inhalation of Soil | Arsenic<br>Cadmium | 4E-3<br>3E-5 |
| | Total Risk | | 1E-2 |
| Current Resident (Adult) | Ingestion of Soil | Arsenic | 9E-5 |
| | Inhalation of Soil | Arsenic<br>Cadmium | 3E-5<br>2E-6 |
| | Total Risk | | 1E-4 |
| Future Resident (Adult) | Ingestion of Soil | Arsenic | 7E-2 |
| | Ingestion of Water | Arsenic | 5E-2 |
| | Inhalation of Soil | Arsenic<br>Cadmium | 7E-2<br>5E-4 |
| | Total Risk | | 2E-1 |

* Summaries from Life System, Inc., 1990.

or relevant and appropriate RCRA Subtitle C requirements would be expected to reduce contamination levels at the flue dust locations to equivalent concentrations in surrounding soils and effectively reduce the risk of flue dust contaminant release from the repository. Final quantification of the risk will be evaluated in the ROD.

#### 10.3.3.3 Alternative No. 3 - Offsite Disposal of Untreated Flue Dust

Offsite disposal of flue dust materials at a RCRA TSD facility provides for long-term prevention of exposure of the materials to human receptors or the environment by removal of the materials from the site. Effectiveness of offsite disposal is dependent upon the proper execution of the onsite excavation and transport activities.

Field verification of flue dust removal would provide adequate and reliable controls for ensuring that no additional impacts to human health and the environment occur at the site. Since the flue dust would be removed from the site to an independently operated RCRA TSD repository, no long-term management or monitoring activities associated with flue dust would be required at the site. Institutional controls may be required in conjunction with the former flue dust pile locations to mitigate potential site access and restrict use. Controls on the receiving TSD facility are adequate and reliable to ensure that exposure of flue dust to human receptors or the environment does not occur.

The magnitude of the risk remaining with implementing the offsite disposal alternative was not quantified in the EA. However, through source removal the exposure pathways to potential receptors are interrupted. Successful excavation and offsite transportation of the flue dust to a RCRA TSD facility

would be expected to reduce contaminant levels at the flue dust locations to equivalent concentrations in surrounding soils. Some additional risk to populations along the transport route may be created by offsite disposal. Proper transport techniques can minimize the potential for accidents which would result in exposure.

#### 10.3.3.4 Alternative No. 4 - Onsite Cement-Based Stabilization/Fixation

Stabilization/fixation is a proven technology for treating hazardous materials to provide long-term effectiveness and permanence. Treatability testing conducted during the RI Phase II indicates long-term effectiveness and permanence can be achieved by making concrete with flue dust materials (i.e., by mixing with Portland cement, hydrated lime, and water). Concrete formulations that were developed for each of the four major flue dust sites, representing over 80 percent of the flue dust present at Smelter Hill, eliminated TCLP characteristics exhibited by untreated flue dust. Additional formulations would need to be developed for the remaining five sites before remedial action using cement-based stabilization/fixation is implemented. Physical and chemical similarities of the five minor flue dust types to the flue dust at the major sites indicate formulations would be similar to those developed for the major sites. Achieving long-term effectiveness and permanence under this remedial alternative is dependent upon maintaining the proper formulations for each flue dust type.

Treatability testing indicates that the treated material does not exceed TCLP regulatory limits, as well as exhibiting longer-term stability as shown by Multiple Extraction Procedure (MEP) and ANS method 16.1 stability testing. However, long-term potential for the material to release metal concentrations is possible. Therefore, disposal of the material in an onsite

engineered repository would provide additional long-term effectiveness.

In addition, maintenance and monitoring activities appropriate for the engineered onsite repository would provide adequate and reliable controls to ensure that releases to the environment do not occur. Institutional controls may be required in conjunction with the former flue dust pile locations and the repository to mitigate potential site access and restrict use. Disposal of the stabilized/fixed material in an appropriately designed repository meeting applicable or relevant and relevant requirements for solid waste disposal and based upon best engineering judgment and would provide adequate and reliable controls to ensure releases to the environment do not occur.

The magnitude of the risk remaining with implementing the onsite disposal of stabilized/fixed flue dust materials was not quantified in the EA. However, through source removal the exposure pathways to potential receptors are interrupted. Successful excavation, and disposal of treated flue dust in an onsite engineered repository would be expected to reduce contamination levels at the flue dust locations to equivalent concentrations in surrounding soils and effectively reduce the risk of flue dust contaminant release from the repository. Final quantification of risk will be evaluated in the ROD.

#### 10.3.3.5 Alternative No. 5 - Cashman Process

The two subalternatives of the Cashman process technology type have similar considerations in terms of long-term effectiveness and permanence. Alternative No. 5A, the Cashman process, produces an acid leach residue which would require disposal, and seven precipitate products that may be sold for subsequent metal recovery processing. One of the precipitate

products, the mercury product, was not successfully produced at a pilot scale during treatability testing.

Treatability testing data from the RI Phase II indicate that uncertainty exists as to whether the acid leach residue would exceed or meet the TCLP regulatory limit for lead. If the TCLP limits are exceeded, the leach residue would require cement-based stabilization/fixation treatment prior to disposal in an appropriately designed onsite repository to ensure long-term effectiveness and permanence of Alternative No. 5A. If TCLP limits are met, the leach residue would be diposed of directly into a similar repository design to ensure the long-term effectiveness and permanence of Alternative No. 5B.

The salability of the Cashman process precipitate products is dependent on several factors, including consistent production quality of each product during processing of flue dust, locating a buyer/processor, and market conditions for each metal of interest. A recent market survey showed that each of the precipitate products are currently salable. Data collected during treatability testing indicate that the copper oxide, bismuth oxychloride, lead sulfate, and cadmium cement products exhibit EP Toxicity characteristics. If these products could not be sold, they would also require further treatment prior to disposal. Final determination of their salability can only be made at the time of product processing.

As with Alternative No. 4, disposal of either the stabilized/fixed autoclave leach residue, or a non-charateristic leach residue, and unsalable precipitate products in an appropriately engineered repository would provide adequate and reliable controls to ensure that releases to the environment do not occur. A maintenance and monitoring program similar to that previously described for onsite disposal of treated flue dust may be required.

In addition, after processing of the flue dust is complete, process reagents and other fluids may require further treatment prior to disposal, and the process facility itself would have to be dismantled. Institutional Controls may be required in conjunction with the former flue dust pile locations and the repository to mitigate potential site access and restrict use. Disposal of the treated acid leach residue in an appropriately designed repository meeting applicable or relevant and relevant requirements for solid waste disposal and based upon best engineering judgment and would provide adequate and reliable controls to ensure releases to the environment do not occur.

The magnitude of the risk remaining with implementing either Alternative No. 5A or 5B was not quantified in the EA. However, through source removal, the exposure pathways to potential receptors are interrupted. Successful excavation, treatment, stabilization/fixation of residuals, and disposal in an onsite engineered repository would be expected to reduce risks at the flue dust locations to equivalent concentrations in surrounding soils and effectively reduce the risk of flue dust contaminant release from the repository. Final quantification of risk will be evaluated in the ROD.

#### 10.3.3.6 Alternative No. 6 - Ambient Acid Leach Process

Alternative No. 6, the Ambient Acid Leach process, produces an acid leach residue, a lime precipitate, and cathode copper using a standard hydrometallurgical technique. Cathode copper is expected to remain salable due to its purity. Acid leach residue and lime precipitate of the SX raffinate are unsalable residues from the process. A proportional composite of the leach residue and the lime precipitate was mixed with Portland cement and hydrated lime to form a stabilized/fixed material. Results of this testing show the treated material does not exceed TCLP regulatory limits.

As with Alternative No. 4, stabilized/fixed leach residue and lime precipitate can be placed in an appropriately designed repository meeting applicable or relevant and appropriate requirements for solid waste disposal. An appropriate maintenance and monitoring program for the repository, similar to that discussed previously, may be required. Institutional controls may be required in conjunction with the former flue dust pile locations and the repository to mitigate potential site access and restrict use. Disposal of the treated acid leach residue and the lime precipitate in an appropriately designed repository meeting applicable or relevant and relevant requirements for solid waste disposal would provide adequate and reliable controls to ensure releases to the environment do not occur.

The magnitude of the risk remaining with implementing the Ambient Acid Leach process and subsequent cement-based stabilization/fixation of residuals was not quantified in the EA. However, through source removal the exposure pathways to potential receptors are interrupted. Successful excavation, treatment, stabilization/fixation of residuals, and disposal in an onsite engineered repository would be expected to reduce risks at the flue dust locations to equivalent concentrations in surrounding soils and effectively reduce the risk of flue dust contaminant release from the repository. Final quantification of risk will be evaluated in the ROD.

### 10.3.4 Reduction of Toxicity, Mobility, or Volume through Treatment

Evaluating the reduction of toxicity, mobility, and volume of the flue dust is based on treatability testing results conducted during the RI Phase II. The treatability testing described the treatment processes and their ability to reduce the toxicity and contaminant mobility characteristics of the flue

dust, and the type and amount of residuals produced. This evaluation criteria evaluates the degree to which alternatives employ recycling or treatment to reduce toxicity, mobility, or volume, including how treatment is used to address the principal threats posed by the site. The six factors given in the NCP that should be considered were listed in Section 10.1.1.

#### 10.3.4.1 Alternative No. 1 - No Action

There is no reduction of toxicity, mobility, or volume of the flue dust materials with the No Action alternative. Transport of toxic constituents in the flue dust through air, ground-water, and surface-water pathways is possible. As a result, contamination of other media from the flue dust may occur under natural weathering conditions.

#### 10.3.4.2 Alternative No. 2 - Onsite Disposal of Untreated Flue Dust

Onsite disposal of untreated flue dust in a repository meeting applicable or relevant and appropriate RCRA Subtitle C requirements would not reduce the toxicity or volume of the materials. Excavation of the nine pile locations and approximately six inches of soil beneath the flue dust piles would result in approximately 339,000 cubic yards requiring disposal. Reduction of contaminant mobility would be achieved with this alternative upon placing the material in the onsite repository. Successful excavation and repository completion and maintenance would eliminate soil, air, groundwater and surface water exposure pathways.

#### 10.3.4.3 Alternative No. 3 - Offsite Disposal of Untreated Flue Dust

Toxicity, mobility and volume of flue dust at the site would be eliminated with complete removal of the flue dust materials to an offsite facility. However, at the offsite facility only the mobility of the flue dust would be decreased, while volume and toxicity would remain unchanged. The mobility of contaminants in the untreated flue dust materials would be controlled by the TSD facility. Successful offsite disposal would eliminate exposure through potential air, groundwater, and surface water exposure pathways.

#### 10.3.4.4 Alternative No. 4 - Onsite Cement-Based Stabilization/ Fixation

The TCLP test results indicate that the toxic leach mobility is reduced through stabilization/fixation of flue dust materials with Portland cement and hydrated lime, while toxicity remains unchanged. The volume of the material requiring disposal would increase with the addition of the Portland cement and lime. Formulations optimizing toxic leach mobility and volume reductions for the four major flue dust types were determined from treatability testing during the RI Phase II and are summarized in Section 6 of this document. For purposes of the detailed analysis, additions of Portland cement and hydrated lime to flue dust are estimated to be 25 percent and 10 percent by weight, respectively. This general formulation has been shown to produce material that does not exceed TCLP regulatory limits. Based on treatability data, cadmium mobility was reduced by 99 percent in the stabilized/fixed flue dust material, while arsenic mobility was reduced by 93 to 98 percent in the four major flue dust types.

Total estimated volume of flue dust is 316,500 cubic yards, and the estimated weight is approximately 316,500 tons. Excavation of the six inches of subgrade soil would add approximately 23,000 cubic yards, (34,500 tons) of soil to be stabilized/fixed with the flue dust. Additional soil excavation from the mobile crusher/batch plant area would add an additional 7,000 cubic yards (10,500 tons) of material to the total amount to be treated. Based on the flue dust tonnage estimates listed above, approximately 90,400 tons of Portland cement and 36,200 tons of hydrated lime would be required. The total volume of material that would require disposal is approximately 361,600 cubic yards, assuming a treated bulk density of 100 $lb/ft^3$. This represents approximately a 15 percent increase in total volume for disposal. Final placement of the stabilized material in a repository would further reduce the potential for mobility by eliminating exposure through potential soil, air, groundwater, and surface water pathways. Reduction of contaminant mobility was not specifically quantified in the treatability testing. Reversibility of the stabilization/fixation process is not considered to be likely based on stability testing results obtained during the RI Phase II. Results of MEP and ANS 16.1 tests, as summarized in Section 6, indicate that the RCRA metals do not leach from the treated materials. Placement of the material in an engineered repository provides further protection from reversing the treatment process.

#### 10.3.4.5 Alternative No. 5 - Cashman Process

Based on RI Phase II treatability data, the Cashman process may potentially produce a leach residue that exceeds TCLP regulatory limits for lead. Arsenic and cadmium toxic leach mobility levels were each reduced by 99 percent. A residue exceeding TCLP characteristic limits would require treatment, as described for Alternative No. 4, to reduce toxic leach mobility.

A separate study was performed by Artech Resources on the same samples analyzed as part of the treatability testing. Artech results also indicated the autoclave leach residue derived during treatability testing exceeded the TCLP regulatory limit for lead (Artech, 1990). Artech produced additional autoclave residues at the bench-scale and found the material did not exceed TCLP regulatory limits. However, the analytical TCLP testing was not conducted using CLP documentation and protocols, and may not be used as enforcement quality data.

The Cashman process also produces seven potentially saleable precipitate products which reduces the overall toxicity of the waste material. As stated previously, four of these precipitate products failed EP Toxicity criteria during the RI Phase II treatability testing.

According to mass balance calculations from Hazen Research, Inc. (HRI), the volume of untreated leach residue requiring disposal, assuming a bulk density of 80 $lbs/ft^3$, would be approximately 332,000 cubic yards. The volume of the bismuth oxychloride, lead sulfate, and cadmium cement potentially requiring disposal would be approximately an additional 5,000 cubic yards. Assuming treatment ratios of Portland cement and hydrated lime similar to those for untreated flue dust (i.e., 25 and 10 percent, respectively), the total disposal volume would be 358,500 cubic yards, an increase in volume of approximately 13 percent. If the leach residue does not require further treatment prior to disposal, the volume increase would be approximately four percent. Successful stabilization/fixation treatment of a TCLP characteristic leach residue and placement of the stabilized material in an onsite repository, or direct disposal of a non-characteristic residue, along with maintenance and monitoring would eliminate exposure through soil, air, groundwater, and surface water exposure pathways.

Reversibility of the Cashman process, does not appear to be likely based on stability testing results obtained during the RI Phase II. Column and shaker type leach tests showed arsenic and cadmium concentrations below EP Toxicity regulatory limits. Leach tests using TCLP procedures were not conducted as part of the treatability testing. Placement of either the stabilized/ fixed characteristic leach residue or a non-characteristic residue in an engineered repository provides further protection from reversing the treatment process.

In addition, residuals such as process fluids and spent reagents may exhibit characteristics of hazardous wastes as specified in 40 CFR Part 261, and may require appropriate disposal.

#### 10.3.4.6 Alternative No. 6 - Ambient Acid Leach Process

The Ambient Acid Leach residue and lime precipitate each exceeded TCLP criteria for cadmium and lead. The process also produces a cathode copper product. Treatability test results indicate a copper content of 9.7 percent in a composite of the four major flue dust types. A copper recovery of approximately 62 percent was achieved in the acid leach step, followed by approximately 94 percent recovery in SX. Using these recovery assumptions, approximately 17,881 tons of cathode copper are potentially recoverable from the flue dust, thus reducing the copper toxicity of the flue dust material. The volume of leach residue and lime precipitate requiring disposal would be expected to be approximately equivalent to the volume of untreated flue dust. The Metcon treatability testing did not reach steady state. As a result detailed mass flowrates of the process residuals could not be determined. Additional testing would be needed to more precisely define the residual volume.

Stabilization/fixation of the residues would increase the volume of the residues. Assuming treatment ratios of Portland cement and hydrated lime similar to those for untreated flue dusts, the total disposal volume would be approximately 366,400 cubic yards, or a volume increase of approximately 16 percent. Successful stabilization/fixation treatment of the acid leach residue and lime precipitate and placement of the non-toxic materials in an onsite repository along with maintenance and monitoring would eliminate exposure through soil, air, groundwater, and surface water exposure pathways. Based on treatability testing conducted duing the RI Phase II (see Table 6.6-2 of Volume I), toxicity and mobility characteristics of stabilized/fixed leach residue and lime precipitate are expected to be similar to Alternative No. 4. Reversibility of the stabilized/fixed leach residue and lime precipitate was also not quantified during treatability testing. However, results of the stability testing performed under Alternative No. 4 suggest irreversibility of the stabilization/fixation process would not appear to be likely. Placement of the stabilized/fixed residue and precipitate provides further protection from reversing the treatment process.

In addition, residuals such as process fluids and spent reagents may exhibit characteristics of hazardous wastes as specified in 40 CFR Part 261, and may require appropriate disposal.

### 10.3.5 Short-Term Effectiveness

Short-term effectiveness is measured relative to protecting human health (both community and worker) and the environment during implementation of the given alternative. The communities of Anaconda, Opportunity, and Warm Springs, are located in the general vicinity of the site. Time requirements to achieve the remedial response objectives are also discussed.

Short-term effectiveness would also be impacted for Alternative Nos. 2 through 6 due to excavation of the Main Flue. Short term exposure during excavation of the main flue was not addressed here. However, exposure would be identified for each alternative, with the exception of No Action, and therefore does not affect the comparative analysis. Time requirements to achieve the remedial response objectives identified in the following sections does not include excavation of the Main Flue.

#### 10.3.5.1 Alternative No. 1 - No Action

No additional short-term risks would be created for the local community or environment as a result of no action on the Flue Dust Operable Unit. However, all existing risks would remain.

#### 10.3.5.2 Alternative No. 2 - Onsite Disposal of Untreated Flue Dust

Untreated flue dust presents concerns as a dust source during excavation, transportation, and placement. Dust suppression activities would be effective to mitigate air transport of flue dust for community and worker protection. Dust suppression on the haul roads and haul truck wheel washes would be effective in minimizing fugitive dust during transportation (Dames & Moore, 1990c). After the material is placed in the repository, wetting of the flue dust surface would be effective in reducing dust emissions until construction of the repository cap is completed. Protective gear and training for the workers would be utilized to reduce exposure to the flue dust materials.

Design and construction of a repository meeting RCRA Subtitle C requirements, and flue dust excavation, transportation, and placement would take two years to complete. The repository would be constructed during the first season. The flue dust would be placed in the repository during the second year. The potential for releases during implementation would be

removed at the end of the second operating season. Remedial response objectives would be achieved at the end of the second operating season.

#### 10.3.5.3 Alternative No. 3 - Offsite Disposal of Untreated Flue Dust

Short-term effectiveness for offsite disposal is similar to that for the onsite disposal option. Dust control measures would be effective during excavation and transportation to mitigate fugitive dust emissions for protecting the community and workers. Dust suppression on the haul roads and haul truck wheel washes would be effective in controlling dust during transportation. Dust suppression methods at each flue dust transfer stage (i.e., initial excavation, transfer to hopper, on-loading and off-loading railroad cars, and any flue dust movement activities at the TSD facility) under this alternative would also be effective for protection from fugitive dust. Protective gear and training for the workers would be used to reduce exposure to the flue dust materials. An additional short-term risk would be associated with this alternative as untreated flue dust is transported offsite over a distance of 500 miles.

Excavation and transportation of untreated flue dust to the TSD facility would take approximately six months to complete. Time requirements for the disposal activities at the TSD facility are not known. Short-term impacts to human health and the environment at the site would be removed at the end of the six month period. Remedial response objectives for the Flue Dust Operable Unit would be achieved at the completion of excavation and offsite transportation.

#### 10.3.5.4 Alternative No. 4 - Onsite Cement-Based Stabilization/ Fixation

Short-term effectiveness concerns for stabilization/fixation are similar to Alternative Nos. 2 and 3 with excavation and transportation necessary at each of the flue dust locations. Dust control measures for either subalternative would be effective for community and worker protection. Protective gear and training for the workers would be effective in reducing exposure to the flue dust materials.

Batch plant mixing activities of flue dust with the Portland cement and hydrated lime may potentially generate fugitive dust. Standard dust suppression techniques of the flue dust, cement and lime at the batch plant would be effective in mitigating fugitive emissions. Upon complete mixing, material handling should pose no fugitive dust threat as it would be in a slurry form. Transport of the treated material to the onsite repository presents no problems with short-term effectiveness. The alternative would require three years to complete, and remedial response objectives would be achieved at the end of the third year.

#### 10.3.5.5 Alternative No. 5 - Cashman Process

Both subalternatives of the Cashman process would require excavation and transport to a central onsite processing location. Short-term effectiveness considerations for either subalternative would be similar. Dust control measures previously described would be effective for community and worker protection. In both subalternatives, the flue dust materials would be composited prior to processing. Additional dust suppression activities for the compositing and feed preparation steps would be effective for dust control. Protective gear and training for the workers would be used to reduce exposure to the flue dust materials. However,

under Alternative No. 5A, handling of a TCLP characteristic leach residue would be required for the feed step to the batch plant for stabilization/fixation.

Containment of the flue dust at the central processing facility must also be considered. An engineered liner material such as compacted clay or a geomembrane would be used as a placement base for flue dust. Surfactants, berms and surface water control structures would be required for flue dust storage, and processing activities. These measures would be effective in minimizing impacts to human health and the environment during facility operation.

During operation of the Cashman process, discharges of carbon dioxide, leach vapor and autoclave off-gases, vapors from the cadmium dryer, zinc precipitation and bismuth oxychloride dryer, as well as mercury leach off-gas, assorted reagents, acids and bases, and a potential liquid bleed stream must be monitored in terms of worker and environmental safety. Further characterization of the process vapors and off-gases may be required in order to determine whether additional treatment and disposal systems would be needed.

#### 10.3.5.6 Alternative No. 6 - Ambient Acid Leach Process

Alternative No. 6 would require excavation and transport to a central onsite processing location. Dust control measures previously described would be effective for community and worker protection. The flue dust materials would be composited prior to processing. Additional dust suppression activities for the compositing and feed preparation steps would be effective for dust control. Protective gear and training for the workers would be used to reduce exposure to the flue dust materials. Additional handling of a TCLP characteristic leach residue would

be required for the feed step to the batch plant for appropriate stabilization/fixation.

Containment of the flue dust at the central processing facility must also be considered. An engineered liner material such as compacted clay or a geomembrane would be used as a placement base for flue dust. Surfactants, berms and surface water control structures would be required for flue dust storage, and processing activities. These measures would be effective in minimizing impacts to human health and the environment during facility operation.

During operation of the Ambient Acid Leach process, a work area hygiene ventilation system would be necessary to create the required forced air movement through the processing facility. Handling of various reagents, and acids and bases would need to be monitored for worker and environmental safety. Achievement of the remedial action objectives with either hydrometallurgical subalternative would be met approximately seven to eight years after construction of a treatment plant begins.

### 10.3.6 Implementability

An assessment of implementability includes an evaluation of technical feasibility, e.g., ease of constructing the alternative and the construction time requirements; administrative feasibility of the alternative; and the availability of services and materials to the site.

#### 10.3.6.1 Alternative No. 1 - No Action

There is no implementability concern with this alternative since no action would occur at the site for the Flue Dust Operable Unit. Current activities under the Administrative Order on Consent which include daily visual inspections of the flue

dust piles, and biannual applications of surfactant would not be continued under this alternative.

#### 10.3.6.2 Alternative No. 2 - Onsite Disposal of Untreated Flue Dust

Results of the transportation study were used to evaluate the implementability of onsite excavation and transport (Dames & Moore, 1990c). The use of standard earth-moving equipment would be adequate to implement this alternative.

Equipment necessary for excavation, transportation, and disposal are expected to be available locally. Materials for the construction of a repository meeting applicable or relevant and appropriate RCRA Subtitle C requirements would also be expected to be available locally, or at a nearby regional distribution center, in sufficient quantities to ensure the schedule of remediation activities are not adversely impacted. In addition, there are no known adverse effects related to other potential remedial alternatives at the site through construction of a permanent onsite repository. Permits would not be required for onsite response activities in accordance with § 121(e)(1) of CERCLA.

#### 10.3.6.3 Alternative No. 3 - Offsite Disposal of Untreated Flue Dust

Since this alternative does not involve treatment of flue dust at the site, the implementability concerns are similar to flue dust excavation and transportation under Alternative No. 2. The additional handling step from the haul trucks to the mobile hopper prior to transfer to the rail cars would require further dust control measures. This additional dust control would not result in additional implementability concerns.

Special rail container cars would be used for shipping to the TSD facility. Shipping and manifest requirements under RCRA required by the EPA and the U.S. Department of Transportation (DOT), would be implemented. Some difficulties may be encountered in obtaining the necessary approvals for offsite transport and disposal in Grandview, Idaho given the volume of the material and the interstate nature of the shipment.

A railroad spur exists from the site to 5 miles west of Butte, where connection with the Union Pacific rail lines can be made. No constraints with availability of rail container cars are expected according to the TSD facility operators. Equipment used for the onsite flue dust excavation and transportation to the rail lines would be obtained locally.

#### 10.3.6.4 Alternative No. 4 - Onsite Cement-Based Stabilization/ Fixation

Alternative No. 4 uses standard technologies that have been successfully used to treat other hazardous materials. A standard mobile crusher and batch plant would be brought to the site to implement this alternative. No problems are anticipated with obtaining and using this equipment for either subalternative. Alternative No. 4 would require three mobilizations of the crusher and batch plant, in addition to having the excavation equipment at each pile location. These mobilization requirements are not expected to present implementability problems.

Standard earth-moving equipment for flue dust excavation and transportation is available locally. The crusher and batch plant would also be available in the Rocky Mountain region. No constraints are expected with site conditions, or with obtaining materials for repository construction. No significant operational problems are expected with the crusher or batch plant. Monitoring the stabilization/fixation formulations would

be critical to ensure production of material which does not exceed TCLP regulatory limits, but acceptable formulas should be easily obtained. In addition, there are no known adverse effects related to other potential remedial alternatives at the site through construction of a permanent onsite repository. Permits would not be required for onsite response activities in accordance with § 121(e)(1) of CERCLA.

#### 10.3.6.5 Alternative No. 5 - Cashman Process

Treatability testing conducted during the RI Phase II was used to identify issues relating to performance, construction, and operation of both of the Cashman process. Concerns with flue dust excavation and transportation are as previously described for Alternative Nos. 2 through 4. At this time it is not known if the construction of a process facility at the site would impact future remedial actions on Smelter Hill. The Cashman process has not been used previously at a commercial scale for treating flue dust materials. Implementability concerns are similar for both subalternatives, although the addition of the batch plant for stabilization/fixation of the autoclave leach residue under Alternative No. 5A adds additional process control and disposal requirements.

The Cashman process has several implementability concerns which were identified during the RI treatability testing. Due to the number of variables associated with the Cashman process, the pilot-scale operation was generally unable to achieve steady state, or equilibrium conditions. Optimization of the unit operations would be needed prior to design of a full-scale facility. In general, the pilot-scale plant was unable to produce precipitate products which would meet expected design criteria, and it was uncertain whether a leach residue would be produced which does not exceed TCLP regulatory limits. These

TCLP data for the leach residue are presented and discussed in Section 6.0 of Volume I of the RI/FS.

Due to pressure and temperature requirements and composition of solutions throughout the Cashman process, the need for comparatively exotic construction materials was identified. As a result, replacement materials or parts may not be as readily available as more conventional materials.

Mass balance calculations performed by HRI during the treatability testing indicate that a zero discharge from a full-scale plant is attainable. The pilot-scale testing did produce a bleed stream, however, in order to balance the chloride concentration. A full-scale facility may possibly require a bleed stream, and provisions for an evaporation pond to accommodate such a discharge should be included in facility design. The following specific observations made during the treatability testing identify implementability concerns for several of the unit operations of Alternative No. 5.

Feedstock Prep: Material that could not be ground finer than 28 mesh in the 2.5 hours specified during treatability work may present an operational problem in a full-scale system. In the proposed continuous closed grinding circuit, this material may tend to accumulate in the recirculated coarse fraction. At some point the coarse material would then require removal to prevent its introduction into the leach circuit. Corrosion in the grinding circuit and autoclave feed system may then become an operational problem, dictating a requirement for exotic construction materials.

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#### 10.3.6.6 Alternative No. 6 - Ambient Acid Leach Process

Alternative No. 6 was tested in two phases at the bench-scale during treatability testing. The first phase identified unit operations that were either acceptable or unacceptable for treating flue dust materials. The second phase attempted to optimize selected unit operations for copper recovery.

The process train developed during the second phase tested standard proven unit operations currently used in the metallurgical processing industry. Several full-scale commercial plants are currently operating that use ambient acid leaching followed by SX-EW, as was implemented during treatability testing. However, copper smelter flue dusts have not yet been processed with this technology at a commercial scale.

The processing occurs at ambient temperature and pressure conditions, and reactors and piping are constructed with conventional materials. Replacement materials and parts are expected to be relatively easy to obtain, which would tend to minimize processing delays that may occur. The following observations made during the treatability testing indicate specific concerns related to the implementability of Alternative No. 6.

<u>Acid Leaching:</u> During treatability testing approximately 62 percent of the copper was leached from a composite flue dust sample. A relatively high concentration of sulfuric acid (280 pounds of acid per ton of flue dust) was required to achieve this level of copper leaching. In addition, greater leaching of arsenic, cadmium, iron, lead, and zinc was observed at the higher acid addition rate. Carry-over of these metals to the subsequent processing stages would need to be addressed at a pilot-scale before design of a full-scale facility.

Solvent Extraction: The pregnant solution from acid leaching was subjected to selective copper recovery with an appropriate organic solvent. Approximately 94 percent of the copper was recovered, along with approximately 83 percent of the lead present in the pregnant solution. Less than 5 percent of the remaining metals were recovered. The remaining metals would be removed in the lime precipitation of the SX raffinate. Electrowinning copper from an SX process is a standard technology, although it was not performed on the SX strip solution during treatability testing. The EW process step would need to be tested to evaluate the potential impacts of the lead concentration in the strip solution. In addition, the required discharge stream from EW must be evaluated to determine if it may be used effectively as a recycle stream to the acid leach step.

Lime Precipitation: Raising the pH of the SX raffinate to the neutral range with hydrated lime was effective in removing approximately 50 percent of the lead and approximately 99 percent of the arsenic, cadmium, copper, iron, and zinc in solution. Using the filtrate from lime precipitation as a recycle stream to the acid leach circuit was not evaluated in the testing, and would be needed prior to design of the full-scale facility.

### 10.3.7 Cost

The cost analysis includes delineation of capital, O&M, and future capital costs. Future capital costs are capital costs that would be required for construction activities in any given year. A net present worth analysis and present worth discount rate sensitivity analysis are also performed for each alternative. Detailed backup information supporting the cost estimates is given in Appendix C.

The unit capital and O&M costs for each alternative are presented as a constant dollar analysis in 1990 dollars. All

costs are before taxes, do not include salvage, and do not assume depreciation. Following these estimates, the present worth and sensitivity analyses are discussed in a separate summary section. Assumptions used to develop the cost estimates in current dollars are outlined in the sections below.

#### 10.3.7.1 Alternative No. 1 - No Action

The are no costs associated with this alternative as maintenance and access controls would not be in place at the site. A cost analysis does not apply to the No Action alternative.

#### 10.3.7.2 Alternative No. 2 - Onsite Disposal of Untreated Flue Dust

This section summarizes the cost estimate for the excavation, transportation and disposal of untreated flue dust, and outlines the corresponding assumptions.

General assumptions for onsite disposal of untreated flue dust include:

- Total volume of flue dust is approximately 316,500 cubic yards;
- Total dry weight of the flue dust is approximately 316,500 tons;
- In site locations where flue dust rests on native soils, approximately six inches of the soil will be excavated along with the flue dust;
- Taxes, licenses, bonds, and permits are not included in the estimate.

Untreated flue dust materials would be placed directly into a single repository meeting applicable or relevant and appropriate RCRA Subtitle C requirements, and the material would be hauled as excavated from each pile location to the repository.

Construction of the repository, followed by the excavation, transportation, and placement of the untreated flue dust in the repository would require approximately 13 months. The work would be assumed to occur over two operating seasons approximately from mid-April to the end of October. However, if weather conditions permit, the work season would be extended beyond the six months assumed in the estimate. Specific assumptions for the untreated flue dust disposal option cost estimate are:

- Earthmoving equipment includes CAT 235 excavator, CAT 769 off road dumptrucks, CAT 14G road graders, CAT D6 dozers and D8 dozers with rippers, CAT 637 scrapers, and CAT 815 compactors; two 4,000 gallon capacity water trucks for dust control, where one is used for roadbed dust control and the other has a water cannon for dust control during excavation;
- Equipment and labor prices quoted by a local contractor;
- Concrete liner in Thickener would remain in place;
- Flue dust in Main Flue would be excavated and stockpiled at base of the flue under separate contract. A cost of excavating the Main Flue was estimated by MK Corporation (1990 dollars) to be approximately $3.0 million.
- Liner prices are quoted from similar contracts;
- Long-term annual maintenance and monitoring of a repository is included;
- Worker health and safety training costs are included;
- Equipment mobilization and demobilization are not included because the location of the equipment at the time of startup is not known.

Table 10.3-3 is a cost summary for this disposal option. A detailed breakdown of costs for each of the cost items listed in Table 10.3-3 is given in Appendix C.

Total capital costs, which include the excavation, transportation, and placement of the flue dust in the repository, engineering, design, and construction of the repository, construction management, and a 15 percent contingency are

Table 10.3-3
Alternative No. 2 Cost Summary
Capital and O&M Costs

| Item | Quantity | Unit | Unit Price | Total |
|---|---|---|---|---|
| Capital | | | | |
| 1. Excavation/transportation of Untreated Flue Dust and Place in Repository | 339,308 | CY | $5.12 | $1,738,000 |
| 2. Construction of RCRA Subtitle C Equivalent Repository | 1 | LS | $3,970,000.00 | $3,970,000 |
| Subtotal | | | | $5,708,000 |
| Contingency @ 15% | | | | $856,000 |
| Subtotal | | | | $6,564,000 |
| Engineering @ 7% | | | | $459,000 |
| Subtotal | | | | $7,023,000 |
| Construction Management | 1 | LS | $399,000.00 | $399,000 |
| Contingency (Constr. Mgmt.)@ 15 | 1 | LS | $60,000.00 | $60,000 |
| Total Capital Costs | | | | $7,482,000 |
| O&M | | | | |
| Long-term Repository Monitoring | 1 | PY | 8,700.00 | 8,700 |
| Contingency @ 15% | 1 | PY | 1,300.00 | 1,300 |
| Total Annual O&M Costs | | | | 10,000 |

CY Cubic Yard
TN Ton
LS Lump Sum
PY Per Year

approximately $7.5 million. Total O&M costs relate to the long-term maintenance and monitoring of the repository. Annual O&M costs associated with maintenance and monitoring of a repository and including a 15 percent contingency are approximately $10,000.

#### 10.3.7.3 Alternative No. 3 - Offsite Disposal of Untreated Flue Dust

Excavated flue dust would be disposed at the Envirosafe TSD facility in Idaho under this alternative. Costs have been prepared for excavation and local transportation to a rail facility, and subsequent rail transportation to Grandview, Idaho, offloading, and placing the flue dust in the repository. General and specific assumptions listed for Alternative No. 2 are similar for this alternative. Excavation and offsite transportation of the flue dust would take approximately six months to complete. Table 10.3-4 is a cost summary for this remedial alternative.

Total capital costs, which include the excavation, transportation, and loading onto railroad container cars, construction management, disposal of treated flue dust, a Idaho State hazardous waste tax, and a 15 percent contingency are approximately $71.9 million. This alternative has no additional O&M costs.

#### 10.3.7.4 Alternative No. 4 - Onsite Cement-Based Stabilization/ Fixation

Costs have been prepared for the excavation, transportation, and treatment of the flue dust materials, and placement of the treated material in an onsite repository for the stabilization/fixation alternative.

Table 10.3-4
Alternative No. 3 Cost Summary
Capital Costs*

| Item | Quantity | Unit | Unit Price | Total |
|---|---|---|---|---|
| Capital | | | | |
| 1. Excavation/transportation of Untreated Flue Dust and Place in Railroad Container Cars | 339,308 | CY | 4.75 | 1,612,000 |
| 2. Rail Transportation, Includes Offloading at TSD Facility | 350,812 | TN | 73.00 | 25,609,428 |
| 3. Disposal of Treated Flue Dust | 350,812 | TN | 80.00 | 28,064,760 |
| 4. Hazardous Waste Idaho State Tax | 350,812 | TN | 20.00 | 7,016,000 |
| Subtotal | | | | 62,302,000 |
| Contingency @ 15% | | | | 9,345,000 |
| Subtotal | | | | 71,647,000 |
| Construction Management | 1 | LS | 249,000.00 | 249,000 |
| Contingency (Constr. Mgmt.) @ 15% | 1 | LS | 37,000.00 | 37,000 |
| Total Capital Costs | | | | 71,933,000 |

* No O&M costs are associated with Alternative No. 3.

CY Cubic Yard
TN Ton
LS Lump Sum

Specific assumptions for Alternative No. 4 are:

- Earthmoving equipment includes CAT 235 excavators, CAT 769 off road dump trucks, CAT 14G road graders, CAT D6 dozers and D8 dozers with rippers, CAT 637 scrapers, and CAT 815 compactors;
- Two 4,000 gallon capacity water trucks for dust control, where one is used for roadbed dust control and the other has a water cannon for dust control during excavation;
- Equipment and labor prices are quoted by a local contractor;
- Pug mill and crusher prices are quoted by a local contractor, and includes mobilization and demobilization;
- Concrete liner in Thickener would remain in place;
- Flue dust in Main Flue would be stockpiled at base of the flue under separate contract for removal to the repository. A cost of excavating the Main Flue was estimated by MK Corporation (1990 dollars) to be $3.0 million;
- Liners are quoted from similar contracts;
- Annual maintenance and monitoring of an onsite repository is included;
- Worker health and safety and training costs are included;
- Equipment mobilization and demobilization are not included because the location of the equipment at the time of startup is not known;
- Portland cement and hydrated lime are added at 25 percent and 10 percent of total dry weight of flue dust, and excavated soil respectively; and,
- Laboratory tests are priced for CLP analyses by a local laboratory, with one sample taken for each 1,000 tons of material placed, with two day turn around time, and a laboratory technician on site 5 days per week.

Table 10.3-5 is a cost summary for Alternative 4. A breakdown of costs for each of the cost items listed in Table 10.3-5 are given in Appendix C.

Table 10.3-5
Alternative No. 4 Cost Summary
Capital and O&M Costs

| Item | Quantity | Unit | Unit Price | Repository Total |
|---|---|---|---|---|
| CAPITAL | | | | |
| 1. Excavate and place in Stockpile for Crusher | 346,571 | CY | $3.18 | $1,101,000 |
| 2. Place Material from Nine Areas into Crusher and Stockpile for Batch Plant | 346,571 | CY | $4.22 | $1,463,000 |
| 3. Place Stockpiled Material into Batch Plant and Process | 488,308 | TN | $26.18 | $12,785,000 |
| 4. Load Treated Material/ Haul to Repository and Place | 361,710 (488,308 | CY TN) | $6.98 | $2,526,000 |
| 5. Construct Engineered Repository | 1 | LS | | $1,933,000 |
| Subtotal | | | | $19,808,000 |
| Contingency @ 15% | | | | $2,971,000 |
| Subtotal | | | | $22,779,000 |
| Engineering @ 7% | | | | $1,595,000 |
| Subtotal | | | | $24,374,000 |
| Construction Management | 1 | LS | $837,000.00 | $837,000 |
| Contingency (Constr. Mgmt.) @ 15% | 1 | LS | $126,000.00 | $126,000 |
| TOTAL CAPITAL COSTS | | | | $25,337,000 |
| O&M | | | | |
| Long-term Maintenance and Monitoring | 1 | PY | $8,700.00 | $8,700 |
| Contingency @ 15% | 1 | PY | $1,300.00 | $1,300 |
| Total Annual O&M Cost | | | $10,000.00 | $10,000 |

CY is Cubic Yard, TN is Ton, LS is Lump Sum, PY is Per Year

Repository includes an 80 mil HDPE liner and leak detection system.

Total capital costs, which include excavation, transportation, treatment at each pile location, placement of treated material in the repository, engineering design and construction of the onsite repository, construction management, and a 15 percent contingency are approximately $25.3 million. Annual O&M costs associated with the maintenance and monitoring of a repository with a 15 percent contingency are estimated at approximately $10,000.

#### 10.3.7.5 Alternative No. 5 - Cashman Process

Costs associated with the construction and O&M for the processing facilities for the Cashman process were prepared directly by the subcontractor who performed the treatability testing on the process during the RI Phase II. The cost estimate for Alternative No. 5 was prepared by HRI (Hazen, 1990b). In addition, costs associated with flue dust excavation and transportation, and stabilization/fixation of process residues under Alternative No. 5A, and disposal to the onsite repository have been included with the costs provided by the treatability subcontractors.

Costs associated with construction and operation of the Cashamn process facility is not thought to be as certain as the costs calculated for Alternative Nos. 1-4. The basis for this statement is that Alternative Nos. 1-4 use standard proven technologies which is relatively simple. Alternative No. 5 calls for the development of full scale facilities, not previously constructed, from information collected at pilot-scale levels. Therefore, greater uncertainty is considered to be associated with costs estimated for facility development.

Table 10.3-6 gives a summary of capital and annual O&M costs for both subalternatives of the Cashman process. Potential salable values of the precipitate products reported by HRI, based

on metal prices in the fourth quarter of 1989, would be approximately $12 million per year. Actual revenues would not be received until at least three years from the date that facility construction begins and would be based on spot market prices at that time.

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#### 10.3.7.6 Alternative No. 6 - Ambient Acid Leach Process

Metcon Research, Inc. prepared the cost estimate for Alternative No. 6 (Metcon, 1990b). In addition, costs associated with flue dust excavation and transportation, stabilization/fixation of process residues, and disposal to the

Table 10.3-6

Alternative No. 5A - Cashman Process

Capital Cost Summary

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Table 10.3-6 (Continued)

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onsite repository have been included with the costs provided by the treatability subcontractors.

Costs associated with construction and operation of an Ambient Acid Leach facility is not thought to be as certain as the costs calculated for Alternative Nos. 1-4. The basis for this statement is that Alternative Nos. 1-4 use standard proven technologies which is relatively simple. Alternative No. 6 calls for the development of a full scale facility, not previously constructed for flue dust treatment, from information collected from batch-scale testing. Therefore, greater uncertainty is considered to be associated with costs estimated for facility development.

Table 10.3-7 gives a summary of capital and O&M costs for the Ambient Acid leach process. In order to compute potential revenue from the sale of cathode copper, results were used from the RI Phase II treatability testing. Results of treatability testing showed that approximately 62 percent of the copper present in the flue dust could be recovered from the pregnant acid leach filtrate. Approximately 94 percent of the copper present in the pregnant leach solution was recovered in the SX processing. A current market price of cathode copper of approximately $1.00 per pound was used. Using this value and a commercial facility processing 8 tons of flue dust per hour, the revenue would be approximately $7.2 million per year.

The cost estimate prepared by Metcon did not include a contingency for processing plant capital or O&M costs. Capital costs were estimated to be $18.9 million for facility construction, flue dust processing and, construction of an engineered onsite repository, having a liner and leak detection system. A 15 percent contingency was applied to the processing plant annual O&M costs of $3.7 million which added approximately $550,000. The annual O&M processing contingency would apply to

Table 10.3-7
Alternative No. 6 - Ambient Acid Leach Process
Capital Cost Summary

| Item | Quantity | Unit | Unit Price | Repository Total |
|---|---|---|---|---|
| CAPITAL | | | | |
| 1. Excavation/transportation of Flue Dust to Central Stockpile | 339,308 | CY | $3.75 | $1,274,000 |
| 2. Construct Engineered Repository | 1 | LS | | $1,952,000 |
| Subtotal | | | | $3,226,000 |
| Contingency @ 15% | | | | $484,000 |
| Subtotal | | | | $3,710,000 |
| Engineering @ 7% | | | | $260,000 |
| Subtotal | | | | $3,970,000 |
| Construction Management | 1 | LS | $215,000.00 | $215,000 |
| Contingency (Constr. Mgmt.)@ 15% | 1 | LS | $32,000.00 | $32,000 |
| Subtotal | | | | $4,217,000 |
| 3. Processing Facility Design and Construction* | 1 | LS | $14,719,000.00 | $14,719,000 |
| TOTAL CAPITAL COSTS | | | | $18,936,000 |

* Estimate taken from "Feasibility Study, ARCO Coal Flue Dust Processing Facility, Capital and Operating Cost Estimate", Metcon Research, 1990b.

Table 10.3-7 (con't)
Alternative No. 5B - Ambient Acid Leach Process
O&M Cost Summary

| Item | Quantity | Unit | Unit Price | Repository Total |
|---|---|---|---|---|
| O&M | | | | |
| 1. Long-term Repository Monitoring | 1 | PY | $8,700.00 | $8,700 |
| Contingency @ 15% | 1 | PY | $1,300.00 | $1,300 |
| REPOSITORY MONITORING TOTAL | 1 | PY | | $10,000 |
| 2. Process Facility Operation* | 1 | PY | $3,669,000.00 | $3,669,000 |
| Contingency @ 15% | 1 | PY | $550,000.00 | $550,000 |
| FACILITY OPERATION TOTAL | 1 | PY | | $4,219,000 |
| 3. Process Residuals through Batch Plant, Place in Repository | 73,280 CY/ year | | $39.82 | $2,918,000 |
| Contingency @ 15% | 1 | PY | $438,000.00 | $438,000 |
| Subtotal | | | | $3,356,000 |
| Engineering @ 7% | 1 | PY | $235,000.00 | $235,000 |
| Subtotal | | | | $3,591,000 |
| Construction Management | 1 | PY | $194,000.00 | $194,000 |
| Contingency (Constr. Mgmt.)@ 15% | 1 | PY | $29,000.00 | $29,000 |
| RESIDUAL PROCESSING TOTAL | 1 | PY | | $3,814,000 |

CY Cubic Yard, LS is Lump Sum, PY is Per Year

Repository includes an 80 mil HDPE liner and leak detection system.

* Estimate taken from "Feasibility Study, ARCO Coal Flue Dust Processing Facility, Capital and Operating Cost Estimate", Metcon Research, 1990b.

each year of facility operation. Costs for processing the acid leach residue and lime precipitate through a batch plant and transportation of these treated materials to the repository were not calculated for the Metcon study, but have been included based on the similar estimates made for Alternative Nos. 2 through 4. These O&M costs would be approximately $4.7 million per year. Annual maintenance and monitoring of a repository would cost approximately $10,000, which includes a 15 percent contingency. A breakdown for each of the cost items in Table 10.3-7 is given in Appendix C.

#### 10.3.7.7 Net Present Worth Cost Summary

A net present worth analysis was performed for each of the remedial alternatives. Table 10.3-8 gives the results of the net present worth analysis. All remedial alternatives had a negative net present worth. Values for capital, O&M, future capital, and potentially salable products were taken from the preceding sections. A 10 percent discount rate is suggested in the NCP for all present worth calculations. The Summary in Table 10.3.8 includes a sensitivity analysis which shows the present worth costs for each alternative using 5 and 15 percent discount rates.

The greatest net negative present worth was for Alternative No. 3, at negative $71.9 million. The lowest net negative present worth was for Alternative No. 2, at negative $6.9 million.

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## TABLE 10.3-8

## ESTIMATED NET PRESENT WORTH ANALYSIS

Alternative Nos.

| Item | 1 No Action | 2 Onsite Disposal | 3 Offsite Disposal* | 4 Stabilization/ Fixation# | 5A Cashman Process+ | 5B Cashman Process+ | 6 Ambient Leach# |
|---|---|---|---|---|---|---|---|
| Initial Capital | 0 | 3,741,000 | 71,933,000 | 8,446,000 | | | 7,360,000 |
| O&M | 0 | 10,000 | 0 | 10,000[3] | | | 8,033,000[5]<br>4,217,000[7]<br>10,000[6] |
| Future Capital | 0 | 3,741,000[2] | 0 | 8,446,000[4] | | | 7,360,000[2] |
| Saleable Products | 0 | 0 | 0 | 0 | | | 7,152,000[5] |
| Total Net Present Worth (5% Discount) | 0 | (7,272,000) | (71,933,000) | (23,556,000) | | | (21,101,638) |
| Total Net Present Worth (10% Discount) | 0 | (6,911,000) | (71,933,000) | (21,866,0000) | | | (19,189,569) |
| Total Net Present Worth (15% Discount) | 0 | (6,620,000) | (71,933,000) | (20,451,000) | | | (17,682,318) |

* No O&M or future capital costs are associated with Alternative No. 3

\# Costs represent disposal of treated materials in a repository with an 80 mil liner, a leak detection system, and a vegetated clay cap.

\+ Costs for the Cashman process are Confidential Business Information.

1 years 2 - 30
2 year 2
3 years 1 - 30
4 years 2 and 3
5 years 3 - 7
6 years 3 - 30
7 year 3

The present worth analysis for the Ambient Acid Leach process includes a 15 percent contingency applied to all capital and annual O&M costs, in addition to costs for construction of an onsite repository and the disposal of stabilized/fixed process residues. For Alternative No. 6, the assumed price of salable cathode copper is a recent quote of the prevailing market price of approximately $1.00 per pound, which results in a negative net present worth of $19.2 million.

Cost Sensitivity Analysis A review of the economics of the treatment alternatives in the RI/FS was performed. Table 10.3-9 summarizes the sensitivity analysis of the net cost of Alternative Nos. 4, 5, and 6 (Stabilization/fixation, Hydrometallurgical Process (metal removal/chemical fixation) and Hydrometallurgical Process (metal removal)). The variables evaluated were those with significant economic impact, and also characterized by substantial uncertainty. They include the capital costs for construction of the processing plant and residue repository, plant operating costs, and the price of copper and associated revenue. For each alternative, these varaibles were assigned an "expected" cost or price as presented in the above section, and a "best" and "worst" case value. In this way a range of the net present value cost was computed for each of the three treatment processes.

As summarized in Table 10.3-9 from best to worst case, Alternative No. 5 varies by a factor of more than four, ranging from a low of (CONFIDENTIAL) to a high of (CONFIDENTIAL). This high variablility is a result of the relatively high capital cost, and the uncertainty of such costs since a

**Table 10.3-9**
**Cost Sensitivity Analysis**
**Net Present Value Cost at 10% Discount**

| | Best Case $ | Expected $ (Dames & Moore) | Worst Case $ |
|---|---|---|---|
| Cashman Process (with stabilization) | * | * | * |
| Cashman Process (without stabilization) | * | * | * |
| Acid Leach | 6.5 million | 21.7 million | 34.7 million |
| Stabilization | 19.1 million | 21.9 million | 24.9 million |

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plant of this type has never been built. Alternative No. 6 had the highest degree of uncertainty from "best" to "worst" case. This reflects the the relatively large uncertainty regarding capital constructions costs and potential variability in the future price of copper. Alternative No. 4 had the least variation indicating that the process parameters are well known.

Alternative No. 6 also had the lowest "best" case cost of negative $6.5 million, but was 50 percent higher than Alternative No. 4 in the "worst" case. Although Alternative Nos. 4 and 6 have comparable expected costs, Alternative No. 6 costs have greater uncertainty.

Additional factors that would affect the ultimate costs of Alternative Nos. 5 and 6, but that have not been included in the original estimates or sensitivity analyses have also been considered. For Alternatives 5 and 6, a temporary flue dust repository may need to be constructed for containment of the flue dust at a central processing location during processing. Costs for this facility were not directly estimated, but are considered to be similar to the 1.9 million dollar repository costs for Alternative 4.

Costs to date for preliminary pilot testing of the Cashman process are approximately 1 million dollars. The Cashman pilot study costs are not included in the estimates provided. It is expected that complete pilot studies for the Ambient Acid Leach process would range from $1.25 to $1.5 million. Additional bench-scale testing prior to pilot testing may also be required and is estimated to cost approximately $100,000. Confirmation testing for stabilization/fixation of ambient acid leach residue and precipitate is also expected to cost approximately $100,000.

The costs for decommissioning the contaminated Cashman and Ambient Acid Leach facilities were also not directly included in

the provided estimates. It was assumed that these costs would be covered by salvage value. However, it is probably unlikely that salvage income would cover decommission costs. If closure of a temporary central flue dust repository is required, decommission costs could greatly exceed salvage value.

Operation of the relatively complex Cashman facility and Ambient Acid Leach facility would also require oversight by EPA staff. The complexity of the process and the duration of operation would ultimately control total oversight costs. These costs cannot be estimated but are thought to be real and substantial. Finally, it is anticipated that disposal of process reagents and by-products, other than the primary residues or precipitates, would be required. As the volume and nature of these materials are not known, the costs cannot be estimated.

All of the items discussed above reflect a portion of the uncertainty associated with the final costs for Alternative Nos. 5 and 6. The total net increase for these items cannot be forecast and, therefore, is not included in the total estimates. However, these costs are anticipated and are discussed for that reason.

### 10.3.8 Detailed Analysis Summary

Table 10.3-10 provides a summary of each alternative relative to the seven evaluation criteria. The table is divided into two sections; the first summarizes Alternative Nos. 1 through 4 and the second section summarizes Alternatives 5A, 5B, and 6. This information was used in part to develop the comparative analysis.

**TABLE 10.3-10**

**Individual Evaluation of Final Alternatives**
**Alternatives 1 Through 4**

| CRITERIA | ALTERNATIVE 1 NO ACTION | ALTERNATIVE 2 ONSITE DISPOSAL | ALTERNATIVE 3 OFFSITE DISPOSAL | ALTERNATIVE 4 STABILIZATION/ FIXATION |
|---|---|---|---|---|
| OVERALL PROTECTIVENESS | Does not provide adequate protection of human health and the environment. | Protection of human health and the environment achieved through placement of Flue Dust in a RCRA Subtitle C repository. | Protection of human health and the environment achieved through placement of Flue Dust in a permitted RCRA TSD facility. | Protection of human health and the environment achieved through production of a stable non-characteristic material and placement in an engineered repository. |
| COMPLIANCE WITH ARARS | Would not attain ARARs. | Would attain ARARs. | Would attain ARARs. | Would attain ARARs. |
| LONG-TERM EFFECTIVENESS AND PERMANENCE | Existing risk would remain and may increase. | Risk of contaminant releases effectively reduced; but will be dependent on long-term integrity, maintenance and monitoring of a RCRA Subtitle C repository. | Risk of contaminant releases effectively reduced; but will be dependent on long-term integrity, maintenance and monitoring of a RCRA TSD facility. | Risk of contaminant release effectively reduced; but will be dependent on the long-term stability of treated material, and long-term integrity, maintenance and monitoring of an engineered repository. |

TABLE 10.3-10 (continued)

Individual Evaluation of Final Alternatives
Alternatives 1 Through 4

| CRITERIA | ALTERNATIVE 1 NO ACTION | ALTERNATIVE 2 ONSITE DISPOSAL | ALTERNATIVE 3 OFFSITE DISPOSAL | ALTERNATIVE 4 STABILIZATION FIXATION |
|---|---|---|---|---|
| REDUCTION OF TOXICITY, MOBILITY, OR VOLUME THROUGH TREATMENT | No reduction in toxicity, mobility, or volume. | No reduction in toxicity, mobility, or volume through treatment. | No reduction in toxicity, mobility, or volume through treatment. | Reduction of toxicity and mobility to below noncharacteristic (TCLP) levels. Increase of volume by approximately 15%. |
| SHORT-TERM EFFECTIVENESS | Not applicable. | Dust controls required to reduce worker and community risk. Two year implementation. | Dust controls required to reduce worker and community risk. Additional handling and transportation would increase potential for release. Six month implementation. | Dust controls required to reduce worker and community risk. Additional controls required for treatment. Three year implementation. |
| IMPLEMENTABILITY | Not applicable. | Simple to construct and operate. Services, equipment and technology are readily available. | Simple to operate. No construction Services, equipment and technology are readily available. | Simple to construct, somewhat complex, but proven, to operate to meet ARARs. Services equipment and technology are readily available. |
| PRESENT WORTH COST AT 10% DISCOUNT | Not applicable. | $6,911,000 | $71,933,000 | $21,866,000 |

**TABLE 10.3-10 (continued)**

**Individual Evaluation of Final Alternatives**
**Alternatives 5A Through 6**

| CRITERIA | ALTERNATIVE 5A CASHMAN PROCESS WITH STABILIZATION | ALTERNATIVE 5B CASHMAN PROCESS WITHOUT STABILIZATION | ALTERNATIVE 6 AMBIENT ACID LEACH WITH STABILIZATION |
|---|---|---|---|
| OVERALL PROTECTIVENESS | Protection of human health and the environmental achieved through removal of some contaminants, stabilization of residues, and placement of non-characteristic material in an engineered repository. | Protection of human health and the environment achieved through removal of some contaminants, production of a stable non-characteristic residue, and placement in an engineered repository. | Protection of human health and the environment achieved through removal of some contaminants, stabilization of residues, and placement of non-characteristic material in an engineered repository. |
| COMPLIANCE WITH ARARs | Would attain ARARs. | Would attain ARARs. | Would attain ARARs. |
| LONG-TERM EFFECTIVENESS AND PERMANENCE | Risk of contaminant release effectively reduced; but will be dependent on long-term stabillity of treated material, and long-term integrity, maintenance and monitoring of an engineered repository. | Risk of contaminant release effectively reduced; but will be dependent upon the ability to produce a long-term stable non-characteristic residue, and the long-term integrity, maintenance, and monitoring of an engineered repository. | Risk of contaminant release effectively reduced, but will be dependent on long-term integrity, maintenance and monitoring of an engineered repository. |

**TABLE 10.3-10 (continued)**

**Individual Evaluation of Final Alternatives**
**Alternatives 5A Through 6**

| CRITERIA | ALTERNATIVE 5A CASHMAN PROCESS WITH STABILIZATION | ALTERNATIVE 5B CASHMAN PROCESS WITHOUT STABILIZATION | ALTERNATIVE 6 AMBIENT ACID LEACH WITH STABILIZATION |
|---|---|---|---|
| REDUCTION OF TOXICITY, MOBILITY, OR VOLUME THROUGH TREATMENT | Reduction of toxicity and mobility to below non-characteristic (TCLP) levels. Increase of volume by approximately 16%. | Reduction of toxicity and mobility, although possibly not to below non-characteristic (TCLP) levels. Increase of volume by approximately 4%. | Reduction of toxicity and mobility to below non-characteristic (TCLP) levels. Increase of volume by approximately 16%. |
| SHORT-TERM EFFECTIVENESS | Dust controls required to reduce worker and community risk. Controls also needed for treatment operations. Seven to eight-year implementation. | Dust controls required to reduce worker and community risk. Controls also needed for treatment operations. Approximate seven-year implementation. | Dust controls required to reduce worker and community risk. Controls also needed for treatment operations. Seven to eight-year implementation. |
| IMPLEMENTABILITY | Complex to construct and operate. Some exotic equipment needed. Training of personnel required. Technology not proven at full scale, except for stabilization stage. | Complex to construct and operate. Some exotic equipment needed. Training of personnel required. Technology not proven at full scale. | Complex to construct and operate. Services, equipment technology are available. Training of personnel may be required. Technology proven in commercial operations. |
| PRESENT WORTH COST AT 10% DISCOUNT | <<CONFIDENTIAL>> | <<CONFIDENTIAL>> | $19,189,000 |

## 10.4 COMPARATIVE ANALYSIS

The comparative analysis reviews the six remedial alternatives described above in relation to threshold criteria, primary balancing criteria, and modifying criteria as specified in the NCP. The threshold criteria include overall protection of human health and the environment and compliance with ARARs. These two criteria must be met by an alternative in order to be eligible for selection. Primary balancing criteria include long-term effectiveness and permanence, reduction of toxicity, mobility, or volume through treatment, short-term effectiveness, implementability, and cost. Modifying criteria include State and community acceptance.

The remedial alternatives are evaluated in this comparative analysis relative to one another, discussing the advantages and disadvantages of each alternative. As a quick reference, Table 10.4-1 summarizes a net positive, neutral, or negative ranking assigned to each alternative for each of the evaluation criteria. A more detailed comparison among the alternatives for each evaluation criteria is given in the following sections.

## TABLE 10.4-1

## COMPARATIVE ANALYSIS OF ALTERNATIVES*

| THRESHOLD CRITERIA | 1 No Action | 2 Onsite Disposal | 3 Offsite Disposal | 4 Stabilization/ Fixation | 5A Cashman Process | 5B Cashman Process | 6 Ambient Acid Leach Process |
|---|---|---|---|---|---|---|---|
| Overall | No | Yes | Yes | Yes | Yes | Yes | Yes |
| ARARs | No | Yes | Yes | Yes | Yes | Yes | Yes |
| PRIMARY BALANCING CRITERIA | | | | | | | |
| Long-term Effectiveness and Permanence | – | – | – | + | + | 0 | + |
| Reduction of Toxicity, Mobility, or Volume | – | – | – | + | + | + | + |
| Short-term Effectiveness | – | + | + | + | – | – | – |
| Implementability | 0 | + | 0 | + | – | – | – |
| Cost | 0 | + | – | 0 | – | – | 0 |
| Net Ranking | NA | 1+ | 2– | 4+ | 1– | 2– | 0 |

* + is a positive ranking relative to other alternatives
0 is a neutral ranking relative to other alternatives
- is a negative ranking relative to other alternatives

NA Not Applicable.

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

Alternative Nos. 2 through 6 would provide for overall protection of human health and the environment through containment and/or treatment and containment. Alternative Nos. 4 and 5 would reduce the risks associated with flue dust exposure through treatment, although Alternative Nos. 5A and 6 would require an additional stabilization/fixation process step for the residue materials. Alternative No. 2 would only contain the flue dust in an onsite repository, but would offer no treatment. Each alternative, except Alternative No. 1, would involve removal of the flue dust materials from their present pile locations, and would achieve the same level of source contamination removal. Alternative No. 1 would not achieve overall protection of human health and the environment.

In evaluating the overall protection to human health and the environment, a focus on compliance with ARARs, short-term effectiveness, and long-term effectiveness and permanence is required. Alternative Nos. 2 through 6 would attain ARARs identified by EPA. While each alternative would meet the remedial action objectives specified for the Flue Dust Operable Unit, Alternative Nos. 5 and 6 would require a minimum of 7 years, as opposed to the 1, 2, or 3 year completion schedules for Alternative Nos. 2 through 4, respectively. Alternative Nos. 2 through 6 would all achieve long-term effectiveness and permanence. Alternative No. 2 emphasizes repository integrity as the means to prevent a release to the environment. Alternative No. 3 relies on proper flue dust handling from the site to the TSD facility, and Alternative Nos. 5A and 6 rely on additional treatment steps beyond the initial flue dust processing. In addition, there are some uncertainties related to the short-term impact of process activities to both the environment (by-products) and workers under Alternative Nos. 5 and 6, as

facilities for flue dust processing have not previously been constructed.

Alternative No. 4 appears to offer the greatest overall protection through the use of a standard, proven technology to produce a stable, non-toxic material for onsite disposal in a timely manner.

### 10.4.2 Compliance with ARARs

With the exception of Alternative No. 1, each of the alternatives would attain the ARARs listed in Table 10.3-1. For each alternative compliance would be contingent upon the remedial alternatives being properly executed.

### 10.4.3 Long-Term Effectiveness and Permanence

Alternative Nos. 4, 5A and 6 would provide for a high degree of long-term effectiveness and permanence because the flue dust or residue materials are stabilized/fixed using a standard, proven technology. The stabilized/fixed material does not exceed TCLP regulatory limits and also did not do so under long-term stability testing conditions. Placement of the stabilized material in a repository provides additional long-term security. Alternative No. 5B would provide for long term effectiveness and permanence through generation of a non-TCLP characteristic residue and placement of the residue in an onsite repository.

Alternative No. 2 would provide for containment of the flue dust. Since treatment of flue dust does not occur with Alternative No. 2, a potential for a release to the environment of untreated flue dust still exists if there were a failure of the monitoring or containment systems. Long-term monitoring and maintenance would be required for this alternative.

Alternative No. 3 would provide for long-term effectiveness and permanence at the site through removal of the flue dust from Smelter Hill. Maintenance and monitoring at the TSD facility would be required to ensure the proper containment of flue dust.

Alternative No. 5A would produce an autoclave leach residue that requires cement-based stabilization/fixation prior to onsite disposal in an engineered repository. As such, Alternative No. 5A would also provide a similar degree of long-term effectiveness and permanence as compared to Alternative No. 4. A repository design similar to that discussed under Alternative No. 4 would provide similar controls to ensure containment of the treated material.

In addition to the autoclave residue, other process reagents and materials that would be present within the facility may require further treatment if found to exhibit toxicity subsequent to the flue dust processing. The Cashman process facility would also need to be dismantled, extending the total time requirements of processing the flue dust under Alternative No. 5.

Alternative No. 6 would produce an acid leach residue and a lime precipitate that requires cement-based stabilization/fixation prior to onsite disposal in an engineered repository. As such, Alternative No. 6 would also provide a similar degree of long-term effectiveness and permanence as compared with Alternative No. 4. A repository design similar to that discussed under Alternative No. 4 would provide similar controls to ensure containment of the treated material.

In addition to the acid leach residue and lime precipitate, other process reagents and materials that would be present within the facility may require further treatment if found to exhibit toxicity subsequent to the flue dust processing. The Ambient Acid Leach process facility would also need to be dismantled,

extending the total time requirements of processing the flue dust under Alternative No. 6.

### 10.4.4 Reduction of Toxicity, Mobility, or Volume through Treatment

Overall, Alternative No. 4 would provide for the fastest reduction in flue dust toxicity and mobility, but would increase the total volume for disposal by approximately 15 percent.

Alternative Nos. 5A and 6 would produce process residuals that exceed TCLP regulatory limits, and would require stabilization/fixation treatment to eliminate its toxicity. The volume of the process residuals would be approximately four percent greater than the volume of untreated flue dust under both alternatives. Stabilization/fixation of these residuals may also increase the total volume for disposal by approximately 16 percent. Toxicity and mobility would be reduced similarly to Alternative No. 4. Alternative No. 5B would produce a non-TCLP characteristic residue, which would increase the volume by approximately four percent.

Alternative No. 2 would provide the fastest reduction of mobility by immediate placement of untreated material in an onsite repository. Alternative No. 2 would provide for no reduction in flue dust toxicity or volume, but would provide for reduction in flue dust mobility. Alternative No. 3 calls for placement of the untreated flue dust in an offsite RCRA Subtitle C repository. Alternative No. 3 provides for flue dust reduction in toxicity, mobility and volume at the Smelter Hill site, but only reduction in mobility at the RCRA TSD facility. Since treatment of the flue dust does not occur under Alternative Nos. 2 and 3, a potential release pathway to the environment of untreated flue dust still exists if there were a failure of the monitoring or containment systems. Such a release pathway would

not exist under Alternative Nos. 4 through 6, with either stabilized/fixed material or a non-TCLP characteristic residue. Alternative No. 1 does not provide reduction of flue dust toxicity or volume, and would potentially increase its mobility from the present pile locations.

### 10.4.5 Short-Term Effectiveness

Alternative Nos. 2 through 6 each involve flue dust excavation and transportation. Similar dust control activities would be implemented under each of these alternatives. Alternative No. 4 requires dust control only for excavation, and during mixing activities at the mobile crusher and batch plant, providing for the least number of untreated flue dust handling and transportation steps.

Alternative No. 2 would require additional dust control during flue dust transport and placement in the onsite repository meeting applicable or relevant and appropriate RCRA Subtitle C requirements, and during construction of the repository cap. Alternative No. 3 would also require additional dust control during flue dust on-loading and off-loading from the railroad container cars, as well as during the activities at the TSD facility.

Alternative Nos. 5 and 6 require additional dust control at the central processing facility, where blending of a composite flue dust would occur. Further dust control would also be needed during the feedstock preparation. No dust control would take place under Alternative No. 1.

Remedial action objectives at the site would be achieved most quickly with Alternative No. 3, approximately six months to one year. Alternative No. 2 would achieve these objectives in approximately two years. The objectives would be met under

Alternative No. 4 in approximately three years. Both Alternative Nos. 5 and 6 would require a minimum of seven years to meet the objectives. A startup "shakedown" period, and a required shutdown period would add time requirements to the seven year minimum under each subalternative. Remedial action objectives would not be met under Alternative No. 1.

Based on this information, Alternative No. 4 provides for the greatest short-term effectiveness because it has the lowest number of untreated flue dust handling steps, and it contains a stable, non-TCLP material in a repository in three years. While Alternative No. 2 contains the flue dust in two years, it requires additional flue dust handling. Alternative No. 3 removes the flue dust threat in one year, although the untreated material may remain at the TSD facility for two or three additional years prior to disposal. Alternative Nos. 5 and 6 require two additional handling steps of untreated flue dust compared to Alternative No. 4, and requires at least seven to ten years to complete, where exposure risks would remain. In addition, Alternative Nos. 5 and 6 have other short-term risks related to process activities which may impact the workers and the environment.

### 10.4.6 Implementability

Alternative No. 2 provides the easiest implementability. Excavation and transport of flue dust could be accomplished with conventional equipment. Dust control during these steps could also be obtained with standard technology. Implementability concerns are anticipated to be minimal for the repository associated with Alternative Nos. 2, 4, 5 and 6. Alternative No. 4 would also be implemented with standard technology. Stabilization/fixation would be easily accomplished.

Alternative No. 3 would use standard, proven technologies for excavation and onsite transportation. Offsite transportation using railroad cars for large volumes of flue dust has not been performed in the past. Additional flue dust handling steps for transfer to railroad container cars may make this alternative more difficult to implement than Alternative Nos. 2 and 4.

Alternative 5 would require construction of a relatively complex processing facility using exotic construction materials. Replacement parts and back-up equipment would be more difficult to obtain causing potential processing delays.

Alternative 6 also requires facility construction, although not as complex as Alternative 5. Standard materials such as those in use at existing hydrometallurgical facilities could be used, potentially minimizing processing delays.

Preparing a composite feedstock would be needed under both alternatives, adding flue dust handling steps to the treatment process. The process residuals would also require cement-based stabilization/fixation treatment prior to onsite disposal. Closure of the processing facilities would be expected to require additional disposal, or possibly treatment and disposal, of process fluids and various reagents. This effort would make either Alternative No. 5 or 6 more difficult to implement than Alternative Nos. 2 and 4.

### 10.4.7 Cost

Alternative No. 2 has the lowest negative net present worth cost (at a 10 percent discount rate) of approximately $6.9 million, excluding Alternative No. 1, which has no associated costs. Alternative No. 4 has a net present worth cost for alternatives requiring treatment, at approximately negative $21.9 million. Alternative No. 6 was a net negative present worth of

approximately $19.2 million, while Alternative Nos. 5A and 5B have a net present worth of approximately (CONFIDENTIAL BUSINESS INFORMATION). Alternative No. 3 has the highest net negative present worth at approximately $71.9 million.

Cost estimates for each alternative (excluding the No Action Alternative) used the same method for excavation and onsite transportation of flue dust, which was based on extensive experience with cost estimation for standard earth-moving type activities. In addition, the remaining remedial activities under Alternative Nos. 2 and 4 were cost estimated from experience with similar construction activities. As such, these cost estimates are considered to be most reliable. In contrast, estimates for Alternative Nos. 3, 5, and 6 are considered to be less reliable due to uncertainties associated with their respective remedial activities. For example, the addition of flue dust handling steps under Alternative No. 3, along with long-distance travel requirements to the TSD facility pose potentially costly uncertainties.

Alternative Nos. 5 and 6 require detailed engineering design of potentially complex facilities. If delays in construction are required, or if a shakedown period is longer than anticipated, costs would increase accordingly. Additional pilot-studies may be required for either alternative to develop the necessary data for operating a full-scale facility. In addition, cost estimates for both alternatives were based on one set of market values for salable products. A drop or increase in metals prices would effect operational costs of the facilities.

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# APPENDIX A

Institutional Controls

# REVISED LEGAL MEMORANDUM REGARDING THE USE OF INSTITUTIONAL CONTROLS

Submitted by: Arco Coal Company
Date: September 11, 1989

TABLE OF CONTENTS

Page

I. INTRODUCTION . . . . . 1

II. THE USE OF INSTITUTIONAL CONTROLS UNDER CERCLA . . . . . 4

III. THE RELIABILITY AND EFFECTIVENESS OF INSTITUTIONAL CONTROLS . . . . . 8

A. Land Use Zoning Restrictions . . . . . 8

1. Legal authority for land use zoning restrictions . . . . . 8

a. Police Power . . . . . 8

b. Limitations on exercise of police power. . 10

c. Confiscatory taking . . . . . 14

2. Procedure for implementing land use zoning restrictions in Anaconda-Deer Lodge County. . . 17

a. Procedures Under MCA §76-2-101, et seq.. . 18

b. Procedures Under MCA §76-2-201, et seq.. . 20

1. Jurisdictional area . . . . . 21

2. Comprehensive plan . . . . . 27

3. Adoption of zoning districts and regulations . . . . . 29

c. Procedures under MCA §76-2-301, et seq.. . 31

3. Enforceability of land use zoning restrictions as an institutional control . . . . . 33

4. Potential for change in land use zoning restrictions . . . . . 34

B. Deed Restrictions . . . . . 38

1. Legal authority for easements and restrictive covenants . . . . . 38

a. Easements . . . . . 38

b. Restrictive covenants . . . . . 42

2. Procedure for implementing easements and restrictive covenants at the Smelter site . . . 43

a. Easements . . . . . 43

b. Restrictive covenants . . . . . 47

3. Enforceability of easements and restrictive covenants as institutional controls . . . . . 53

4. Potential for change in easements and restrictive covenants . . . . . 54

IV. WATER WELL BANS . . . . . 55

V. EVALUATION OF POSSIBLE ROLES FOR INSTITUTIONAL CONTROLS . . . . . 58

A. Use of Institutional Controls as Interim Protection. 58

B. Use of Institutional Controls to Protect an Engineered Containment System. . . . . 59

C. Use of Institutional Controls as a Sole Remedy . . . 59

VI. CONCLUSION . . . . . 60

I.

## INTRODUCTION

As part of the General Work Plan for the Anaconda Smelter NPL site and the Smelter Hill Remedial Investigation/Feasibility Study Work Plan ("Smelter Site"), Atlantic Richfield Company ("ARCO") has agreed to submit to the United States Environmental Protection Agency ("EPA") and the State of Montana a legal evaluation of all state and local authorities and jurisdictions concerning authority to establish, implement and enforce institutional controls, such as restrictive covenants, land use zoning restrictions, and drinking water well bans. ARCO has agreed to evaluate these institutional controls for the following roles:

(1) To protect permanent components of an engineered containment system (such as a soil cap) from disturbance;

(2) As interim protection while a permanent remedy is being implemented; and

(3) As a sole remedy.

Additionally, ARCO has agreed to evaluate the reliability and effectiveness of the institutional controls over the long term according to the following criteria:

(1) State or local legal authority for implementing specific institutional controls;

(2) Enforceability of the institutional controls;

(3) Potential for change in the controls through variances, amendments, inter-party agreements, etc.

The General Work Plan also called for ARCO to evaluate the availability of resources for state or local governments for implementing the controls and the commitment of state or local governments to enact, implement, and/or enforce the controls. EPA subsequently informed ARCO that it need not address these issues in this memorandum.

The Smelter Hill operable unit of the Anaconda Smelter NPL site was the location of copper smelting facilities erected by the Anaconda Minerals Company to process copper ores mined in Butte, Montana. The Washoe Works (later known as the Anaconda Reduction Works) went on-line on Smelter Hill in 1902 and ceased operation in September, 1980. After smelting operations ceased, the facility was demolished (between September, 1982 and June, 1986). The only structures remaining on the site are the smelter stack, truck repair shop, and the three east Anaconda yard office buildings.

The site boundaries of the Anaconda Smelter NPL site are as yet undefined. It appears, however, that the site includes property owned by ARCO, property owned by federal, state and local governments, and property owned by third parties. This memorandum will address issues arising from the various forms of property ownership at the Smelter site.

This memorandum will first address the use of institutional controls within the statutory framework of the Comprehensive Environmental Response Compensation and Liability Act, as amended by the Superfund Amendments and Reauthorization Act ("CERCLA"),

42 U.S.C. §§9601-9675.[1] The memorandum will then evaluate the reliability and effectiveness of institutional controls according to the criteria set forth above.

Because the General Work Plan requires ARCO to provide a legal evaluation of institutional controls "such as restrictive covenants, land use zoning restructures, and drinking water well bans," this memoranda discusses the implementation, enforceability, and potential for change for each of these mechanisms separately. This organization, however, may create some confusion. A drinking water well ban is an institutional control in and of itself -- the same as a fence or a sign. These actual institutional controls must be contrasted with the legal means used to implement them, such as zoning restrictions, deed restrictions, statutes, regulations, and ordinances. The requirement that a fence be built around property must be implemented in some manner so as to make that requirement binding on and enforceable against the person required to build it. Likewise, a water well ban must be implemented in such a manner that it will be binding and enforceable against all persons who might drill or drink from such a well. This memorandum is concerned with evaluating the legal mechanisms for implementing institutional controls generally. It will address the mechanism for implementing one particular type of institutional control,

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[1] All cited authorities have been compiled in a table of cases and authorities attached as Exhibit "A".

water well bans, because the General Work Plan requires separate treatment of that institutional control.

This memorandum has not specifically addressed the implementation of institutional controls through statutes, regulations, and ordinances. No citation of authority is needed for the proposition that states have the power to enact legislation subject to constitutional limitations, or that states may delegate legislative power to counties and municipalities. The legislative power of a state and its subdivisions may be used, in appropriate circumstances, to implement institutional controls.

## II.

## THE USE OF INSTITUTIONAL CONTROLS UNDER CERCLA

CERCLA authorizes the use of institutional controls in appropriate circumstances. Section 121 of CERCLA requires, among other things, that EPA select remedial actions which assure protection of human health and the environment. 42 U.S.C. §9621. As EPA recognizes in the Preamble to the Proposed National Contingency Plan, 53 Fed. Reg. 51394, et seq. (December 21, 1988) (the "Proposed NCP"), this protection can be achieved through a variety of means, including "institutional controls which prevent access to contaminated areas." 53 Fed. Reg. 51422. Institutional controls are an appropriate means under CERCLA to achieve this protection. The preamble to the Proposed NCP provides:

> The mandate for remedies that protect human health and the environment can be fulfilled

> through a variety of means, including the destruction, detoxification, or immobilization of contaminants through the application of treatment technologies, and by controlling exposure to contaminants through engineering controls (such as containment) <u>and/or institutional controls which prevent access to contaminated areas</u>. (Emphasis added.)

53 Fed. Reg. 51422. Thus, the Agency has expressly recognized that institutional controls can be used to achieve a protective remedy, not merely to supplement a remedy where protection has already been achieved through technological or engineering means. EPA further emphasizes in the preamble to the Proposed NCP that,

> For those sites where hazardous substances remain such that unrestricted use and unlimited exposure is not allowable, engineering controls, institutional controls, or some combination of the two must be implemented to control exposure <u>and thereby ensure reliable protection over time</u>. (Emphasis added.)

53 Fed. Reg. 51428.

Protection of public health and the environment can also be achieved through the adoption of institutional controls which prevent the use of or control exposures to contaminated areas or media. The Preamble to the Proposed NCP explains that:

> As appropriate, institutional controls such as water use and deed restrictions may supplement engineering controls for short- and long-term management to prevent, or limit exposure, to hazardous substances, pollutants, or contaminants. Institutional controls will be used routinely to prevent exposures to releases during the conduct of the remedial investigation and feasibility study, during remedial action implementation, and as a supplement to engineering controls designed to manage wastes over time. The use of institutional controls to restrict use or

> access should not, however, substitute for active response measures (e.g., treatment and/or containment of source material restoration of ground waters to their beneficial uses) as the sole remedy unless such active measures are determined not to be practicable.

53 Fed. Reg. 51423.

Whether active response measures are "practicable" is to be determined based on the balancing of trade-offs among alternatives that is conducted during the selection of the remedy. Id. The preamble to the Proposed NCP acknowledges that "comprehensive treatment options" may not be practicable at mining waste sites, and that institutional controls should therefore be considered in the universe of viable alternatives. 53 Fed. Reg. 51427. Additionally, the preamble provides that "if active measures are not practicable and cost effective, exposure to the waste must be controlled through institutional means." 53 Fed. Reg. 51440.

EPA has recognized that institutional controls can be used to determine "reasonable maximum exposure scenarios." 53 Fed. Reg. 51425. The Proposed NCP suggests that a "reasonable maximum exposure level" be used in exposure assessments to "provide decisionmakers with an understanding of potential future exposures." 53 Fed. Reg. 51425. The reasonable maximum exposure scenario "should include an assessment of the likelihood of such exposures occurring. This exposure scenario will provide the basis for the development of protective exposure levels." 53 Fed. Red. 51425. EPA recognizes throughout the Proposed NCP

that institutional controls may be an integral component of a remedy, and may be used to achieve CERCLA's protectiveness mandate. See, e.g., 53 Fed. Reg. 51422; 53 Fed. Reg. 51423; 53 Fed. Reg. 51427; 53 Fed. Reg. 51428. Moreover, the Agency has explicitly recognized the adequacy and reliability of institutional controls as criteria for determining whether a remedy provides long term protectiveness and permanence. 53 Fed. Reg. 51428. Where institutional controls are considered as a remedial alternative, either solely or in conjunction with engineering controls or treatment technologies, the Agency must consider the institutional controls in determining reasonable maximum exposure scenarios.

In recognition of its authority, EPA has used institutional controls as a component of response actions at a number of CERCLA sites. As the federal government acknowledged in United States v. Shell, Civil Action No. 83-C-2379 (D.Colo.):

> A review of records of decisions approved by EPA in a single year, 1986, discloses that over 20 cleanup plans incorporated some type of institutional controls -- including zoning restrictions to limit certain types of development (one site); deed restrictions to prohibit specific land uses (six sites); deed restrictions to prohibit consumptive use of groundwater (four sites); creation of economic incentives for well owners to discontinue the use of their wells (one site); other types of institutional restrictions for the use of groundwater wells (four sites); owner enforced restrictions on site access (three sites); and various other types of regulatory constraints on uses of land and groundwater.

United States' June 7, 1988, Response to Comments Received on the Proposed Consent Decree Lodged on February 1, 1988 with the United States District Court in United States v. Shell Oil Company.[2] Thus, EPA clearly has the authority to adopt institutional controls in appropriate circumstances.

## III.

## THE RELIABILITY AND EFFECTIVENESS OF INSTITUTIONAL CONTROLS

### A. Land Use Zoning Restrictions

#### 1. Legal authority for land use zoning restrictions.

##### a. Police power

The regulation of land use through zoning is derived from the state's "police power." Village of Euclid v. Ambler Realty Co., 272 U.S. 365, 387, 47 S.Ct. 114, 118, 71 L.Ed. 303, 310 (1926). The police power has been defined as that which enables a state "to pass regulations for the health, safety and general welfare of the people." Yellowstone Valley Electric Cooperative Inc. v. Ostermiller Inc., 187 Mont. 8, 13, 608 P.2d 491, 494 (1980); State v. Turk, 197 Mont. 311, 314, 643 P.2d 224, 226 (1982). In Berman v. Parker, 348 U.S. 26, 33, 75 S.Ct. 98, 102-03, 99 L.Ed. 27, 38 (1954), the Supreme Court defined the breadth of public or general welfare as follows:

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[2] This Consent Decree was lodged prior to publication of the Proposed NCP. However, EPA authorized the use of institutional controls in at least one consent decree signed after publication of the Proposed NCP. See United States v. Velsicol Chemical Corp., (S.D. Ill.).

> The concept of the public welfare is broad and inclusive. (Citation omitted.) The values it represents are spiritual as well as physical, aesthetic as well as monetary. It is within the power of the legislature to determine that the community should be beautiful as well as healthy, spacious as well as clean, well balanced as well as carefully patrolled.

See also Construction Ind. Ass'n., Sonoma Cty. v. City of Petaluma, 522 F.2d 897, 906 (9th Cir. 1975).

Local governments have no inherent power to enact zoning regulations. Such power, however, has been delegated by the State of Montana to the local governments. See, generally, MCA §§76-2-101, et seq., 76-2-201, et seq. and 76-2-301, et seq. (authorizing county and municipal governments to adopt zoning regulations for the purpose of promoting health, safety, and the general welfare.)

Although zoning regulations have not traditionally been used to protect the public or the environment from exposure to hazardous substances, the United States Supreme Court has made it clear that the validity of a zoning regulation should not be challenged simply because it is novel or because it seeks to accomplish purposes not previously thought appropriate. In Euclid, the court stated:

> Regulations, the wisdom, necessity and validity of which, as applied to existing conditions, are so apparent that they are now uniformly sustained, a century ago, or even a half century ago, probably would have been rejected as arbitrary and oppressive.

272 U.S. at 387, 47 S.Ct. at 118, 71 L.Ed. at 310.[3]

b. Limitations on exercise of police power

Although the police power is very broad, there are both constitutional and statutory limitations on Anaconda-Deer Lodge County's exercise of its delegated police power. The constitutional limitations were articulated by the Court in Euclid as follows:

> [I]t must be said before the ordinance can be declared unconstitutional, that such provisions are clearly arbitrary and unreasonable, having no substantial relation to the public health, safety, morals or general welfare.

272 U.S. at 395, 47 S.Ct. at 121, 71 L.Ed. at 314; see also Yellowstone Valley Electric Cooperative Inc., 187 Mont. at 15, 608 P.2d at 496 ("The standard of reasonableness is the

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[3] See also First English Evangelical Lutheran Church of Glendale v. Los Angeles County, 482 U.S. 304, 107 S.Ct. 2378, 96 L.Ed.2d 250 (1987) (Stevens, J., dissenting):

> "Long ago it was recognized that 'all property in this country is held under the implied obligation that the owner's use of it shall not be injurious to the community.'" (Citations omitted.) Thus, in order to protect the safety of the community, government may condemn unsafe structures, may close unlawful business operations, and surely may restrict access to hazardous areas -- for example, land on which radioactive material has been discharged, land in the path of a lava flow from erupting volcano, or land in the path of a potentially life-threatening flood. (Emphasis added.)

constitutional measure of the proper exercise of the police power.")

When considering the reasonableness standard, the Supreme Court has declared that one must not "limit the concept of public welfare that may be enhanced by zoning regulations." Village of Belle Terre v. Boraas, 416 U.S. 1, 5, 94 S.Ct. 1536, 1539, 39 L.Ed.2d 797, 802 (1974). In other words, the zoning authorities must be afforded "considerable latitude in choosing the means by which to implement such purposes." Id., 416 U.S. at 13-14, 94 S.Ct. at 1543, 39 L.Ed.2d at 807. Thus, in determining the validity of a given use restriction, the principal question is whether the "restrictions imposed are substantially related to the promotion of the general welfare." Penn Central Transportation Co. v. New York City, 438 U.S. 104, 138, 98 S.Ct. 2646, 2666, 57 L.Ed.2d 631, 657 (1978).

Constitutional challenges against validly enacted zoning ordinances can also take the form of claims of "spot zoning." The Montana Supreme Court has defined spot zoning as "the process of singling out 'a small parcel of land' for a use classification totally different from that of the surrounding area, for the benefit of the owner of such property and to the detriment of other owners." (Emphasis by the Court.) Little v. Board of County Commissioners, 631 P.2d 1282, 1289 (Mont. 1981). More specifically, the following factors must be considered:

> First, in spot zoning, the requested use is significantly different from the prevailing use in the area. Second, the area in which the requested use is to apply is rather

> small. This test, however, is concerned more with the number of separate landowners benefited by the requested change than it is with the actual size of the area benefited. Third, the requested change is more in the nature of special legislation. In other words, it is designed to benefit only one or a few landowners at the expense of the surrounding landowners or the general public.

Id. To the extent that zoning restrictions are designed to benefit the general public in and around the Smelter site, they should not be subject to a claim of spot zoning. However, an attempt to zone only ARCO-owned property for purposes of benefitting ARCO only may be subject to such a claim. The issue of spot zoning will have to be analyzed on a case-by-case basis as particular zoning proposals are considered.

Anaconda-Deer Lodge County's authority to enact zoning regulations is also limited by statute. Because the power of local governments to enact zoning regulations is derived from statutory grants of authority, the regulations must comply with the statutory scheme. Allen v. Flathead County, 184 Mont. 58, 60, 601 P.2d 399, 401 (1979). In addition, with respect to county zoning, MCA §76-2-209 provides that land use zoning resolutions cannot be utilized to "prevent the complete use, development, or recovery of any mineral, forest, or agricultural resources by the owner thereof" and MCA §76-2-109 prevents a county from creating a planning district that "regulates lands used for grazing, horticulture, agriculture, or the growing of timber." Finally, MCA §§76-2-105 and 76-2-208 provide that lawful uses which are made of property at the time a zoning

resolution is adopted may be continued, even if not in conformity with the resolution. Under these statutes, a use existing at the time of the enactment of a zoning ordinance may be continued though not in harmony with the character of the zone or district in which it is placed by the ordinance. Kensmoe v. City of Missoula, 156 Mont. 401, 480 P.2d 835 (1971). The statutes clearly protect only lawful use of property. See generally In re Chamberlin, 360 A.2d 100 (Ut. 1976) (junkyard owner not in compliance with applicable law and therefore not within protection of statute relating to nonconforming uses). The right to continue a nonconforming use runs with the land and is not confined to the original owner. Watts v. City of Helena, 151 Mont. 138, 439 P.2d 767 (1968). However, the courts have held that the right to continue a nonconforming use exists only for the use made of the property at the time the zoning ordinance is enacted. No subsequent change in use is allowed. See generally Kreger v. Public Buildings Commission of Newton, 353 Mass. 622, 234 N.E.2d 283 (1968) (holding that distribution plant for oil business not be same as prior use of property for storage and sale of fuel oil). An area of nonconforming use may not be enlarged or expanded except as permitted by zoning ordinance. Watts.

Despite these limitations, Anaconda-Deer Lodge County possesses the legal authority to adopt a wide variety of land-use zoning restrictions at the Anaconda Smelter site which would

prevent or limit land uses determined to be hazardous.[4] The specific use restrictions adopted need only be reasonably related to the broad concept of public welfare. The specific use restrictions ultimately deemed necessary at the site could be imposed on all property within the site regardless of ownership. Within the Smelter site itself, separate zone classifications could be created with different use restrictions depending upon the particular concerns within each.

c. Confiscatory taking

Article II, §29 of the Montana Constitution provides:

> Private property shall not be taken or damaged for public use without just compensation to the full extent of the loss having been first made to or paid into the court for the owner.

Similarly, the Fifth Amendment to the United States Constitution provides "nor shall any private property be taken for public use, without just compensation."[5] In certain circumstances, zoning restrictions can constitute a confiscatory taking. These constitutional limitations do not limit "governmental

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[4] To the extent the statutory limitations are in conflict with the use restrictions sought to be achieved, institutional controls in the form of deed restrictions can be implemented as discussed, infra.

[5] The Fifth Amendment has been held applicable to the states through the Fourteenth Amendment. See, Chicago, B. & Q.R. Co. v. Chicago, 166 U.S. 226, 17 S.Ct. 581, 41 L.Ed. 979 (1897).

interference with property rights se, but rather . . . secure compensation in the event of otherwise proper interference amounting to a taking." First English Lutheran Church, 107 S.Ct. at 2381, 96 L.Ed.2d at 264. Accordingly, the key inquiry is whether use restrictions imposed at the Smelter site amount to a "taking."

The United States Supreme Court has long recognized that "the government can prevent a property owner from using his property to injure others without having to compensate the owner for the value of the forbidden use." Penn Central Transportation Co., 438 U.S. at 144, 98 S.Ct. at 2669, 57 L.Ed.2d at 661. A use restriction, however, may be deemed a taking if it goes "too far." See, Pennsylvania Coal Co. v. Mahon, 260 U.S. 393, 415, 43 S.Ct. 158, 160, 67 L.Ed. 322, 326 (1922). It is settled that a regulatory program goes too far only when it destroys a major portion of the property's value. See, Keystone Bituminous Coal Ass'n. v. DeBenedictis, 480 U.S. 470, 107 S.Ct. 1232, 94 L.Ed. 472 (1987); Hodel v. Virginia Surface Mining & Reclamation Ass'n., 452 U.S. 264, 101 S.Ct. 2352, 69 L.Ed.2d 1 (1981); Yellowstone Valley Electric Cooperative Inc., 187 Mont. at 15-16, 608 P.2d at 496. Only the most extreme regulations will be deemed a taking. As stated in Pennsylvania Coal Co.: "Government hardly could go on if to some extent values incident to property could not be diminished without paying for every such change in the general laws." 260 U.S. at 413, 43 S.Ct. at 159, 67 L.Ed. at 325. Or, as observed by the California Supreme Court:

> Even a significant diminution in value is insufficient to establish a confiscatory taking. (Euclid v. Ambler Realty Co. (1926), 272 U.S. 365, 47 S.Ct. 114, 71 L.Ed. 303, 54 A.L.R. 1016 [75 percent reduction in value because of zoning law insufficient to establish a taking]; Hadacheck v. Sebastion, 239 U.S. 394, 36 S.Ct. 143, 60 L.Ed. 348 (1915) [nearly 90 percent reduction in value because of use restriction insufficient to establish a taking]

Fisher v. City of Berkley, 37 Cal. 3d 644, 693 P.2d 261, 294-95, 209 Cal. Rptr. 682, 715-16 (1984); see also Griffin Development Co. v. City of Oxnard, 39 Cal. 3d 256, 703 P.2d 339, 345, 217 Cal. Rptr. 1 (1985). Conversely, where government regulation serves to deprive one of "all use of property," there is a taking and "no subsequent action by the government can relieve it of the duty to provide compensation for the period during which the taking was effective." First English Lutheran Church, 107 S.Ct. at 2389, 96 L.Ed.2d at 268.

Much of the property in the vicinity of the Smelter is owned by ARCO. As to such property ARCO could waive any right to seek compensation and thus avoid any taking problem. See, California Reduction Co. v. Sanitary Reduction Works, 199 U.S. 306, 318, 26 S.Ct. 100, 103, 50 L.Ed. 204, 209 (1905). With respect to property not owned by ARCO, certain zoning restrictions might reduce the value of the property to such a degree as to amount to a taking. Each proposed zoning restriction will have to be

analyzed on a case by case basis to determine its impact on a non-ARCO property.[6]

In summary, Anaconda-Deer Lodge County possesses the necessary police power to enact zoning restrictions at the Smelter site which are designed to protect public health and the environment by preventing or limiting exposure to hazardous substances. The specific zoning restrictions employed need only be reasonably related to this objective. Proposed zoning restrictions will have to be reviewed to determine whether they create spot zoning or takings problems.

2. Procedure for implementing land use zoning restrictions in Anaconda-Deer Lodge County.

The procedures which must be followed for implementing land use restrictions at the Smelter site are set forth at MCA §§76-1-101 through 76-2-328. In order to be valid, a zoning ordinance must be enacted in compliance with the statutes. See Allen v. Flathead County, 184 Mont. 58, 601 P.2d 399 (1979). Three different procedures are available to a Board of County Commissioners of a consolidated city-county government to enact

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[6] It should be noted that under legislation recently enacted by the Montana Legislature, the Department of Health and Environmental Sciences would be given the power of condemnation to mitigate the threat of hazardous or deleterious substances to the public or the environment. See S.B. 385, 51st Leg., 1989 Montana. This legislation allows the Department to (1) obtain ownership of appropriate property in and around the Smelter site, and (2) impose any necessary use restrictions on the property. See also §§101(35)(A)(ii) and 107(b) (3) of CERCLA.

zoning ordinances. The first is set forth in MCA §§76-2-101, et seq., the second in MCA §76-2-201, et seq., and the third in MCA §§76-2-301, et seq.

a. Procedures under MCA §76-2-101, et seq.

MCA §76-2-101 states as follows:

> (1) Whenever the public interest or convenience may require and upon petition of 60% of the freeholders affected thereby, the board of county commissioners is hereby authorized and empowered to order and create a planning and zoning district and to appoint a commission consisting of five members.
>
> (2) No such planning or zoning district may be created in an area which has been zoned by an incorporated city pursuant to 76-2-310 and 76-2-311.
>
> (3) For the purposes of this part, the word "district" shall mean any area that consists of not less than 40 acres.

Creation of a planning and zoning district pursuant to MCA §76-2-101 does not require the prior adoption of a county-wide comprehensive plan. Montana Wildlife Federation v. Sager, 620 P.2d 1189 (Mont. 1980). It does require a petition of 60% of the freeholders affected thereby. Doull v. Wohlschlager, 141 Mont. 354, 377 P.2d 758 (1963). The designation of a planning and zoning district pursuant to MCA §76-2-101 will not be considered spot zoning. Montana Wildlife Federation v. Sager, 620 P.2d 1189 (Mont. 1980).

Under MCA §76-2-104, the county planning and zoning commission is required to adopt "a development pattern for the physical and economic development of the planning and zoning district." The "development pattern" is described in the statutes as follows:

> Such development pattern, with the accompanying maps, plats, charts, and descriptive matter, shall show the planning and zoning commission's recommendations for the development of the districts, within some of which it shall be lawful and within others of which it shall be . . . unlawful to erect, construct, alter, or maintain certain buildings or to carry on certain trades, industries, or callings or within which the height and bulk of future buildings and the area of the yards, courts, and other open spaces and the future uses of the land or buildings shall be limited and future buildings setback lines shall be established.

MCA §76-2-104(2).

The planning and zoning commission may submit to the board of county commissioners drafts of resolutions "for the purpose of carrying out the development districts or any part thereof previously adopted by the commission, including zoning and land use regulations . . ." MCA §76-2-107. The board of county commissioners may adopt such resolutions. Id. It may also authorize variances from the recommendations of the planning and zoning commission "as will not be contrary to the public interest, where, owing to special conditions, a literal enforcement of the decision of the planning and zoning commission will result in unnecessary hardship." MCA §76-2-106(2). (See

discussion of special exceptions and variances, Section III.A.4., infra.)

b. Procedures Under MCA §76-2-201, et seq.

Title 76, Chapter 2, Part 2 of the Montana Statutes, MCA §§76-2-201 - 228, is entitled, "County Zoning." MCA §76-2-201 declares:

> [I]n cities and towns and counties whose governing bodies have adopted a comprehensive development plan for jurisdictional areas pursuant to Chapter 1, the boards of county commissioners in such counties are authorized to adopt zoning regulations for all or parts of such jurisdictional areas in accordance with the provisions of this part.

Anaconda-Deer Lodge County is a combined city-county government, which has all the powers conferred upon counties, cities, and towns under Montana law. See MCA §57-3-1201, et seq. There is no separate part within the Montana statutes addressing "City-County Zoning." MCA §76-2-201 authorizes the adoption of zoning regulations by "the boards of county commissioners in . . . counties." However, the statute also allows the zoning to cover "cities and towns." Thus, it appears that in zoning areas outside of incorporated municipalities, a city-county government must follow the procedures set forth in MCA §76-2-201, et seq.[7]

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[7] MCA §§76-2-301 et seq. governs zoning by "the city or town counsel or other legislative body of cities and incorporated towns . . ." MCA §76-2-301. MCA §76-2-302 states that "the local city or town counsel or other legislative body may divide the municipality into districts . . . ." It appears, from the division of MCA §§76-2-201 et seq. and 76-2-301 et seq., that the governing body of a consolidated city-county government

There are three statutory prerequisites to placing a land use zoning restriction on a given piece of property under MCA §76-2-201, et seq.: (1) the property must be included within the "jurisdictional area" of the governing body; (2) the governing body must have adopted a comprehensive development plan for its jurisdictional area; and (3) the governing body must follow the procedures set forth at MCA § 76-2-205 when adopting zoning districts and regulations.

1. Jurisdictional area

As previously stated, the power to zone under MCA §§76-2-201 et seq. exists only for those parts of a county for which a jurisdictional area has been established. MCA §76-2-201. Montana statutes allow for two different mechanisms by which a jurisdictional area may be established. The first is MCA §§76-1-501 - 502. These statutes declare:

> 76-1-501. Jurisdictional area of county planning board. The board of county commissioners shall by resolution establish the jurisdictional area of the county planning board. The jurisdictional area shall include the area which is both outside the incorporated limits of any city in the county as well as outside the jurisdictional area of an existing city-county planning board established pursuant to 76-1-504 through 76-1-507. Should any city or town become represented on the county planning board pursuant to 76-1-111, the

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should follow different procedures depending on whether the property to be zoned is within or without a municipality. See Section III.A.2.c., infra. See also Cutone v. Anaconda-Deer Lodge, 187 Mont. 515, 610 P.2d 691 (1980).

jurisdictional area of the county planning board shall be extended to include that city or town.

76-2-502. Filing of map of jurisdictional area of county planning board--revision of boundaries. The planning board, after the approval of the jurisdictional area by the board of county commissioners, shall file in the office of the clerk and recorder a map showing the boundaries of the jurisdictional area. The boundaries may be revised from time to time by resolution of the board of county commissioners. Such revised boundaries shall be shown upon a map which shall be filed as provided in this section. The area included in such map shall constitute the area over which the planning board shall have advisory jurisdiction.

The second procedure is set forth at MCA §§76-1-504 - 505. Those statutes declare:

76-1-504. Jurisdiction of city-county planning board. The governing bodies represented on a city-county planning board shall by separate resolution establish the jurisdictional area of the planning board. The jurisdictional area shall include the area within the incorporated limits of the city and such contiguous unincorporated area outside the city as, in the judgment of the respective governing bodies, bears reasonable relation to the development of the area involved.

76-1-505. Extension of boundaries of city-county planning board jurisdictional areas. (1) The boundaries of the jurisdictional area can be extended further than 4½ miles from the limits of the cities only upon petition signed by 5% or more of the resident freeholders in excess of 4½ miles and not more than 12 miles from the limits of the cities and within the area desiring to be included within said jurisdictional limits and upon presentation of said petition to the board of county commissioners.

(2) Thereafter, the board of county commissioners must by resolution set the

> proposed boundaries of said area and give notice of their intent to add said area to the jurisdictional limits theretofore created and of receipt of said petition by publication of notice of time and place of hearing on said petition and resolution. Said notice is to be published in a newspaper published in the county not less than 10 or more than 20 days prior to the date of said hearing. Thereafter, the boundaries of said area can only be set upon good cause being shown for the establishment of said extended-jurisdictional area and the boundaries thereof, provided that such resolution shall not be adopted by the board of county commissioners if disapproved in writing by a majority of the freeholders of the territory proposed to be embraced. The jurisdictional area shall not extend more than 12 miles beyond the limits of any city within the jurisdictional area.

Once again, the statutes are not clear as to the procedures to be followed by a consolidated city-county government. MCA §76-1-504 - 505 would initially appear to be the proper procedure. However, close analysis of the statutes reveals that these procedures do not necessarily govern the actions of a consolidated city-county government.

MCA §§76-1-101, et seq. govern the creation of planning boards. MCA §76-1-105 sets forth the procedures for creation of a city planning board. That statute contemplates that a city and county, which have not been consolidated, may create a joint city-county planning board. That statute states:

> 76-1-105. Rule of county in formation of city planning board. (1) Prior to enacting an ordinance creating a city planning board, the city council shall notify in writing the county commissioners of the county in which the city is located of their intention to form a city planning board.

> (2) The board of county commissioners shall elect to form a city-county planning board or to permit the city to form a city planning board and shall notify in writing the city council of its election within 30 days from receipt of notice of the city's intention to form a planning board. In the event the county commissioners so elect, the planning board to be so formed shall be a city-county planning board.

It seems clear that the reference to the "city-county planning board" in MCA §76-1-504 is a reference to the planning board created under MCA §76-1-104 between an unconsolidated city and county. Thus, §76-1-504 speaks of "separate resolutions" to be passed by "the governing bodies represented on a city-county planning board."

It appears, therefore, that Anaconda-Deer Lodge County should follow the procedures set forth in MCA §§76-1-501 - 502 in creating a planning board. This interpretation makes logical sense, for there is no apparent reason for the Montana legislature to allow counties to establish jurisdictional areas covering the whole county, see MCA §76-1-501, but to restrict consolidated city-county governments to establishing jurisdictional areas consisting of "the area within the incorporated limits of the city and such contiguous unincorporated area outside the city as . . . bears relation to the development of the area involved." See MCA §76-1-504.

Prior to the consolidation of the City of Anaconda and the County of Deer Lodge in 1977, the city council of Anaconda passed a resolution calling for the establishment of a city-

county planning board (Exhibit B) and another resolution establishing the jurisdictional area of that board as the city limits of the City of Anaconda (Exhibit C). No county resolution concurring in the establishment of that board, as required by MCA §76-1-504, has been found. In addition, it is unclear whether the resolutions establishing the planning board remain valid in light of MCA §7-3-1211. That statute declares:

> The commission first elected [after creation of a consolidated city-county government] may, at its first meeting make an order that all existing ordinances and resolutions of some one city or town within the consolidated municipality which are of general application in such city or town shall be continued in force and be extended throughout the consolidated municipality, and a copy of such order must be published at least once in each newspaper printed and published within the consolidated municipality within 10 days after the making of such order. All other ordinances and resolutions of such city or town and all ordinances of all other cities and towns within the consolidated municipality, save and except ordinances and resolutions relating to public improvements to be paid for in whole or in part by special assessments, shall, upon the making of such order, be deemed repealed.

The charter of Anaconda-Deer Lodge County, effective May 2, 1977, states:

> <u>Section 2. Continuity.</u>
>
> 1. Each rule, ordinance, or resolution of the Anaconda and Deer Lodge County governments shall remain in force within those former geographic jurisdictions until superseded by action of the Commission. The Commission shall revise, repeal, or reaffirm all such rules, ordinances, and resolutions by May 2, 1979.

Anaconda-Deer Lodge County Charter, Art. X, §2. Arco has not been able to locate any ordinance or resolution revising, repealing, or reaffirming the ordinances and resolutions referred to above. Thus, it is unclear whether the city-county planning commission created by the resolutions referred to above has the power to act lawfully.

In 1972, again prior to consolidation, the board of county commissioners of Deer Lodge County created a county planning board (see Exhibit D). For the reasons stated above, it is unclear whether this resolution survived the consolidation with the City of Anaconda. In addition, the Anaconda-Deer Lodge authorities have been unable to locate any resolution establishing the jurisdictional area for that Board, as is required under MCA §76-2-201.

It appears, therefore, that before any zoning is considered by Anaconda-Deer Lodge County, the Board of County Commissioners should pass new resolutions establishing a planning board and further establishing the jurisdictional area of that board. By statute, that jurisdictional area will have to include all of the county outside the Anaconda city limits. MCA §76-1-501.

Once a jurisdictional area has been established for a planning board, the governing body need not zone the entire jurisdictional area. MCA §76-2-201 provides that "in cities and towns and counties whose governing bodies have adopted a comprehensive development plan for jurisdictional areas pursuant

to Chapter 1, the boards of county commissioners in such counties are authorized to adopt zoning regulations for all parts of such jurisdictional areas . . . ." (emphasis added).

2. Comprehensive plan

The second prerequisite to the adoption of zoning restrictions under MCA §76-2-201, et seq., is the adoption of a master or comprehensive plan for a jurisdictional area by the governing body. See, MCA §§76-1-601 through 606, 76-2-201, and 76-2-304. See also Little v. County Commissioners, 631 P.2d 1282, 1291 (Mont. 1981); Allen v. Flathead County, 184 Mont. 58, 60, 601 P.2d 399, 401 (1979). All land use zoning restrictions must "substantially adhere" to the comprehensive plan. Little, 631 P.2d at 1293; see also MCA §§76-2-203 and 304; 39 A.G. Op. 75 (1982) (a government unit need not strictly adhere to the comprehensive plan, but must substantially adhere to it).

The procedures for adopting a master or comprehensive plan are set forth in MCA §§76-1-601, et seq. MCA §76-1-601 requires that the planning board prepare and propose a master plan for the jurisdictional area that has been established for the planning board by the board of county commissioners pursuant to MCA §76-1-501. Public hearings are required under §76-1-602, and after considering the comments at the public hearing, the planning board is required to recommend, by resolution, the proposed master plan and any proposed ordinances and resolutions for its implementation to the governing body. MCA §76-1-603.

MCA §76-1-604 governs the procedure to be used by the governing body in adopting or revising a comprehensive plan. That statute declares:

> (1) The governing bodies shall adopt a resolution of intention to adopt, revise, or reject such proposed plan or any of its parts.
>
> (2) If the governing bodies adopt a resolution of intention to adopt the proposed plan or any of its parts, they may, in their discretion, submit to the qualified electors of the jurisdictional area included within the proposed plan at the next primary or general election or at a special election the referendum question of whether or not the plan should be adopted. The provisions of Title 7, chapter 5, part 1, except as in this section otherwise provided, shall apply to such referendum election.
>
> (3) The governing bodies may adopt, revise, or repeal a master plan under this section.
>
> (4) The qualified electors of the jurisdictional area included within the master plan may by initiative or referendum, as provided in 7-5-131 through 7-5-137, adopt, revise, or repeal a master plan under this section.

In 1973, a comprehensive plan was prepared for Anaconda-Deer Lodge County and adopted by the planning board. The comprehensive plan, however, was never adopted by the Anaconda-Deer Lodge County Commissioners. Although in many respects the plan is outdated, it nevertheless can provide a good working tool for drafting a new comprehensive plan.

3. Adoption of zoning districts and regulations

The final prerequisite for implementation of zoning restrictions under MCA §76-2-201, et seq., is the establishment of zoning districts and the adoption of the regulations or use restrictions themselves. The procedures required under MCA §76-2-205 are as follows:

> The board of county commissioners shall observe the following procedures in the establishment or revision of boundaries for zoning districts and in the adoption or amendment of zoning regulations:
>
> (1) Notice of a public hearing on the proposed zoning district boundaries and of regulations for the zoning district shall be published once a week for 2 weeks in a newspaper of general circulation within the county. The notice shall state:
>
> (a) the boundaries of the proposed district;
> (b) the general character of the proposed zoning regulations;
> (c) the time and place of the public hearing;
> (d) that the proposed zoning regulations are on file for public inspection at the office of the county clerk and recorder.
>
> (2) At the public hearing, the board of county commissioners shall give the public an opportunity to be heard regarding the proposed zoning district and regulations.
>
> (3) After the public hearing, the board of county commissioners shall review the proposals of the planning board and shall make such revisions or amendments as it may deem proper.[8]

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[8] MCA §76-2-204 requires that: (1) "the board of county commissioners shall require the county planning board and the city-county planning board to recommend boundaries and appropriate regulations for the various zoning districts," and (2) city-county planning board shall make written reports of their recommendation to

(4) The board of county commissioners may pass a resolution of intention to create a zoning district and to adopt zoning regulations for the district.

(5) The board of county commissioners shall publish notice of passage of the resolution of intention once a week for 2 weeks in a newspaper of general circulation within the county. The notice shall state:

(a) the boundaries of the proposed district;
(b) the general character of the proposed zoning regulations;
(c) that the proposed zoning regulations are on file for public inspection at the office of the county clerk and recorder;
(d) that for 30 days after first publication of this notice, the board of county commissioners will receive written protests to the creation of the zoning district or to the zoning regulations from persons owning real property within the district whose names appear on the last completed assessment roll of the county.

(6) Within 30 days after the expiration of the protest period, the board of county commissioners may in its discretion adopt the resolution creating the zoning district and/or establishing the zoning regulations for the district; but if 40% of the freeholders within such district whose names appear on the last completed assessment roll shall have protested the establishment of the district or adoption of the regulations, the board of county commissioners shall not adopt the resolution and no further zoning

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the zoning commissioners, but such recommendation shall be advisory only." Nonetheless, the Montana Supreme Court has held that the planning board's recommendations must "be considered before the commissioners can proceed with a resolution of intent." Little v. County Commissioners, 631 P.2d 1282, 1287 (Mont. 1986).

resolution shall be proposed for the district for a period of 1 year.[9]

c. Procedures under MCA §76-2-301, et seq.

As previously stated, the Montana statutes set forth no separate procedure for zoning by a consolidated city-county government. It appears, for the reasons set forth in footnote 7, supra, that the board of county commissioners should follow the procedures set forth in MCA §76-2-301, et seq. when zoning property within the limits of the City of Anaconda.[10]

Adoption of a comprehensive plan or a jurisdictional area for a municipality are not prerequisites to municipal zoning under MCA §76-2-301, et seq. Compare MCA §76-2-201 with MCA §76-2-301. However, the power granted to local governments to zone property within municipalities is more limited than the general power to zone "for the purpose of promoting the health, safety, morals, and general welfare" set forth in MCA §76-2-201. In particular, MCA §76-2-301 states as follows:

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9 For ease of reference, the foregoing procedural requirements of MCA §76-2-205 for implementation of zoning districts and the use restrictions in Anaconda-Deer Lodge are summarized in the flow sheet attached hereto as Exhibit E. This Exhibit also sets forth the approximate time it will take to implement zoning restrictions.

10 In order to avoid any possible attacks on zoning, the Anaconda-Deer Lodge County commissioners should probably follow the more detailed procedures set forth in MCA §76-2-205 for all zoning within the county. The procedures in §76-2-205 do not conflict with those in §76-2-301, et seq., and would appear to comply with all requirements thereof.

> For the purpose of promoting health, safety, morals, or the general welfare of the community, the city or town council or other legislative body of cities and incorporated towns is hereby empowered to regulate and restrict the height, number of stories, and size of buildings and other structures; the percentage of lot that may be occupied; the size of yards, courts, and other open spaces; the density of population; and the location and use of buildings, structures, and land for trade, industry, residence, or other purposes.

Thus, it appears that the zoning devices that may be employed within the limits of incorporated municipalities are substantially limited.

While MCA §§76-2-301 et seq. do not require prior creation of a comprehensive plan, they do require the creation of a zoning commission. MCA §76-2-307 states:

> In order to avail itself of the powers conferred by this part, except 76-2-306, the city or town council or other legislative body shall appoint a commission, to be known as the zoning commission, to recommend the boundaries of the various original districts and appropriate regulations to be enforced therein. Such commission shall make a preliminary report and hold public hearings thereon before submitting its final report, and such city or town council or other legislative body shall not hold its public hearings or take action until it has received the final report of such commission.

The procedures for adopting zoning regulations are set forth in MCA §76-2-303 as follows:

> (1) The city or town council or other legislative body of such municipality shall provide for the manner in which such regulations and restrictions and the boundaries of such districts shall be determined, established, and enforced and

from time to time amended, supplemented, or changed.

(2) However, no such regulation, restriction, or boundary shall become effective until after a public hearing in relation thereto at which parties in interest and citizens shall have an opportunity to be heard. At least 15 days notice of the time and place of such hearing shall be published in an official paper or a paper of general circulation in such municipality.

3. Enforceability of land use zoning restrictions as an institutional control.

Under Montana law, Anaconda-Deer Lodge County has broad authority to enforce land use zoning restrictions. MCA §76-2-210(1) provides:

> (1) In case any building or structure is erected, constructed, reconstructed, altered, repaired, converted, or maintained or any building, structure, or land is used in violation of this part or of any resolution made under authority conferred hereby, the proper authorities of the county, in addition to other remedies, may institute any appropriate action or proceedings to prevent such unlawful erection, construction, reconstruction, alteration, repair, conversion, maintenance, or use; to restrain, correct, or abate such violation; to prevent the occupancy of such building, structure, or land; or to prevent any illegal act, conduct, business, or use in or about such premises.

See also MCA §76-2-308 (enforcement of city zoning ordinances).[11]

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[11] With respect to the construction a use regulation will receive in an enforcement action, the Montana Supreme Court has held that "the same rules of construction apply to an ordinance as apply to a statute." Schanz v. City of Billings, 182 Mont. 328, 597 P.2d 67 (1979). "If the language of the ordinance is plain and unambig-uous, it

The "other remedies" language in MCA §76-2-210 includes MCA §76-2-211, which provides: "A violation of this part or any resolution adopted pursuant thereto is a misdemeanor and shall be punishable by a fine not exceeding $500 or imprisonment in the county jail not exceeding 6 months or both." See also MCA §76-2-315. MCA §76-2-210(2) additionally authorizes the commissioners to "appoint enforcing officers to supervise and enforce the provisions of the zoning resolutions."

4. Potential for change in land use zoning restrictions.

Land use zoning restrictions may be altered after they are enacted and implemented. First, the commissioners have the authority to revise the boundaries of zoning districts and amend zoning regulations. See, MCA §§76-2-205 and 303. Such amendments and revisions are constrained by the limitations on zoning power set forth in Part III.A.1., supra.

Second, MCA §§76-2-223 and 76-2-323 allows for a board of adjustment to grant variances from the terms of a zoning resolution "as will not be contradictory to the public interest and where, owing to special conditions, a literal enforcement of the provisions of the resolution will result in unnecessary hardship and so that the spirit of the resolution shall be observed and substantial justice done." The Montana Supreme

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is not subject to interpretation or open to construction but must be accepted and enforced as written." Id.

Court has interpreted these statutes as imposing the following requirements for the grant of a variance:

1) The variance must not be contrary to public interest.

2) A literal enforcement of the zoning ordinance must result in unnecessary hardship owing to conditions unique to the property.

3) The spirit of the ordinance must be observed, and substantial justice done.

Rugg v. Kalispell Board of Adjustment, 544 P.2d 1228 (Mont. 1976).

The power to grant variances is a broad and discretionary one, Freeman v. Board of Adjustment, 97 Mont. 342, 34 P.2d 534 (1934), and the decision to grant or deny a variance will not be overturned unless it constitutes an abuse of discretion. Cutone v. Anaconda-Deer Lodge County, 187 Mont. 513, 610 P.2d 691 (1980); Rugg. Nevertheless, courts in other jurisdictions have often stated that the power to authorize a variance must be exercised sparingly and only under exceptional circumstances. See, e.g., Dion v. Board of Appeals of Waltham, 183 N.E.2d 479 (Mass. 1962); Board of Adjustment of San Antonio v. Levinson, 244 S.W.2d 281 (Tex. Civ. App. 1951); In re Shadid, 238 P.2d 794 (Okla. 1951). Furthermore, a board of adjustment may not revise legislatively-enacted rules or amend a zoning ordinance under the guise of a variance. See, e.g., Van Meter v. H.F. Wilcox Oil & Gas Co., 170 Okla. 604, 41 P.2d 904 (1935); Dowsey v. Village of Kensington, 257 N.Y. 221, 177 N.E. 427 (1931). Additionally, a

variance should not be granted unless it is in harmony with the general purpose and intent of the zoning ordinance. See, e.g., Wright v. Michaud, 200 A.2d 543 (Me. 1964); Heady v. Zoning Board of Appeals of Milford, 94 A.2d 789 (Conn. 1953).

Third, MCA §§76-2-221 and 321 allow for "special exceptions to the terms of [a zoning resolution] in harmony with its general purposes and intent and in accordance with the general or specific rules of [Title 76, Part 2, with respect to county zoning or the terms of a zoning ordinance, with respect to city zoning]. Although no Montana cases have interpreted the special exception provisions, numerous cases from other jurisdictions have held that the conditions permitting an exception must be found in the resolution or ordinance itself. See, e.g., Creswell v. Baltimore Aviation Service, Inc., 264 A.2d 838 (Md. 1970); McNalley v. Zoning Board of Review of Cranston, 230 A.2d 880 (R.I. 1967). It appears from MCA §§76-2-221 and 76-2-321 that this requirement exists only for municipal zoning. If the requisite conditions contained in the ordinance or resolution are met, the special exception will be granted, unless there is competent evidence that the exception is adverse to the public interest. See, e.g., In re Moreland, 497 P.2d 1287 (Okla. 1972); Jeffrey v. Planning & Zoning Board of Appeals of Greenwich, 232 A.2d 497 (Conn. 1967).

Finally, Montana law allows for zoning resolutions to be repealed by referendum. First, as previously noted, MCA §76-2-205(6) provides that the county may not adopt zoning regulations

if 40% of the freeholders within the zoning district have protested the establishment of the district or the adoption of the regulations. See Section III.A.2.b.3., supra. In addition, MCA §7-3-1230 states as follows:

> (1) The electors shall have power to approve or reject at the polls any ordinance passed by the commission except an ordinance making a tax levy or an emergency measure, such power being known as the referendum. Ordinances submitted to the commission and passed by the commission without change or passed in an amended form and not required by the committee of the petitioners to be submitted to a vote of the electors shall be subject to the referendum in the same manner as other ordinances.
>
> (2) If, within 30 days after the final passage of an ordinance, a petition signed by 10% of the qualified electors whose names appear on the register of voters on the date when such petition is filed shall be filed with the clerk requesting that the ordinance or any specified part thereof be either repealed or submitted to a vote of the electors, it shall not become operative until the steps indicated herein have been taken. Referendum petitions shall contain the text of the ordinance or part thereof, the repeal of which is sought.

This statute should be contrasted with Article III, Section 5 of the Montana Constitution, which states as follows:

> The people may approve or reject by referendum any act of the legislature except an appropriation of money. A referendum shall be held either upon order by the legislature or upon petition signed by at least five percent of the qualified electors in each of at least one-third of the legislative representative districts. The total number of signers must be at least five percent of the qualified electors of the state. . . .

Montana courts have not addressed whether the requirement of a petition signed by 10% of qualified voter in MCA §7-3-1230 is constitutional in light of Article III, Section 5 of the Montana Constitution.

B. Deed Restrictions

1. Legal authority for easements and restrictive covenants.

a. Easements

MCA §70-17-101 allows for the creation of easements appurtenant to land as follows:

> The following land burdens or servitudes upon land may be attached to other land as incidents or appurtenances and are then called easements:
>
> 1) the right of pasture;
>
> 2) the right of fishing;
>
> 3) the right of taking game;
>
> 4) the right of way;
>
> 5) the right of taking water, wood, minerals, and other things;
>
> 6) the right of transacting business upon land;
>
> 7) the right of conducting lawful sports upon land;
>
> 8) the right of receiving air, light, or heat from or over or discharging the same upon or over land;
>
> 9) the right of receiving water from or discharging the same upon land;
>
> 10) the right of flooding land;

> 11) the right of having water flow without diminution or disturbance of any kind;
>
> * * *
>
> 14) the right of having the whole of a division fence maintained by a coterminous owner;
>
> * * *
>
> 18) the right of conserving open space to preserve natural values on or related to land;

MCA §70-17-102 allows for the creation of easements not appurtenant to land, or easements in gross. That statute declares:

> The following land burdens or servitudes upon land may be granted and held though not attached to land:
>
> (1) the taking of pasture and of fishing and taking game;
>
> * * *
>
> (5) the right of way;
>
> (6) the right of taking water, wood, minerals, or other things;
>
> (7) the right of conserving open space to preserve park, recreational, historic, aesthetic, cultural, and natural values on or related to land.

The Montana Supreme Court has not addressed the issue of whether easements other than those listed in MCA §§70-17-101 and 102 may be created. These statutes were taken from the Field Civil Code. The supreme courts of other states that have adopted the Field Code have held that the lists of easements are not exclusive. See Jersey Farm Co. v. Atlanta Realty Co., 164

Cal. 412, 129 P. 593 (1912) (court upholds as an easement the right to use a pumping station on the servient estate); Story v. Hefner, 540 P.2d 562 (Okla. 1975) (court holds that defendants have implied easement to use surface of lake for recreational purposes); Johnson v. Armour & Co., 291 N.W. 113 (N.D. 1940) (court holds that defendant owned valid easement permitting it to discharge sewage into stream running across plaintiff's property). However, one commentator suggests that there are a number of reasons to conclude that the drafter of the Code, David Dudley Field, intended the list to be exclusive. See Natelson, Montana Running Covenants: Statutory Intent and Modern Reality, 28-29 (paper to be published in the Fall, 1989 issue of Montana Law Review).

The Montana Supreme Court has on two occasions upheld a negative easement that arguably was outside the list of easements contained in MCA §70-17-101. In Northwestern Improvement Co. v. Lowry, 104 Mont. 289, 66 P.2d 792 (1937), the plaintiff conveyed a lot to Linden with a restrictive covenant prohibiting the sale of alcoholic beverages. The county foreclosed on the property to pay back taxes and sold the lot to Hauge, who opened a tavern. The court held that the covenant was a negative easement, citing the precursor of MCA §70-17-101(6) which permits the creation of easements allowing "the right of transacting business upon land." The court did not explain if or why an easement restricting the right to transact business on land fell within the terms of the statute permitting easements creating the right to transact

business on land. See also, Reichert v. Weeden, 618 P.2d 1216 (Mont. 1980) (court upholds as an easement a restriction prohibiting owner from using property for the sale of beer or liquor).

The Montana Supreme Court on several occasions has expressly recognized the validity of negative easements. Haggerty v. Gallatin County, 717 P.2d 550, 556 (Mont. 1986); Reichert v. Weeden, 618 P.2d 1216, 1219 (Mont. 1980). See also MCA §§70-17-101(8) and (18) and 70-17-102(7). In Northwestern Improvement Co. v. Lowry, 104 Mont. 289, 301, 66 P.2d 792, 794 (1937), the court addressed the distinction between affirmative and negative easements as follows:

> An "affirmative easement" is one which authorizes the doing of acts which, if no easement existed, would give rise to a right of action. A "negative easement" is one the effect of which is not to authorize the doing of an act by the person entitled to the easement, but merely to preclude the owner of the land subject to the easement from doing that which, if no easement existed, he would be entitled to do.

Accordingly, authority exists for placing a wide variety of negative easements on property at the Smelter site to prohibit and restrict certain uses of the land.

b. Restrictive covenants

Montana law recognizes that restrictive covenants may be created that will run with the land and bind all successive owners of the land with constructive notice thereof.[12] MCA §70-17-201 states:

> Certain covenants contained in grants of estates in real property are appurtenant to such estates and pass with them so as to bind the assigns of the covenantor and to vest in the assigns of the covenantee in the same manner as if they had personally entered into them. Such covenants are said to run with the land.

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12 An agreement restricting the use of land or requiring certain actions on the land, if contained in a consent decree, would be enforceable by the governmental entity against the other parties to the decree in the United States courts. To assure continued enforceability of the restrictions through the consent decree, the landowner would have to agree not to alienate the property for a period of time. The longevity of such a restraint on alienation, however, is limited by MCA §70-1-406, which states:

> The absolute power of alienation cannot be suspended by any limitation or condition whatsoever for a period longer than 21 years after some life in being at the creation of the interest and any period of gestation involved in the situation as to which the limitation applies. The lives selected to govern the time of suspension must not be so numerous or so situated that evidence of their deaths is likely to be unreasonably difficult to obtain.

See In re Hartwing Estate, 119 Mont. 359, 363-365, 175 P.2d (1946). The restraint on alienation would be enforceable for at least 21 years. In addition, a number of persons, presumably with some relationship to the parties to the agreement, could be selected as lives in being to extend the 21-year period.

MCA §70-17-203 further provides:

> (1) Every covenant contained in a grant of an estate in real property, which is made for the direct benefit of the property or some part of it then in existence, runs with the land.
>
> * * *
>
> (3) A covenant for the addition of some new thing to real property or for the direct benefit of some part of the property not then in existence or annexed thereto, when contained in a grant or an estate in such property and made by the covenantor expressly for his assigns or to the assigns of the covenantee, runs with the land so far as the assigns thus mentioned are concerned.

The statutes further state that successive owners of the burdened estate will be bound by the covenant only if they acquire "the whole estate of the covenantor in some part of the property." MCA §70-17-204. In other words, if A conveys property to B in fee simple with a restrictive covenant, B's lessee may not be bound by the covenant even though B is. Furthermore, the language of MCA §70-17-203(3) permits the creation of covenants requiring subsequent property owners to take affirmative acts on their land (i.e., maintaining a containment system).

2. Procedure for implementing easements and restrictive covenants at the Smelter site.

a. Easements

An easement is an interest in land and can be created by agreement between parties. Reichert v. Weeden, 618

P.2d 1216 (Mont. 1980). A grant of an easement must comply with the statute of frauds. 3 Powell, The Law of Real Property §406 (1987). See Simonson v. McDonald, 131 Mont. 494, 311 P.2d 982 (1957) (easement for right-of-way over land is an interest in real property and must be in writing).

In order to be effective, an easement must be implemented so as to be binding and enforceable upon subsequent purchasers of the encumbered property. An easement will be binding if the written agreement in which the easement is created states that the easement runs with and binds the land and if the written agreement is recorded with the clerk and recorder so that all subsequent purchasers have constructive notice thereof. Reichert v. Weeden, 618 P.2d 1216 (Mont. 1980) (easement appurtenant); Lindley v. Maggert, 198 Mont. 197, 645 P.2d 430 (1982) (easement in gross).

With respect to easements appurtenant as listed in §70-17-101, the terms of the statute indicate that they must be attached to other land. The land that is burdened by the easement is called the servient estate. The land to which the easement is appurtenant, i.e., the land benefited by the easement, is called the dominant estate. "An easement may be appurtenant to land even though the servient tenement is not adjacent to the land of the dominant tenement." Northwestern Improvement Co. v. Lowry, 104 Mont. 289, 302, 66 P.2d 792, 795 (1937). However, while no Montana case law has been found on the issue, the common law holds that the land to which the easement attached, the dominant

estate, must be benefited by the easement. 3 Powell, The Law of Real Property §405 (1987). Little case law exists on the issue of when a dominant estate is sufficiently benefited such that a valid easement appurtenant is created. In most cases, the benefit to the dominant estate is clear. It should be noted however, that MCA §70-17-101 authorizes an easement appurtenant whose dominant estate is only peripherally benefited. MCA §70-17-101(16) states that "the right of a seat in church" can be created by an easement appurtenant. Clearly, the dominant estate for such an easement would be only tangentially benefited by the easement.

The context within which most easements would be created as an institutional control at the Smelter site would be one involving the possibility of a release of or exposure to hazardous substances. While no case has been found directly on point, it appears that an easement appurtenant could be created if the easement benefited the dominant estate by reducing the possibility that that estate might be subject to a release of hazardous substances. For example, an easement prohibiting the grantor from performing certain types of construction or excavation might be granted to the owner of a nearby dominant estate whose property might be affected by releases of hazardous substances resulting from such construction or excavation. Such a benefit might also be realized by other types of easements if the grant of the easement eliminates or reduces the likelihood

that on-site operations would result in releases of hazardous substances.

With respect to an easement in gross under MCA §70-17-102, there need be no benefit to a dominant tenement as an easement in gross is not appurtenant to land. The easement will be binding on successors to the servient estate owner and successors to the holder of the easement in gross if the grant of the easement indicates an intent that the easement not be personal. Lindley v. Maggert, 198 Mont. 197, 645 P.2d 430 (1982). In that case, the court held that a reserved right-of-way easement was an easement in gross, authorized by MCA §70-17-102(5), and that the terms of the easement did not prevent its holder from alienating it.

With respect to property owned by ARCO, ARCO could grant an easement appurtenant or an easement in gross directly to a holder of the easement, such as the state or a local government, by complying with the requirements set forth above. With respect to property not owned by ARCO, an easement could be purchased. If it is in gross and written to evince an intent that it not be personal to the purchaser, the purchaser could transfer the easement to the state or to the United States. See Lindley v. Maggert, 198 Mont. 197, 645 P.2d 430 (1982). If the easement is appurtenant, the purchaser would have to own property (a dominant estate) to which the easement could attach. Both the United States and the State of Montana could also exercise the power of eminent domain to obtain an easement, provided the easement was

for a public purpose. See United States v. Deist, 442 F.2d 1325 (9th Cir. 1971) (condemnation of easement for power line); MCA §70-30-104(3) (authorizing state to obtain easements for public purpose under eminent domain power).

b. Restrictive covenants

In order to be effective against subsequent owners, restrictive covenants must be made to run with the land. MCA §70-17-201 states that in order to run with the land, a covenant must be made in a grant of an estate. The Montana Supreme Court has construed the term "grant" extremely broadly. In Reichert, the court was faced with the question of whether a covenant that prohibited the sale of liquor on the plaintiff's property was enforceable. The covenant was created by written agreement between the parties and properly recorded in the county real estate records. Plaintiffs contended that the covenant was unenforceable because it was not contained in the grant of an estate. The court held that the covenant was enforceable, stating:

> "The term 'conveyance as used [here] embraces every instrument in writing by which any estate or interest in real property is created, aliened, mortgaged, or encumbered or by which the title to real property may be affected." Section 70-21-201, MCA
>
> This definition of a conveyance of real property is sufficiently comprehensive to include the written agreement that placed a covenant on the real property which is the basis of the present controversy.

Id., 618 P.2d at 1219-20 (brackets in original).

The basis for the Reichert court's determination that the recording of a covenant in the claim of title constitutes a "grant" under MCA §70-17-201 is not entirely clear. It may be that the court was simply acknowledging that a negative easement is created by grant. This reading of the case suggests that MCA §70-17-101 is not exclusive because that statute does not appear to authorize the creation of a negative easement prohibiting the owner of the servient estate from selling liquor.

MCA §70-17-203(1) requires that the covenant be made "for the direct benefit of the property or some part of it then in existence." It is clear that under Montana law, a covenant may be contained in a fee simple grant and it may burden the granted property. See Gosnay v. Big Sky Owners Ass'n., 205 Mont. 221, 666 P.2d 1247 (1983) (court upholds restrictive covenant prohibiting landowner from building a fence and constructing stables without prior approval from architecture review board). It further appears that under Montana law, a covenant may be created that only burdens and does not benefit the transferred property. In Haggerty v. Gallatin County, 717 P.2d 550 (Mont. 1986), the court upheld a covenant that prohibited the sale of beer and wine on transferred property. The covenant was upheld despite the fact that it was clearly intended only to protect the

grantor from competition and thus did not benefit the burdened property.[13]

Under the common law, the burden of a covenant will not run with an estate in land unless it "touches and concerns" the land. 5 Powell, The Law of Real Property §673[1] (1989). A covenant touches and concerns the burdened estate if the covenantor's legal interest in land is rendered less valuable by the covenant's performance. Bigelow, "The Content of Covenants on Leases," 12 Mich. L. Rev. 639, 645 (1914); 5 Powell, The Law of Real Property §673[2][a] (1989). Under any scenario that might be envisioned for the use of a covenant at the Smelter site, whether it be development restrictions or maintenance obligations, it seems clear that the burden of the covenant will touch and concern land.

Likewise, under the common law, the benefit of a covenant will not run with an estate in land unless it touches and concerns the benefited land. Id. A covenant touches and concerns the benefited estate if the covenantee's legal interest in land is rendered more valuable by the covenant's performance. Id.

Under English common law, neither the benefit nor the burden of a covenant could run unless both the benefit and the burden

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[13] Cf. Town & Country Estates Ass'n. v. Slater, 740 P.2d 668, 671 (Mont. 1987) ("Covenants in a restrictive subdivision are enforceable only when used in connection with some general plan or scheme . . . . In view of the wide variety of designs, no one seemed burdened by the covenant except the Slaters.")

touched and concerned land. 5 Powell, The Law of Real Property §673[2][a] (1989). In other words, a grantee of burdened land would be relieved of the burden of the covenant if the benefit of the covenant were held in gross. In the United States, the jurisdictions appear divided over whether land can be burdened with a covenant where the burden is placed on the grantee and the benefit is personal to the grantor (i.e., the grantor retains no interest in land). Compare Bill Wolf Petroleum Corp. v. Chock Full of Power Gasoline Corp., 41 A.D.2d 950, 344 N.Y.S.2d 30 (2d Dept.), app. dismissed, 33 N.Y.2d 656, 348 N.Y.S.2d 980, 303 N.E.2d 705 (1973) and Staebler-Kempf Oil Co. v. Mac's Auto Mart, Inc., 329 Mich. 351, 45 N.W.2d 316 (1951) with Matter of Turners Crossroad Development Co., 277 N.W.2d 364 (Minn. 1979) and Sanitary Facilities II, Inc. v. Blum, 22 Md. App. 90, 322 A.2d 228 (1974). See, 5 Powell, The Law of Real Property §673[2][a] (1989). No Montana case addresses the issue of whether the burden of a covenant may run if the benefit is held in gross; however, at least one authority states that MCA §70-17-203(1) prohibits the running of burdens when no land is benefited. See 5 Powell, The Law of Real Property §673[2][a], fnte 42 (1989).

Little case law exists on the question of whether land can be burdened by a covenant when the benefit is held by third parties who are strangers to the transaction in which the burden is placed. Three courts that have addressed the issue directly have split on the issue. Compare Vogeler v. Alwyn Improvement Corp., 347 N.Y. 131, 159 N.E. 856 (1928) (covenant in grant of

land expressly for the benefit of adjacent land not owned by grantor held valid) with Hazen v. Mathews, 184 Mass. 388, 68 N.E. 838 (1903) (court refuses to enforce covenant that benefits land owned by stranger to deed, even if the land is owned by grantor and stranger as tenants in common) and Stegall v. Housing Authority of Charlotte, 278 N.C. 95, 178 S.E. 2d 824, 51 A.L.R.3d 548 (1971) (court refuses to enforce covenant on grounds that grantors retained no land benefited by covenant and grantors had no right to limit free use of land except for the benefit of other lands then owned by grantors). A Montana statute appears to authorize the creation of a covenant benefiting strangers to the transaction in which the covenant is made. MCA §70-1-521 states as follows:

> A present interest and the benefit of a condition or covenant respecting property may be taken by any natural person under a grant although not named a party thereto.

The Restatement of Property also appears to accept the concept that the burden of a covenant may run with the land even if the benefit is to a third party who is not the covenantee. Restatement of Property §537, comment e (1944).

Applying the principles relating to restrictive covenants set forth above, ARCO could impose a covenant on its own property in the following manner. ARCO could grant the land to be burdened by the covenant to an ARCO subsidiary or affiliate by deed which incorporates a restrictive covenant, reserving a small parcel of land to which the benefit of the covenant would attach.

The benefit of a covenant could be the same as previously identified with respect to an easement appurtenant: namely, the reduced likelihood of a release of hazardous substances onto the benefited property.[14] ARCO could transfer the small retained parcel to the state or to a local government, in which case the governmental entity would be able to enforce the covenant. In addition, the covenant could be written to acknowledge that it benefits not only the small retained parcel, but also other nearby property. In that way, the owners of the nearby properties would also be able to enforce the covenant.

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[14] It is noteworthy that the Restatement has expanded the concept of benefit beyond an analysis simply of the benefit of the performance of the promise to an examination of the entire transaction of which the promise is a part. Restatement of Property § 537 (1944) phrases the scope of the analysis as follows:

> The successors in title to land respecting the use of which the owner has made a promise can be bound as promisors only if:
>
> (a) the performance of the promise will benefit the promisee or other beneficiary of the promise in the physical use or enjoyment of the land possessed by him, or
>
> (b) the consummation of the transaction of which the promise is a part will operate to benefit and is for the benefit of the promisor in the physical use or enjoyment of land possessed by him,
>
> and the burden on the land of the promisor bears a reasonable relation to the benefit received by the person benefited.

3. Enforceability of negative easements and restrictive covenants as institutional controls.

MCA §70-17-109 states that the owner of "any estate in a dominant tenement or the occupant of such tenement may maintain an action for enforcement of an easement attached thereto." Similarly, under MCA §70-17-201, if a restrictive covenant is one that runs with the land, it is enforceable by the original covenantee and his assigns against the original covenantor and his assigns.[15]

No Montana statute authorizes the owner of an easement in gross to enforce it against the owner of the servient tenement. However, the Montana Supreme Court has acknowledged the right of assignees of the owner of an easement in gross to enforce the easement against the assignees of the original grantor. Lindley v. Maggert, 198 Mont. 197, 645 P.2d 430 (1982).

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[15] With respect to the interpretation and construction of such use restrictions, the Montana Supreme Court has stated: "The overriding policy of individual expression in free and reasonable land use dictates that restrictions should not be aided or extended by implication or enlarged by construction." Higdem v. Whitham, 167 Mont. 201, 208-09, 536 P.2d 1185, 1189 (1975). Accordingly, the following rules of construction are settled: (1) that the restrictive covenants be strictly construed, (2) that ambiguities be resolved in favor of free use of property, and (3) that the District Court should not broadly interpret and impose restrictive covenants in terms of what the parties would have desired because of the overriding policy of individual expression in free and reasonable land use." Id., 167 Mont. at 209, P.2d at 1190.

The specific nature of an enforcement action was discussed in Northwestern Improvement Co. v. Lowry, 104 Mont. 289, 305-06, 66 P.2d 792, 796 (1937) as follows:

> In this case the remedy by injunction is proper. (Citation omitted.) "Injunctions are frequently allowed to restrain the violation of covenants restricting the use of the land. 'When the owner of land enters into a covenant concerning it, when in a deed the grantor or the grantee covenants, or in a lease the lessor or the lessee covenants, concerning the land, concerning its use, restricting certain specified uses, stipulating for certain specified uses, subjecting it to easements or servitudes, and the like, and the land is afterwards conveyed, or sold, or passes to one who has actual or constructive notice of the covenant, the grantee or purchaser will take the premises bound by the covenant, and will be compelled in equity either to specifically execute it, or will be restrained from violating it, at the suit of the original covenantee or of any other person who has a sufficient equitable interest in such performance. (Citations omitted.)

See also Porter v. K & S Partnership, 627 P.2d 836, 839-40 (Mont. 1981).

4. Potential for change in negative easements and restrictive covenants.

Under the doctrine of changed circumstances, where the restricted area has changed so radically over the years such that the purpose and intent of the restrictions are totally defeated, then equity cannot enforce the restrictions. Porter, 627 P.2d at 841; Kosel v. Stone, 146 Mont. 218, 255, 404 P.2d 894, 898 (1965). Additionally, the right to enforce a restrictive covenant

may be lost by laches, waiver, or acquiescence in violation of such restrictions. McColm v. Stegman, 596 P.2d 167 (Kan. App. 1979); see also Gosnay v. Big Sky Owners Ass'n., 205 Mont. 221, 666 P.2d 1247 (1983). Finally, the restrictive covenants themselves may provide for modification or termination upon specified conditions. Brown v. McDavid, 676 P.2d 714 (Colo.App. 1983).

Similarly, a negative easement may be extinguished through any of the following means:

> (1) by the vesting of the right to the servitude and the right to the servient tenement in the same person;
>
> (2) by the destruction of the servient tenement;
>
> (3) by the performance of any act upon either tenement by the owner of the servitude or with his assent which is incompatible with its nature or exercise.

MCA §70-17-111. A negative easement may also be extinguished by reconveyance of the easement from the original grantee back to the original grantor. Park County Rod & Gun Club v. Department of Highways, 163 Mont. 372, 517 P.2d 352 (1973).

## IV.

## WATER WELL BANS

As described in the Introduction to this memorandum, water well bans are a particular type of institutional control -- not a legal mechanism to enforce an institutional control. The legal

mechanisms referred to above, zoning regulations and deed restrictions, could both be used to implement water well bans. Another implementation mechanism is provided under MCA §7-13-4401:

> The city or town council has the power to provide for the cleaning of waters, water courses, and streams within the city or to alter, straighten, or widen the same and to provide for the draining and filling in of ponds, wells, or shafts on private property when necessary to the public health or public welfare. (Emphasis supplied.)

The authority conferred by MCA §7-13-4401 was used as a basis for a city well permit system at the Libby Ground Water Contamination Site at Libby, Montana. (See City of Libby Ordinance Nos. 1344 and 1353 attached hereto as Exhibits F and G, respectively.) The permit system effectively precludes the installation of new wells for human consumption or irrigation. As to existing wells at the Libby site, Champion International Corporation developed a "Buy Water Plan." The plan was described in the Record of Decision for the site as follows:

> The Buy Water Plan is a program whereby individuals with contaminated ground water wells agree to cease using their well, and instead use water from the public water system operated by the City of Libby. The well owner also allows Champion to cap and lock the well. Champion provides monetary compensation to the well owners to pay for costs incurred by using metered public water instead of well water. The compensation offered is $200 per year or the actual cost of additional metered water, whichever is more. Well owners who are not currently connected to the city water system would be hooked up and receive all their water free of charge under the agreement. The agreement is indefinite in term, and would be terminated

> only if the threat of contamination no longer exists, if the well owner provides written notice that he/she wishes to terminate the agreement, or if other alternatives become available.

Id. at 23. The Libby well permit system was adopted as an interim remedy pending completion of an RI/FS to evaluate a permanent remedy. Nevertheless, Ordinance No. 1353 (Exhibit G) is not stated to be temporary and was not drafted pursuant to any temporary or emergency power. EPA has recognized that institutional controls and natural attenuation of contaminants may be the remedy selected for groundwater remediation in certain circumstances. See 53 Fed. Reg. 51434. Such a plan could also be explored at the Smelter site.

Additional authority for the imposition of water well bans is contained in MCA §§75-6-101, et seq., entitled, "Public Water Supplies, Distribution, and Treatment." That Act authorizes the Montana Board of Health and Environmental Sciences to adopt rules and standards concerning "any . . . requirement necessary for the protection of public health as described in this part." MCA §75-6-103(i). It further requires the Department of Health and Environmental Sciences to "establish a plan for the provision of safe drinking water under emergency circumstances," MCA §75-6-104(10), and states that a person shall not "construct, alter, or extend any system of water supply . . . without first submitting necessary maps, plans, and specifications to the department for its review and approval." MCA §75-6-112(4).

V.

## EVALUATION OF POSSIBLE ROLES FOR INSTITUTIONAL CONTROLS

Whether institutional controls can be used as interim protection, as a supplement to an engineered containment system, or as a sole remedy must be evaluated with reference to the potential exposure pathways at the Smelter site. The exposure pathways for humans include ingestion of soil and water, dermal contact, and inhalation of dust and ambient air. The most significant route of exposure to hazardous materials for children is ingestion of soil. For adults, the most significant potential exposure pathways are ingestion of contaminated drinking water and inhalation or ingestion of airborne dirt and dust. This evaluation of the possible roles for institutional controls is not intended to be exhaustive. More detailed analysis will be provided in the feasibility study process and, in particular, the IASD.

### A. Use of Institutional Controls as Interim Protection

Institutional controls in the form of zoning or deed restrictions can be effective with respect to all exposure pathways as interim protections while a permanent remedy is being implemented. These institutional controls could be used, among other things, to restrict access to the site, to require the construction and maintenance of fences, or to require the use of dust suppression controls. Water well bans could be used on an

interim basis to prevent ingestion of contaminated groundwater and to prevent uses of contaminated groundwater that might feed surface water.

B. Use of Institutional Controls to Protect an Engineered Containment System

Both zoning and deed restrictions can be effective to protect an engineered containment system from disturbance. In addition, these institutional controls can be an effective supplement to an engineered containment system in which the controls are combined with treatment or containment technologies. These institutional controls could be used, among other things, to restrict the types of uses to which property is put, to prohibit certain soil disturbing activities, to restrict access to the site, or to require inspection and maintenance of an engineering containment system. Water well bans could be used to prevent ingestion of contaminated groundwater and to prevent uses of contaminated groundwater that might feed surface water.

C. Use of Institutional Controls as a Sole Remedy

The effectiveness of institutional controls as a sole remedial action for the Smelter site will depend upon the contaminated sources and pathways and how these ultimately impact source areas.

## VI.

## CONCLUSION

Institutional controls were intended by Congress to play an integral role in the remediation of CERCLA sites such as the Anaconda Smelter site. Institutional controls in numerous forms can be used to serve the purpose of CERCLA by preventing or limiting exposure to hazardous substances or by restricting access to contaminated areas. There is abundant authority for the implementation and enforcement of institutional controls at the Smelter through land use zoning, deed restrictions and water well bans.

## TABLE OF CASES AND AUTHORITIES

Page

1. Cases

Allen v. Flathead County, 184 Mont. 58, 60, 601 P.2d 399, 401 (1979) . . . . . 12, 17, 27

Berman v. Parker, 348 U.S. 26, 33, 75 S.Ct. 98, 102-03, 99 L.Ed. 27, 38 (1954) . . . . . 8

Bill Wolf Petroleum Corp. v. Chock Full of Power Gasoline Corp., 41 A.D.2d 950, 344 N.Y.S.2d 30 (2d Dept.), app. dismissed, 33 N.Y.2d 656, 348 N.Y.S.2d 980, 303 N.E.2d 705 (1973) . . . . . 49

Board of Adjustment of San Antonio v. Levinson, 244 S.W.2d 281 (Tex. Civ. App. 1951) . . . . . 35

Brown v. McDavid, 676 P.2d 714 (Colo.App. 1983) . . . . . 54

California Reduction Co. v. Sanitary Reduction Works, 199 U.S. 306, 318, 26 S.Ct. 100, 103, 50 L.Ed. 204, 209 (1905) . . . . . 16

Chicago, B. & Q.R. Co. v. Chicago, 166 U.S. 226, 17 S.Ct. 581, 41 L.Ed. 979 (1897) . . . . . 14

Construction Ind. Ass'n., Sonoma Cty. v. City of Petaluma, 522 F.2d 897, 906 (9th Cir. 1975) . . . . . 8

Creswell v. Baltimore Aviation Service, Inc., 264 A.2d 838 (Md. 1970) . . . . . 36

Cutone v. Anaconda-Deer Lodge, 187 Mont. 515, 610 P.2d 691 (1980) . . . . . 20, 35

Dion v. Board of Appeals of Waltham, 183 N.E.2d 479 (Mass. 1962) . . . . . 35

Doull v. Wohlschlager, 141 Mont. 354, 377 P.2d 758 (1963) . . 18

Dowsey v. Village of Kensington, 257 N.Y. 221, 177 N.E. 427 (1931) . . . . . 35

First English Evangelical Lutheran Church of Glendale v. Los Angeles County, 482 U.S. 304, 107 S.Ct. 2378, 2391-92, 96 L.Ed.2d 250, 271 . . . . . 9, 14, 16



EXHIBIT A

Fisher v. City of Berkley, 37 Cal. 3d 644, 693 P.2d 261, 294-95, 209 Cal. Rptr. 682, 715-16 (1984) . . . . . 15

Freeman v. Board of Adjustment, 97 Mont. 342, 34 P.2d 534 (1934) . . . . . 35

Gosnay v. Big Sky Owners Ass'n., 205 Mont. 221, 666 P.2d 1247 (1983) . . . . . 48, 54

Griffin Development Co. v. City of Oxnard, 39 Cal. 3d 256, 703 P.2d 339, 345, 217 Cal. Rptr. 1 (1985) . . . 15

Hadacheck v. Sebastion, 239 U.S. 394, 36 S.Ct. 143, 60 L.Ed. 348 (1915) . . . . . 15

Haggerty v. Gallatin County, 717 P.2d 550, 556 (Mont. 1986) . . . . . 41, 48

Hazen v. Mathews, 184 Mass. 388, 68 N.E. 838 (1903) . . . . . 50

Heady v. Zoning Board of Appeals of Milford, 94 A.2d 789 (Conn. 1953) . . . . . 35

Higdem v. Whitham, 167 Mont. 201, 208-09, 536 P.2d 1185, 1189 (1975) . . . . . 53

Hodel v. Virginia Surface Mining & Reclamation Ass'n., 452 U.S. 264, 101 S.Ct. 2352, 69 L.Ed.2d 1 (1981) . . . . . 15

In re Chamberlin, 360 A.2d 100 (Ut. 1976) . . . . . 12

In re Hartwing Estate, 119 Mont. 359, 363-365, 175 P.2d (1946) . . . . . 42

In re Moreland, 497 P.2d 1287 (Okla. 1972) . . . . . 36

In re Shadid, 238 P.2d 794 (Okla. 1951) . . . . . 35

Jeffrey v. Planning & Zoning Board of Appeals of Greenwich, 232 A.2d 497 (Conn. 1967) . . . . . 36

Jersey Farm Co. v. Atlanta Realty Co., 164 Cal. 412, 129 P. 593 (1912) . . . . . 39

Johnson v. Armour & Co., 291 N.W. 113 (N.D. 1940) . . . . . 39

Kensmoe v. City of Missoula, 156 Mont. 401, 480 P.2d 835 (1971) . . . . . 12

Keystone Bituminous Coal Ass'n. v. DeBenedictis, 480 U.S. 470, 107 S.Ct. 1232, 94 L.Ed. 472 (1987) . . . 15

Kosel v. Stone, 146 Mont. 218, 255, 404 P.2d 894, 898 (1965) . . . . . 54

Kreger v. Public Buildings Commission of Newton, 353 Mass. 622, 234 N.E.2d 283 (1968) . . . . . 13

Lindley v. Maggert, 198 Mont. 197, 645 P.2d 430 (1982) . . . . . 44-46, 53

Little v. Board of County Commissioners, 631 P.2d 1282, 1289 (Mont. 1981) . . . . . 11, 27, 29

Matter of Turners Crossroad Development Co., 277 N.W.2d 364 (Minn. 1979) . . . . . 50

McColm v. Stegman, 596 P.2d 167 (Kan. App. 1979) . . . . . 54

McNalley v. Zoning Board of Review of Cranston, 230 A.2d 880 (R.I. 1967) . . . . . 36

Montana Wildlife Federation v. Sager, 620 P.2d 1189 (Mont. 1980) . . . . . 18

Northwestern Improvement Co. v. Lowry, 104 Mont. 289, 66 P.2d 792 (1937) . . . . . 40, 41, 44, 53

Park County Rod & Gun Club v. Department of Highways, 163 Mont. 372, 517 P.2d 352 (1973) . . . . . 55

Penn Central Transportation Co. v. New York City, 438 U.S. 104, 138, 98 S.Ct. 2646, 2666, 57 L.Ed.2d 631, 657 (1978) . . . . . 11, 14

Pennsylvania Coal Co. v. Mahon, 260 U.S. 393, 415, 43 S.Ct. 158, 160, 67 L.Ed. 322, 326 (1922) . . . . . 15

Porter v. K & S Partnership, 627 P.2d 836, 839-40 (Mont. 1981) . . . . . 54

Reichert v. Weeden, 618 P.2d 1216 (Mont. 1980) . . . . . 40, 41, 43, 44, 47

Rugg v. Kalispell Board of Adjustment, 544 P.2d 1228 (Mont. 1976) . . . . . 35

Sanitary Facilities II, Inc. v. Blum, 22 Md. App. 90, 322 A.2d 228 (1974) . . . . . 50

Schanz v. City of Billings, 182 Mont. 328, 597 P.2d 67 (1979) . . . . . 33

Simonson v. McDonald, 131 Mont. 494, 311 P.2d 982 (1957) . . 43

Staebler-Kempf Oil Co. v. Mac's Auto Mart, Inc., 329 Mich. 351, 45 N.W.2d 316 (1951) . . . . . 49

State v. Turk, 197 Mont. 311, 314, 643 P.2d 224, 226 (1982) . . . . . 8

Stegall v. Housing Authority of Charlotte, 278 N.C. 95, 178 S.E. 2d 824, 51 A.L.R.3d 548 (1971) . . . . . 50

Story v. Hefner, 540 P.2d 562 (Okla. 1975) . . . . . 39

Town & Country Estates Ass'n. v. Slater, 740 P.2d 668, 671 (Mont. 1987) . . . . . 48

United States v. Deist, 442 F.2d 1325 (9th Cir. 1971) . . . . 46

United States v. Shell, Civil Action No. 83-C-2379 (D.Colo.) . . . . . 6, 7

Van Meter v. H.F. Wilcox Oil & Gas Co., 170 Okla. 604, 41 P.2d 904 (1935) . . . . . 35

Village of Belle Terre v. Boraas, 416 U.S. 1, 5, 94 S.Ct. 1536, 1539, 39 L.Ed.2d 797, 802 (1974) . . . . 10

Village of Euclid v. Ambler Realty Co., 272 U.S. 365, 387, 47 S.Ct. 114, 118, 71 L.Ed. 303, 310 (1926) . . . . . 8-10, 15

Vogeler v. Alwyn Improvement Corp., 347 N.Y. 131, 159 N.E. 856 (1928) . . . . . 50

Wright v. Michaud, 200 A.2d 543 (Me. 1964) . . . . . 35

Yellowstone Valley Electric Cooperative Inc. v. Ostermiller Inc., 187 Mont. 8, 13, 608 P.2d 491, 494 (1980) . . . . . 8, 10, 15

2. Table of Statutes and Regulations


| | Page |
|---|---|
| 42 U.S.C. §§9601-9675 | 3 |
| 42 U.S.C. 9621 | 4 |
| 53 Fed. Reg. 51394, *et seq.* | 4 |
| MCA §7-3-1211 | 24 |
| MCA §7-3-1230 | 36, 37 |
| MCA §7-13-4401 | 55 |
| MCA §57-3-1201, *et seq.* | 19 |
| MCA §70-1-406 | 42 |
| MCA §70-1-521 | 51 |
| MCA §70-17-101 | 38-40, 44, 47 |
| MCA §70-17-102 | 39, 45, 46 |
| MCA §70-17-109 | 52 |
| MCA §70-17-111 | 55 |
| MCA §70-17-201 | 42, 46, 47, 52 |
| MCA §70-17-203 | 42, 43, 48, 50 |
| MCA §70-17-204 | 43 |
| MCA §70-30-104(3) | 46 |
| MCA §75-6-103(i) | 57 |
| MCA §75-6-104(10) | 57 |
| MCA §75-6-112(4) | 57 |
| MCA §76-1-104 | 23 |
| MCA §76-1-105 | 23 |
| MCA §76-1-501 | 21 |
| MCA §76-1-504 | 22-24 |

MCA §76-1-504 - 505 . . . . . 23

MCA §76-1-601 . . . . . 27

MCA §76-1-602 . . . . . 27

MCA §76-1-603 . . . . . 27

MCA §76-1-604 . . . . . 27

MCA §76-2-101 . . . . . 17, 18

MCA §76-2-101, et seq. . . . . 9, 17

MCA §76-2-109 . . . . . 12

MCA §76-2-201 . . . . . 19-21, 26, 31

MCA §76-2-201, et seq. . . . . 9, 17, 19, 20, 26, 28

MCA §76-2-204 . . . . . 29

MCA §76-2-205 . . . . . 20, 28, 30, 31, 34, 36

MCA §76-2-209 . . . . . 12

MCA §76-2-210 . . . . . 33

MCA §76-2-211 . . . . . 33

MCA §76-2-221 . . . . . 35, 36

MCA §76-2-223 . . . . . 34

MCA §76-2-301, et seq. . . . . 9, 17, 20, 30-32

MCA §76-2-302 . . . . . 20

MCA §76-2-303 . . . . . 32, 34

MCA §76-2-307 . . . . . 32

MCA §76-2-308 . . . . . 33

MCA §76-2-315 . . . . . 33

MCA §76-2-321 . . . . . 35, 36

MCA §76-2-323 . . . . . 34

MCA §76-2-502 . . . . . 21

MCA §§70-17-101(8) and (18) and 70-17-102(7) . . . . . 41

MCA §§75-6-101 et seq. . . . . 56

MCA §§76-1-101 et seq. . . . . 23

MCA §§76-1-501 - 502 . . . . . 24

MCA §§76-1-504 - 505 . . . . . 21

MCA §§76-1-601 - 606 . . . . . 26

MCA §§76-1-601, et seq. . . . . 27

MCA §§76-2-201 et seq. . . . . 20, 21

MCA §§76-2-203 and 304 . . . . . 27

MCA §§76-2-205 and 303 . . . . . 34

MCA §§76-1-101, et seq. . . . . 17

MCA §§76-2-105 and 76-2-208 . . . . . 12

3. Miscellaneous Authorities — Page

3 Powell, The Law of Real Property §405 (1987) . . . . . 44

3 Powell, The Law of Real Property §406 (1987) . . . . . 43

5 Powell, The Law of Real Property §673[1] (1989) . . . . . 48

5 Powell, The Law of Real Property §673[2][a] (1989) . . 49, 50

5 Powell, The Law of Real Property §673[2][a], fnte 42 (1989) 50

39 A.G. Op. 75 (1982) . . . . . 27

Anaconda-Deer Lodge County Charter, Art. X, §2 . . . . . 25

Article II, §29 of the Montana Constitution . . . . . 14

Bigelow, "The Content of Covenants on Leases," 12 Mich. L. Rev. 639, 645 (1914) . . . . . 49

Charter of Anaconda-Deer Lodge County . . . . . 25

Fifth Amendment to the United States Constitution . . . . . 14

Mont. Const. Art. III, Section 5 . . . . . 37

Natelson, Montana Running Covenants: Statutory Intent and Modern Reality, 28-29 (paper to be published in the Fall, 1989 issue of Montana Law Review) . . . . . 40

Restatement of Property § 537 (1944) . . . . . 51

Restatement of Property §537, comment e (1944) . . . . . 51

RESOLUTION #736

A RESOLUTION CALLING FOR THE ORGANIZATION OF A CITY-COUNTY PLANNING COMMISSION.

WHEREAS the members and Mayor of the Anaconda, Montana City Council recognizes the need for City planning and are aware of the need for urban development and

WHEREAS neither City planning or urban development is possible without a City Planning Commission or a County Planning Commission and

WHEREAS the City of Anaconda must have the concurrence of Deer Lodge County to form a City-County Planning Commission.

WE THEREFORE RESOLVE the Mayor and City Council establish such Commission and petition the Deer Lodge County Board to concur by official action in regular session to form a City-County Planning Commission. That to conform with the statutes of the State of Montana must appoint:

a. Two (2) official members to be appointed by the City Council who may in the discretion of the City Council be employed by or hold office in the City.

b. Two (2) citizen members to be appointed by the Mayor of the City.

c. Two (2) official members to be appointed by the Board of County Commissioners who may in the discretion of the Board of County Commissioners be employed by or hold public office in the County.

d. Three (3) citizen members to be appointed by the Board of County Commissioners. The three (3) members must reside outside the City limits but within the jurisdictional area of the Planning Board.

PASSED AND APPROVED THIS 15th DAY OF NOVEMBER, 1965.

MAYOR

ATTEST:

CITY CLERK

EXHIBIT B

RESOLUTION NO. 738

A RESOLUTION ESTABLISHING THE BOUNDARIES OF THE JOINT CITY-COUNTY PLANNING BOARD

WHEREAS, the City Council of the City of Anaconda, County of Deer Lodge, State of Montana, has heretofore by Resolution created a joint City-County Planning Board with the County of Deer Lodge, and

WHEREAS, it is necessary that the said City Council of the City of Anaconda, as one of the governing bodies of the said joint City-County Planning Board, by Resolution, establish the jurisdictional area of said Planning Board, now, therefore,

BE IT RESOLVED that the jurisdictional area of the Anaconda Deer Lodge County-City Planning Board is hereby established to be within th city limits of the City of Anaconda, County of Deer Lodge, State of Montana.

Dated this 5TH day of JULY, 1966.

ATTEST:

City Clerk

Henry F. Tessy
Mayor

EXHIBIT C

RESOLUTION OF THE BOARD OF COUNTY COMMISSIONERS
OF DEER LODGE COUNTY OF INTENTION TO CREATE
COUNTY PLANNING BOARD

COPY

WHEREAS, Revised Codes of Montana, 1947, Section 11-3801 provides for the creation of a county-wide planning board; and,

WHERAS, the Board of County Commissioners of Deer Lodge County, State of Montana, has determined that a county-wide planning board would be in the best interests of the County of Deer Lodge and the various incorporated and unincorporated municipalities located within the said County of Deer Lodge: now, therefore,

BE IT RESOLVED BY THE BOARD OF COUNTY COMMISSIONERS OF DEER LODGE COUNTY, STATE OF MONTANA, THAT it is the intention of the said Board of County Commissioners to create a county-wide planning board in accordance with said Section 11-3801 and subsequent sections of the Revised Codes of Montana, 1947.

The purpose of the creation of the Board would be to carry out the purposes of the above section of the Revised Codes of Montana, 1947, which states as follows:

> It is the object of this legislation to encourage local units of government to improve the present health, safety, convenience, and welfare of their citizens and to plan for the future development of their communities to the end: that highway systems be carefully planned; that new community centers grow only with adequate highway, utility, health, educational, and recreational facilities; that the needs of agriculture, industry and business be recognized in future growth; that residential areas provide healthy surroundings for family life; and that the growth of the community be commensurate with and promotive of the efficient and economical use of public funds.

The planning board, when created, would serve in an advisory capacity to presently established boards and officials.

WHEREFORE NOTICE shall be given of a public hearing on the resolution of intent in the Commissioners Room of the Deer Lodge County Courthouse, Anaconda, Montana, on the 21 day of April, 1972, at the hour of 11:00 a.m. Notice of the time and place of the hearing shall be published in every newspaper in Deer Lodge County



EXHIBIT D

not less than fifteen (15) days nor more than thirty (30) days prior to the time of hearing.

A resolution creating the planning board shall not be adopted by the board of county commissioners if disapproved in writing not later than sixty (60) days after such hearing, by a majority of the qualified electors of the county residing outside the limits of the jurisdictional area of an existing planning board established, pursuant to Section 11-3830, R.C.M. 1947, and outside the incorporated limits of each city and town in the county.

DATED this 30 day of March, 1972.

Chairman of the Board of County Commissioners, Deer Lodge County, Montana

ATTEST:

do the studies named, also the State Board of Health [illegible]
to do the water tests in the future.

Mr. Don Gates mentioned that in a matter of months Deer Lodge County would have a County wide Planning Board and possibly this would be a solution to some of the problems of gathering and coordinating the information. He expressed his desire for Granite County to creat a special planning District around the Lake so Deer Lodge County Planning Board could plan for the entire Lake. Mr. Linford felt the R. C. & D. program would be more adventagous to this project since they were some what involved with the Soil Conservation Service and once definite plans could be made the R. C. & D. District could receive a grant through the County Commissioners.

Money is also available to the County Commissioners through the Emergency Employment Act and this would possibly be a way of obtaining one or two men to work on a staff to gather this information. Deer Lodge County expressed

ATTEST: Helen K. Farrell
T/mb CLERK

APPROVED: Donald Y. Gates
CHAIRMAN

April 21, 1972

11:00 a.m. The County Commissioners met with Gene Marcille Chairman of the City County Planning Board and John Radonich Attorney for the City County Planning Board at a public hearing to creat a county-wide Planning board. There beingno objections, a motion was made by Commissioner Mr. Lee Fitzpatrick and seconded by Chairman Don Gates to accept and pass the resolution to creat a County-wide Planning Board. Motion carried. There being no further business to discuss the public hearing was adjourned (continued)

PROCEDURES FOR IMPLEMENTING
LAND USE ZONING RESTRICTIONS
PURSUANT TO MCA §§76-2-201 ET SEQ.

| 6 - 12 mos. | 2 wks. - 1 mo. | 6 wks. - 2 mos. | 1 mo. |
|---|---|---|---|
| A. Master Plan*<br><br>1. Planning Board (PB) prepares and proposes master plan for the jurisdictional area. 76-1-601, M.C.A.<br><br>2. PB holds public hearings on the proposed master plan pursuant to notice. Notice of time and place of hearing published 10 days before hearing. 76-1-602, M.C.A.<br><br>3. After consideration of public comments, PB by resolution recommends the proposed master plan for implementation to the County Commissioners (CC). 76-1-603, M.C.A.<br><br>4. CC prepare resolution of intention to adopt proposed master plan. 76-1-604, M.C.A.<br><br>5. CC may either (1) adopt the plan or (2) submit it to the electors of the jurisdictional area. 76-1-604, M.C.A.<br><br>B. Zoning Ordinances<br><br>1. PB prepares recommended boundaries and appropriate resolutions/ ordinances. 76-2-204, M.C.A.<br><br>2. PB by resolution recommends proposed ordinances and resolutions to CC. 76-1-603, M.C.A.<br><br>C. Jurisdictional Area<br><br>1. CC adopt resolution establishing jurisdictional area of PB. 76-1-501, M.C.A.<br><br>2. After approval of jurisdictional area by CC, PB files a map showing the boundaries of the jurisdictional area with the clerk and recorder. 76-1-502, M.C.A. | A. CC publish notice of public hearing once a week for two weeks on proposed zoning district boundaries and regulations for the zoning districts. 76-2-205(1), M.C.A.<br><br>B. Public hearing held at which CC give public opportunity to be heard regarding zoning districts and regulations. 76-2-205(2), M.C.A. | A. After public hearing, CC review PB proposals and make such revisions and amendments as they deem proper. 76-2-205(3), M.C.A.<br><br>B. CC pass resolution of intention to create zoning district and to adopt zoning regulations. 76-2-205(4), M.C.A.<br><br>C. CC public notice of passage of the resolution of intention once a week for two weeks. 76-2-205(5), M.C.A.<br><br>D. For 30 days following the first publication of the notice, the CC may receive written protests to the creation of the zoning districts or to the zoning regulations from persons owning real property within the district. 76-2-205(d), M.C.A. | Within 30 days after expiration of the protest period, CC may adopt the resolution creating the zoning districts and/or establishing the zoning regulations. 76-2-205(6), M.C.A. |

EXHIBIT E

# EXHIBIT "F"

ORDINANCE NO. 1344

AN EMERGENCY ORDINANCE PROVIDING FOR THE ENACTMENT OF AN ORDINANCE PLACING RESTRICTIONS ON THE USE OF GROUNDWATER IN THE CITY OF LIBBY, MONTANA.

WHEREAS, Champion International Corporation has contracted with Woodward-Clyde Consultants, Consulting Engineers, Geologists and Environmental Scientists in an effort to identify certain groundwater contamination from a contamination site located on the premises of Champion International Corporation, Libby, Montana; and

WHEREAS, as a result of Woodward-Clyde Consultants' studies certain compounds and elements have been identified, namely: polynuclear aromatic compounds (pah), pentachlorophenol (pcp), creosote, volatile organics (e.g. benzene) and certain metals (e.g. arsenic). Certain of these compounds are suspected carcinogens and others have known toxic effects to humans; and

WHEREAS, the City of Libby deems it in the best interests of the residents of the City of Libby to provide certain regulations concerning the use of groundwater potentially contaminated with said compounds; and

WHEREAS, the City of Libby has authority pursuant to Sections 7-1-4123, M.C.A. and 7-13-4401, M.C.A. to control the use of ground water within the city limits of the City of Libby;

NOW THEREFORE:

BE IT ORDAINED THAT THE FOLLOWING ORDINANCE BE PASSED AS AN EMERGENCY ORDINANCE TO BE EFFECTIVE ON PASSAGE AND SHALL REMAIN IN EFFECT FOR NO MORE THAN NINETY (90) DAYS.

Section 1 -- Application, Investigation, Permit and Fee. Any person desiring to drill, dig, or excavate for a water well within the corporate limits of the City must first apply to the City of Libby, or its designated representative and agent, for a permit therefor and must advise the City of Libby, or its designated representative and agent, of the exact location, size, and purpose of the proposed water well. The application for such permit must contain:

A) That the permittee will submit to annual inspection of wells by the City of Libby, or its designated representative and agent, on or before the anniversary date of the original permit to permittee, and the payment of an inspection fee of Fifteen Dollars ($15.00) to the City of Libby must be paid on or before the date of inspection.

The applicant will pay a Fifteen Dollar ($15.00) fee for the permit upon the City of Libby's, or its designated representative or agent, determination that it conforms with the plan submitted.

Section 2 -- Wells For Human Consumption And Irrigation. No water well shall be authorized for the purpose of human consumption or irrigation.

Section 3 -- Review. The refusal of the City of Libby, or its designated representative or agent, to grant any such application is subject to review by the City Council of the City of Libby, Montana.

Section 4 -- Control Valves. Any water well drilled, dug

or excavated pursuant to a permit granted hereunder must be equipped with adequate shut-off valves or control valves for the purpose of controlling the flow of water from the water well and for the protection of the City water system in the event of pollution or other hazards.

Section 5 -- Marking. The issuance of a water well permit may be conditioned on marking the water well in a manner to be designated by the City of Libby, or its designated representative or agent, for the purposes of identification, location, and for inspection by the City of Libby, or its designated representative of agent, at reasonable times and as may be required.

Section 6 -- Violations And Penalties. Any person, whether as principal, agent, employee or otherwise, who violates any of the provisions of this Chapter shall be subject to a fine not to exceed Five Hundred Dollars ($500.00) and imprisonment not in excess of six (6) months in jail.

PASSED BY THE CITY COUNCIL and approved by the Mayor of the City of Libby this 21st day of July, 1986.

Mayor

ATTEST:

City Clerk

EMERGENCY ORDINANCE EFFECTIVE UPON PASSAGE FOR A PERIOD NOT TO EXCEED NINETY (90) DAYS.

EXHIBIT "G"

ORDINANCE NO. 1353

AN ORDINANCE PROVIDING FOR THE ENACTMENT OF AN ORDINANCE PLACING RESTRICTIONS ON THE USE OF GROUNDWATER IN THE CITY OF LIBBY, MONTANA.

Whereas, on July 21, 1986, the City Council of the City of Libby, Montana, passed Emergency Ordinance Number 1344; and

Whereas, it is the desire and intention of the City Council of the City of Libby, Montana, to propose said Emergency Ordinance as a permanent ordinance of the City of Libby, Montana;

NOW THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF LIBBY, MONTANA, that the following ordinance be enacted as an ordinance of the Municipal Code of the City of Libby, Montana, to read as follows:

Section 1 -- Application, Investigation, Permit and Fee. Any person desiring to drill, dig, or excavate for a water well within the corporate limits of the City must first apply to the City of Libby, or its designated representative and agent, for a permit therefor and must advise the City of Libby, or its designated representative and agent, of the exact location, size, and purpose of the proposed water well. The application for such permit must contain:

A) That the permittee will submit to annual inspection of wells by the City of Libby, or its designated representative and agent, on or before the anniversary date of the original permit to permittee, and the payment of an inspection fee of Fifteen Dollars ($15.00) to the City of Libby must be paid on or before the date of inspection.

The applicant will pay a Fifteen Dollar ($15.00) fee for the permit upon the City of Libby's, or its designated representative or agent, determination that it conforms with the plan submitted.

Section 2 -- Wells For Human Consumption And Irrigation. No water well shall be authorized for the purpose of human consumption or irrigation.

Section 3 -- Review. The refusal of the City of Libby, or its designated representative or agent, to grant any such application is subject to review by the City Council of the City of Libby, Montana.

Section 4 -- Control Valves. Any water well drilled, dug or excavated pursuant to a permit granted hereunder must be equipped with adequate shut-off valves or control valves for the purpose of controlling the flow of water from the water well and for the protection of the City water system in the event of pollution or other hazards.

Section 5 -- Marking. The issuance of a water well permit may be conditioned on marking the water well in a manner to be designated by the City of Libby, or its designated representative or agent, for the purposes of identification, location, and for inspection by the City of Libby, or its designated representative or agent, at reasonable times and as may be required.

Section 6 -- Violations And Penalties. Any person, whether as principal, agent, employee or otherwise, who violates any of the provisions of this Chapter shall be subject to a fine not to exceed Five Hundred Dollars ($500.00) and imprisonment not

in excess of six (6) months in jail.

PASSED BY THE CITY COUNCIL and approved by the Mayor of the City of Libby this 20th day of October, 1986.

Mayor

ATTEST:

Virginia McGill
City Clerk

First Reading: Oct 6, 1986

Second Reading: Oct 20, 1986

**FIRST ADDENDUM TO REVISED LEGAL MEMORANDUM REGARDING USE OF INSTITUTIONAL CONTROLS**

**June 4, 1991**

On September 11, 1989 ARCO Coal Company ("ARCO") prepared a Revised Legal Memorandum Regarding Use of Institutional Controls (the "Memorandum") as a part of the General Work Plan for the Anaconda Smelter NPL site and the Smelter Hill Remedial Investigation/Feasibility Study Work Plan (the "Smelter Site"). This First Addendum is a supplement to the Memorandum providing an update of the efforts undertaken by the Anaconda-Deer Lodge city-county government to address zoning matters at the Smelter Site, and reflecting final revisions to the National Contingency Plan which occurred on March 8, 1990, subsequent to the date of the Memorandum.

## I. Comprehensive Master Plan and Development Permit System

On December 19, 1990 the Anaconda-Deer Lodge County Commissioners adopted a new Comprehensive Master Plan for the county. Among other things, the Comprehensive Master Plan classifies the Smelter Site as an area that is the least likely to be developed. This means that the Smelter Site may be used for agriculture, industrial or open space purposes. In addition, the Comprehensive Master Plan indicates that the Smelter Site also may be used as a repository of some nature. The Anaconda-Deer Lodge Commissioners presently are preparing a development permit system to implement provisions of the Comprehensive Master Plan. The development permit system will provide the detailed regulations and guidelines for development of property in Deer Lodge County, including the Smelter Site.

## II. The Use of Institutional Controls under the NCP

CERCLA authorizes the use of institutional controls in appropriate circumstances. Section 121 of CERCLA requires, among other things, that EPA select remedial actions which assure

protection of human health and the environment. 42 U.S.C. § 9621. The revised National Contingency Plan, 55 Fed. Reg. 8666, et seq. (March 8, 1990) (the "Revised NCP") provides that this protection can be achieved through a variety of means, including institutional controls:

> The mandate for remedies that protect human health and the environment can be fulfilled through a variety or combination of means. These means include the recycling or the destruction, detoxification, or immobilization of contaminants through the application of treatment technologies. Protection can also be provided in some cases by controlling exposure to contaminants through engineering controls (such as containment) and/or institutional controls which prevent access to contaminated areas. (Emphasis added.)

55 Fed. Reg. at 8703. EPA further emphasizes in the Preamble to the Revised NCP that:

> Solutions often will involve a combination of methods of protection, including treatment and engineering controls and institutional controls.

Id. See also 55 Fed. Reg. at 8702 (stating that the Preamble to the proposed NCP recognized that institutional controls could supplement engineered controls).

Protection of public health and the environment can also be achieved through the adoption of institutional controls which prevent the use of or control exposures to contaminated areas or media. The NCP provides that:

> EPA expects to use institutional controls such as water use and deed restrictions to supplement engineering controls as appropriate for short- and long-term management to prevent or limit exposure to hazardous substances, pollutants, or contaminants. Institutional controls may be used during the conduct of the remedial investigation/feasibility study (RI/FS) and implementation of the remedial action and, where necessary, as a component of the completed remedy. The use of institutional controls shall not substitute for active response measures (e.g., treatment and/or containment of source

> material, restoration of ground waters to their beneficial uses) as the sole remedy unless such active measures are determined not to be practicable, based on the balancing of trade-offs among alternatives that is conducted during the selection of remedy.

40 C.R.R. §300.430(a)(iii)(D).

EPA further explained in the Preamble to the Revised NCP that:

> EPA agrees that institutional controls should not substitute for more active response measures that actually reduce, minimize, or eliminate contamination unless such measures are not practicable, as determined by the remedy selection criteria. Examples of institutional controls, which generally limit human activities at or near facilities where hazardous substances, pollutants, or contaminants exist or will remain on-site, include land and resource (e.g. water) use and deed restrictions, well-drilling prohibitions, building permits, and well use advisories and deed notices. EPA believes, however, that institutional controls have a valid role in remediation and are allowed under CERCLA (e.g. section 121(d)(2)(B)(ii) appears to contemplate such controls). Institutional controls are a necessary supplement when some waste is left in place, as it is in most response actions.

55 Fed. Reg. at 8706.

Whether active response measures are "practicable" is determined based on the evaluation of nine criteria, including cost and other factors. 40 C.F.R. §300.430(f)(1)(ii). See also 55 Fed. Reg. at 8712. The Preamble to the Revised NCP states that:

> Where the balancing of trade-offs among alternatives during the selection of remedy process indicates no practicable way to actively remediate a site, institutional controls such as deed restrictions or well-drilling prohibitions are the only means available to provide for protection of human health.

55 Fed. Reg. at 8706.

EPA has recognized that institutional controls can control exposure and thus can be used to determine "reasonable maximum exposure scenarios." 55 Fed. Reg. at 8711. Additionally, the

adequacy and reliability of institutional controls are among the factors to consider in determining whether a remedy provides long-term protectiveness and permanence. See 40 C.F.R. §430(e)(9)(iii)-(C)(2).

# APPENDIX B

EPA Final ARARs

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VIII, MONTANA OFFICE
FEDERAL BUILDING, 301 S. PARK, DRAWER 10096
HELENA, MONTANA 59626-0096

RECEIVED
JAN 2 ? 1991
MONTANA
ENVIRONMENTAL DEFICITS

Ref: 8MO

January 18, 1991

Ms. Sandra Stash
Atlantic Richfield Company
P.O. Box 1491
Anaconda, MT 59711

Dear Sandy:

Enclosed is the final Screening and Description of Potential Applicable or Relevant and Appropriate Requirements (ARARs) for the Flue Dust Operable Unit, Anaconda Smelter NPL Site for your use in developing the preliminary draft Flue Dust RI/FS Report. This ARARs screening is intended to address all potential alternative scenarios and cover the recent regulatory changes. Final ARARs will be identified with the selected remedy in the Proposed Plan. Any changes to an ARAR status would be identified at that time.

Please provide EPA and MDHES with the preliminary Draft Flue Dust RI/FS Report by February 20, 1991. Comments to the ARAR screening document will be addressed in the responsiveness summary for the RI/FS. However, if you have any questions with the identified ARARs in regard to alternative evaluation, please give me a call.

Sincerely,

Charles Coleman
Anaconda Project Manager

Enclosure

cc: Andy Lensink, 8RC
Greg Mullen, SHWB
Laura Bassein, SHWB

# SCREENING AND DESCRIPTION OF POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS) FOR THE FLUE DUST OPERABLE UNIT ANACONDA SMELTER NPL SITE

**DEER LODGE COUNTY, MONTANA**

ENVIRONMENTAL PROTECTION AGENCY
JAN - 8 1991
MONTANA OFFICE

**January 1991**

06-619800/R2/022A
MAW/01-17-91.R5

## EXECUTIVE SUMMARY

This document represents the screening of applicable or relevant and appropriate requirements (ARARs) for the remediation of the Flue Dust Operable Unit at the Anaconda Smelter site in Deer Lodge County, Montana. The remediation is a Comprehensive Environmental Response, Compensation and Liability Act, (CERCLA) remedial action and the potentially responsible party is ARCO Coal Company.

A definitive list of ARARs is presented in Section 5 of this document. Also in Section 5 is a list of criteria, policies, guidelines and proposed legislation that are information To Be Considered (TBCs) during the remedial action. Earlier sections of this document establish the pertinent scope of ARARs, define the selection criteria of ARARs, present a brief overview of the history and background of the site that includes important points relevant to ARARs selection, and present the selection process for the potential ARARs.

There are some particularly important points established in this document that should be presented in this executive summary. First, recent changes to regulations under the Resource Conservation and Recovery Act (RCRA) serve to narrow the mining waste exclusion. In Section 2.0, the rationale for defining the flue dust materials at the Anaconda Smelter site as RCRA hazardous wastes is presented. Since flue dust is a hazardous waste, then certain parts of RCRA are ARARs.

Secondly, the action specific ARARs, or those requirements that apply only to certain remedial alternatives, have been determined without considering all of the remedial alternatives that were initially presented in the IASD. Only the ARARs that are applicable or relevant and appropriate for the alternatives that are still being considered for the remedial action are presented herein.

## CONTENTS


| | | Page |
|---|---|---|
| EXECUTIVE SUMMARY | | i |
| LIST OF TABLES | | iv |
| GLOSSARY | | v |
| PREFACE | | viii |
| 1.0 | INTRODUCTION | 1-1 |
| 1.1 | DEFINITIONS | 1-3 |
| 2.0 | BACKGROUND INFORMATION | 2-1 |
| 2.1 | DESCRIPTION OF THE FLUE DUST OPERABLE UNIT | 2-1 |
| 2.2 | TYPES OF WASTE AT THE FLUE DUST OPERABLE UNIT | 2-8 |
| 2.3 | RECENT REGULATORY CHANGES | 2-9 |
| 2.4 | PROPOSED REMEDIAL ALTERNATIVES | 2-14 |
| 3.0 | FEDERAL ARARS | 3-1 |
| 3.1 | FEDERAL CONTAMINANT-SPECIFIC ARARS | 3-1 |
| 3.2 | FEDERAL LOCATION-SPECIFIC ARARS | 3-7 |
| 3.3 | FEDERAL ACTION-SPECIFIC ARARS | 3-12 |
| 3.4 | REMEDIAL ALTERNATIVES ACTION CONSIDERATION | 3-18 |
| 4.0 | MONTANA STATE ARARS | 4-1 |
| 4.1 | MONTANA CONTAMINANT-SPECIFIC ARARS | 4-2 |
| 4.2 | MONTANA LOCATION-SPECIFIC ARARS | 4-10 |
| 4.3 | MONTANA ACTION-SPECIFIC ARARS | 4-18 |

5.0 ARARS SUMMARY AND INFORMATION TO BE CONSIDERED 5-1

5.1 SUMMARY OF FEDERAL AND STATE ARARS 5-1

5.2 INFORMATION TO BE CONSIDERED (TBCs) 5-12

6.0 REFERENCES

APPENDICES

APPENDIX A: STATE OF MONTANA ARARS IDENTIFIED TO EPA A-1

APPENDIX B: STATE OF MONTANA TBCs IDENTIFIED TO EPA B-1

## LIST OF TABLES


| | | Page |
|---|---|---|
| Table 2.1 | Flue Dust Operable Unit Waste Site Descriptions | 2-2 |
| Table 2.2 | Summary of Flue Dust Constituents: 1982 Data | 2-10 |
| Table 2.3 | Summary of Flue Dust Constituents: 1990 Data | 2-11 |
| Table 2.4 | Comparison of EP-Toxicity Data to Regulatory Limits | 2-12 |
| Table 3.1 | Summary of Preliminary Analysis of Contaminant-Specific Federal ARARs Flue Dust Operable Unit | 3-2 |
| Table 3.2 | The Status of Mining Wastes Exclusion within the Beville Amendment as of October 10, 1990 | 3-5 |
| Table 3.3 | Summary of Preliminary Screening Analysis of Location Specific Federal ARARs Flue Dust Operable Unit | 3-8 |
| Table 3.4 | Summary of Preliminary Analysis of Action Specific Federal ARARs for the Flue Dust Operable Unit | 3-13 |
| Table 4.1 | Screening Analysis of Contaminant Specific Montana ARARs Flue Dust Operable Unit | 4-3 |
| Table 4.2 | Screening Analysis of Location Specific Montana ARARs Flue Dust Operable Unit | 4-10 |
| Table 4.3 | Screening Analysis of Action Specific Montana ARARs Flue Dust Operable Unit | 4-19 |
| Table 5.1 | Summary of Screening Analysis of Federal ARARs Flue Dust Operable Unit | 5-2 |
| Table 5.2 | Summary of Screening Analysis of Montana ARARs Flue Dust Operable Unit | 5-7 |
| Table 5.3 | Information To Be Considered (TBCs) | 5-13 |

## GLOSSARY

ARM - Administrative Rules of Montana

CERCLA - The Comprehensive Environmental Response, Compensation and Liability Act of 1980.

CFR - Code of Federal Regulations

EPA - United States Environmental Protection Agency

FDS - Interim Flue Dust Storage Facility

FR - Federal Register

Hazardous Wastes - Wastes regulated under RCRA 40 CFR Part 261 and/or as defined in ARM § No. 44.202 (40) either because they are "listed" or because they are ignitable, corrosive, reactive or toxic solid wastes.

IASD - Initial Alternatives Screening Document

MCA - Montana Code Annotated

MCL - Maximum Contaminant Level.

MCLG - Maximum Contaminant Level Goals.

NHPA - National Historic Preservation Act

NPL - National Priorities List

OU - Operable Unit

PRP - Potentially Responsible Party.

RAGS - Risk Assessment Guidance for Superfund - Interim Final, July, 1989.

RCRA - Resource Conservation and Recovery Act of 1976.

RfD - Reference Dose.

RI/FS - Remedial Investigation/Feasibility Study.

ROD - Record of Decision.

SARA - Superfund Amendments and Reauthorization Act of 1986.

SHPO - State Historic Preservation Officer.

Slope Factor - A plausible upper-bound estimate of the probability of a response per unit intake of a chemical over a lifetime.

TBCs - Information To-Be-Considered.

## PREFACE

For ease of both legal and technical review, literature quoted is cited in two separate manners:

- Laws, regulations, policies and standards both federal and state appear as a footnote proximate to the reference, whereas

- Reports, data, studies and correspondence appear as a reference denoted in the text as a parenthetical, which is cited completely in Section 6.0 - References.

## 1.0 INTRODUCTION

This document constitutes EPA's analysis of potential applicable or relevant and appropriate requirements (ARARs) as a part of the Flue Dust Operable Unit-RI/FS process. Final determination of ARARs will be presented in the Record of Decision (ROD) issued by EPA, following public comment on the RI/FS report for the Flue Dust Operable Unit cleanup.

The ARARs analysis is based on section 121(d) of CERCLA, 42 U.S.C. § 9621(d); the memorandum "Consideration of RCRA Requirements in Performing CERCLA Responses at Mining Waste Sites", Henry L. Longest III, Director Office of Emergency and Remedial Response, EPA (August 19, 1986); "CERCLA Compliance with Other Laws Manual, Volume I", OSWER Dir. 9234.1-01 (August 8, 1988); "CERCLA Compliance with Other Laws Manual, Volume II", OSWER Dir. 9234.1-02 (August, 1989); the Preamble to the Proposed National Contingency Plan, 53 Fed. Reg. 51394 et seq. (December 21, 1988); the Preamble to the Final National Contingency Plan, 55 Fed. Reg. 8666 - 8813 (March 8, 1990); and the Final National Contingency Plan, 40 CFR Part 300 (55 Fed. Reg. 8813 - 8865, March 8, 1990) (hereinafter referred to as the final NCP). All references to 40 CFR Part 300 contained in this document refer to the final NCP, unless noted.

Section 121(d)(2) of CERCLA, 42 U.S.C. § 9621(d)(2), requires EPA to ensure that cleanup actions conducted under CERCLA meet "any standard, requirement, criteria or limitation under any Federal environmental law . . . or any (more stringent) promulgated standard, requirement, criteria or limitation under a State environmental or facility siting law . . . (which) is legally applicable to the hazardous substance concerned or is relevant and appropriate under the circumstances of the release or threatened release of such hazardous substance, pollutant, or contaminant . . ." EPA calls the standards, requirements, criteria or limitations identified pursuant to this Section ARARs.

EPA conducts two types of cleanup actions under CERCLA, removal actions and remedial actions. Removal actions are used to respond to emergencies and accidental releases, while remedial actions are performed to thoroughly cleanup the site, permanently. The Flue Dust Operable Unit cleanup is considered a remedial action.

Remedies selected must reflect the scope and purpose of actions to be undertaken at a particular site.[1] The scope of the remedy in this matter is limited, particularly where compliance with ground and surface water requirements and final compliance with air requirements is concerned. For the most part, final compliance with these requirements will be expected to occur at the time of completion of remedial action on the Smelter Hill Operable Unit. Though the expectation is that these requirements will be implemented later, they are nevertheless identified in this document as ARARs pertinent to the Flue Dust OU.

The Flue Dust Operable Unit Remedial Action involves the stabilization of nine source areas of contamination at the Anaconda Smelter Superfund site. These areas are located near the Smelter facilities, on Smelter Hill. The action is not intended to address current problems associated with the geographical areas on which these waste disposal areas lie. Therefore, the scope of this action does not address the cleanup of ground water or surface water located at or near these areas, or final compliance with air standards within these areas after remediation. The scope does include cleanup of those portions of the geographical areas which will be designated for cleanup in the record of decision (ROD), including potential disposal areas. EPA will assess final compliance with all standards including air and surface and groundwater quality standards, at these geographical areas, through other actions and operable units at the Anaconda Smelter Site.

**Contaminant specific ARARs**, applicable or relevant and appropriate air standards, both Federal and State, are standards which must be achieved during on-site remedial activities. Standards such as groundwater and surface water standards are outside of the scope of this action and will be dealt with as ARARs within other Operable Units.

For **location specific ARARs**, all of the potential ARARs, both Federal and State, identified in the Initial Alternative Screening Document have been analyzed, and the rationale for selection or deletion of a particular potential ARAR is discussed in Sections 3.0 and 4.0 of this document.

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[1] 40 CFR § 300.430

For **action specific ARARs**, the (Federal) Occupational Safety Health Act ("OSHA") regulations and the Montana Safety Act and Employee and Community Hazardous Chemical Information Act regulations are within the scope of this action. The Federal and State hazardous waste regulations are within the scope of this action, for remedial activities. The Federal and State Clean Air Act regulations are within the scope of this action insofar as they relate to new conditions created by the remedial action. The Federal and State reclamation regulations are within the scope of this action, to the extent that they address above ground excavation and revegetation. For the purpose of this document, the Flue Dust Operable Unit cleanup is considered a remedial action. Remedial cleanup actions must attain ARARs.

ARCO shall use this document to analyze various options for cleanup of the Flue Dust Operable Unit. This document shall be attached as an appendix to the RI/FS report. This document shall also be used in developing risk management strategies for the Anaconda Smelter Site.

## 1.1 DEFINITIONS

ARARs may be divided into applicable requirements or relevant and appropriate requirements.

Applicable requirements are those cleanup standards, standards of control, and other substantive requirements, criteria or limitations promulgated under federal environmental, state environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site. Only those state standards that are identified by a state in a timely manner and that are more stringent than federal requirements may be applicable.[2]

Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive requirements, criteria or limitations promulgated under federal environmental or state environmental or facility siting laws that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at

[2] 40 CFR § 300.5

the CERCLA site that their scope encompasses the remedial activity at the particular site. Only those state standards that are identified in a timely manner and are more stringent that federal requirements may be relevant and appropriate.[3] Factors which may be considered in making this determination, when the factors are pertinent, are presented in 40 CFR § 300.400(g)(2). They include an examination of the purpose of the requirement and the purpose of the proposed CERCLA action; the medium and substances addressed by the requirement and the proposed requirement; the actions or activities regulated by the requirements and the cleanup action; and the potential use of resources addressed in the requirement and the cleanup action.

To meet the above identified requirements, ARARs may be: contaminant-specific, location-specific, or action-specific (CERCLA Compliance with Other Laws Manual, 1989).

> Contaminant specific requirements address chemical or physical characteristics of a given compound or substance on a site. These values establish the acceptable amount or concentration of a chemical that may be found in, or discharged to, the ambient environment.
>
> Location-specific requirements are restrictions placed on the concentrations of hazardous substances or the conduct of cleanup activities because they are in specific locations. They relate to the geographic or physical position of the site, rather than to the nature of the site contaminants.
>
> Action-specific requirements are usually technology based or activity based requirements or limitations on actions taken with respect to hazardous substances, pollutants or contaminants. A particular cleanup activity will trigger an action specific requirement. Such requirements do not themselves determine the cleanup alternative, but define how chosen cleanup methods should be done.

Only substantive portions of the requirements are ARARs. Administrative requirements are not ARARs and need not be attained during or after site cleanups. Administrative requirements

---

[3] 40 CFR §§ 300.5.

are those which involve consultation, issuance of permits, documentation, reporting, recordkeeping, and enforcement. The CERCLA program has its own set of administrative procedures which assure proper implementation of CERCLA. The application of additional or conflicting administrative requirements could result in delay or confusion.[4]

Provisions of statutes or regulations which contain general goals that merely express legislative intent about desired outcomes or conditions but are non-binding are not ARARs.[5]

ARARs must be attained both during the conduct of on site clean up activities and at the conclusion of the cleanup activity unless specifically exempted.[6]

Compliance with Substantive and Administrative Requirements

CERCLA §121(e) exempts any response action conducted entirely on-site from having to obtain a Federal, State, or local permit, where the action is carried out in compliance with §121.

Off-site actions must comply with all legally applicable requirements, both substantive and administrative. The concept of "relevant and appropriate" is not available for off-site actions.

In general, on-site actions need comply only with the substantive aspects of ARARs. The Feasibility Study, the Proposed Plan, the Record of Decision, the Community Relations Plan, and the Administrative Record should demonstrate full compliance with all substantive requirements of ARARs unless a waiver is used.

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[4] Section 121(e) of CERCLA, 42 U.S.C. § 9621(e); Preamble to the Final NCP, 55 Fed. Reg. 8756 - 8757; Compliance with Other Laws Manual, Volume 1, pp. 1-11 - 1-12.

[5] 40 CFR § 300.400(g)(4) Preamble to the Final NCP, 55 Fed. Reg. 8746.

[6] 40 CFR § 300.435(b)(2) Preamble to the Proposed NCP, 53 Fed. Red. 51440; Preamble to the Final NCP, 55 Fed. Reg. 8755-8757.

Coordination/Consultation With Other Federal and State Programs

Sources of potential ARARs include Federal environmental laws administered by EPA, authorized States, and other Federal agencies, and more stringent State environmental or facility siting laws. Therefore, to ensure that remedies comply with substantive aspects of identified ARARs, other Federal and State program offices have been consulted as appropriate, particularly for on-site actions where no permit will be obtained. For the Flue Dust Operable Unit, the list of ARARs presented by the State of Montana is presented in Appendix C.

Advisories, proposed legislation, policies and guidance information promulgated by relevant authorities and agencies may be relevant to the site remediation and clean-up standards. Such guidelines are called information To Be Considered (TBCs). This means that they can be identified by the lead and support agencies, and considered, as appropriate, in selecting and developing cleanup actions. Often these guidelines are tied to the consideration of whether a particular cleanup action is protective of human health and the environment.[7]

[7] 40 CFR § 300.400(g)(3) Preamble to the Final NCP, 55 Fed. Reg. 8744-8746.

## 2.0 BACKGROUND INFORMATION

### 2.1 Description of the Flue Dust Operable Unit

Flue dust was generated at the Anaconda site as a by-product of smelting operations. It has a fine texture similar to silt and contains significant quantities of toxic metals such as copper, arsenic, cadmium, and lead. The majority of the flue dust generated during the operation of the Anaconda smelter was reprocessed. However, it has been estimated as much as 390,000 tons of flue dust are still present at nine site locations on the Smelter Hill Site.

The flue dust operable unit lies on a terrace approximately 150 feet above the Deer Lodge Valley floor at an elevation of 5,350 feet. The only remaining structure on the site is the stack. All other buildings have been demolished. Some flue dust has been consolidated and contained in a structure known as the interim FDS facility which is located 5,000 feet to the southeast of the stack. Flue dust has also been contained in the collapsed flue which extends northwards down Smelter Hill from the stack. The 120-foot double flue which is located at the top of the hill narrows to the 60-foot single flue at the bottom. The top of the flue is at an elevation of 5,875 feet and the base of the 60-foot flue is at an elevation of 5,515 feet (Dames & Moore, June, 1989).

This ARARs analysis focuses on the nine flue dust site locations which comprise the Flue Dust Operable Unit within the Anaconda Smelter National Priorities List (NPL) Site. The nine locations are listed in Table 2.1 and are described further below:

- **Bradley Ponds** - This location consists of approximately 100,000 tons of limed sludge which is present in five areas. Four of the five areas contain thickened, limed sludge in discrete above-ground piles. These materials were removed from the pond bed using a dragline during normal operation of the settling ponds. The fifth area is the pond bed itself. Rubble debris is also associated with the sludge. The flue dust sludge at Bradley Ponds came from the Ducon scrubber and the baghouse associated with the electric furnace. The Bradley ponds flue dust was deposited between 1976 and 1980.

Table 2.1

Flue Dust Operable Unit Waste Site Descriptions

| Site Location | Estimated Amount of Material | Source of Material | Deposition Dates | Potential RCRA Hazardous Waste Numbers | Additional Information |
|---|---|---|---|---|---|
| Bradley Ponds | ~100,000 tons | Limed sludge from Ducon scrubber (electric furnace) | 1976 to 1980 | K064, D006 | Rubble and other debris also presen. |
| Thickener | ~12,000 tons | Pelletized dust from baghouse (electric furnace) | 1960 to 1984 (estimated) | D006 | Thickener constructed in 1960's. It is not clear when materia. was deposited here, or if thickener was ever used for sludge thickening. |
| Area Cut | ~4,400 tons | Pelletized dust from baghouse (electric furnace) | 1960 to 1984 (estimated) | D006 | Constructed approximately the same time as thickener. |
| Coal Pile Tracks | ~64,000 tons | Cu precipitate process feedstock, flue dust from feeder flues, Cottrells. Some material deposited during demolition. | (1920's) to 1984 | D004, D006 | Flue dust known to be stored here since 1970's |

Table 2.1 (Continued)

Flue Dust Operable Unit Waste Site Descriptions

| Site Location | Estimated Amount of Material | Source of Material | Deposition Dates | Potential RCRA Hazardous Waste Numbers | Additional Information |
|---|---|---|---|---|---|
| Switchback | ~1,200 tons | Flue dust and some slag. Deposited during demolition. | 1983, during demolition | D004, D006 | |
| Iron Ponds | ~42,000 tons | Scrubber sludge and limed bag-house sludge. (Electric furnace and reverberator furnace). | 1902-present (estimated) | K064, D006 | |
| Miscellaneous Piles | ~6,800 tons | Two piles flue dust (deposited during FDS construction). | May-June 1983 | D006 | |
| | | Two piles unknown origin (may be process related and non-native). | Unknown | | |

Table 2.1 (Continued)

Flue Dust OU Waste Site Descriptions

| Site Location | Estimated Amount of Material | Source of Material | Deposition Dates | Potential RCRA Hazardous Waste Numbers | Additional Information |
|---|---|---|---|---|---|
| FDS Facility | ~120,000 tons | Flue dust from thickener and miscellaneous piles. Some deposited during demolition. | May, 1983 - 1984 | D004, D006 | Flue dust from Thickener and Miscellaneous Piles was compacted. Dust deposited during demolition was not. All dust here is treated with a sealant biannually. |
| Main Flue | 30,000 tons | Flue dust (reverb. furnace and electric furnace). | 1902-1980 | D006 | Deposition ceased in 1980. Now covered and capped with rubble, soil and sealant. |
| Total Flue Dust Deposits | 380,400 | | | | |

The Bradley Ponds flue dust material exceeds the Resource Conservation and Recovery Act (RCRA) EP Toxicity limit for cadmium (40 CFR Part 261.24)[1]. In addition, settling may be considered a thickening process so this material may be considered a K064 waste as defined in 40 CFR Part 261, Subpart D[2].

- **Thickener** - The Thickener is a circular concrete structure 370-feet in diameter. Its walls, overflow trench, and bottom are concrete. The Dames and Moore RI/FS Summary Report, produced June 7, 1989, indicates that a clay liner of approximately 18-inch thickness was placed in the center of the structure. The Thickener was constructed for the purpose of sludge thickening. It was constructed during the 1960's but may not have been so used. The source of the approximately 12,000 tons of flue dust material at the Thickener location is believed to be pelletized dust from the baghouse associated with the electric furnace. It is unclear when material was deposited in the Thickener. Flue dust deposition here probably ceased in 1980. Flue dust material at this location exceeds the RCRA EP toxicity test limit for cadmium.

- **Area Cut** - This location consists of a relatively small volume (approximately 4,400 tons) of pelletized flue dust material placed in a cut in the natural landscape approximately 20 feet deep. Flue dust in the area cut was deposited about the same time as the flue dust in the thickener and is also believed to come from the baghouse associated with the electric furnace. The material at this location exceeds the RCRA EP toxicity limit for cadmium.

- **Coal Pile Tracks** - This location, named for its proximity to a railroad siding, consists of approximately 64,000 tons of flue dust material currently located in two parallel above-ground piles. The material currently present at the Coal Pile Tracks site location is believed to have originated from two sources. A portion of the material is believed to be the remains of a process feedstock used in the processing of copper precipitates. The second source is believed to be flue dust

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[1] 40 CFR 261.24

[2] 40 CFR Part 261, Subpart D

from the cleanout of feeder flues, Cottrells, and other process facilities during demolition activities. There are also some remnants of coal piles used for fuel earlier in this century. Accumulation of material at the coal piles tracks began in the 1920's and continued up to 1984, when demolition was completed. The material at this location exceeds the RCRA EP toxicity limit for both arsenic and cadmium.

- **Switchback** - This location contains approximately 1,200 tons of flue dust material in three areas. The flue dust was previously alongside an onsite railway switchback. Most of the material was consolidated and pushed down an embankment, forming a pile at the embankment base. Some flue dust material remains on the embankment in small rows. This is apparently the result of material escaping around the outside edges of the bulldozer blade as material was pushed down the embankment forming the base pile. A small amount of material is presently located on a bench situated above the embankment. This material is spread over a small area and the pile is of shallow depth. All flue dust material present at the switchback site location was originally located on the bench. The source of the materials at the Switchback location is believed to be flue dust from the cleanout of feeder flues, Cottrells, and other process facilities. The material was deposited between 1983 and 1985, during demolition activities. The material at this location exceeds the RCRA EP toxicity limits for arsenic and cadmium.

- **Iron Ponds** - This location consists of approximately 42,000 tons of limed baghouse sludge present in five pond areas. The material was routinely removed from the pond beds during normal operation of the ponds. Limed, slurried sludge from the baghouse was piped here from the reverberatory furnace. The period of deposition began with the installation of the baghouse and continued until 1976 when the slurry was piped to Bradley Ponds. The flue dust material at this location exceeds the RCRA EP toxicity limit for cadmium. This material may also be classified as a K064 waste, similar to the sludge at the Bradley Ponds.

- **Miscellaneous Piles** - These consist of four above-ground piles of dust material. Two piles are located along the west side of the roadway leading to the FDS facility. They are believed to have been placed there between May and June, 1983 while materials were being deposited in the FDS facility. Another small pile is located along the east side of the roadway leading to the FDS facility. The source of material contained in this pile and the period it was deposited are unknown. One other pile is located to the northeast of the FDS facility in an area previously used to store concentrate materials. The source and deposition period of this material are also unknown. The material in these two piles may be process-related, non-native, and some may have come from the reverberatory copper furnace. Samples of the material from the Miscellaneous Piles locations exceeds the RCRA EP toxicity limit for cadmium.

- **FDS Facility** - The FDS facility, which contains up to 120,000 tons of flue dust material, is located on a terrace at the southeastern part of the Anaconda Smelter site. Flue dust at the FDS was brought there from the Thickener and the Miscellaneous Piles during May and June, 1983. This material has been partially compacted. Material from the 60-foot flue, the Cottrells, and associated feeder flues that was also deposited during demolition activities. Some of this material was compacted. The FDS facility occupies an area of approximately 14.5 acres. Surface sealant is applied to the deposited flue dust twice a year. As an interim dust control measure (1985), Anaconda graded and applied a 1/2-inch cover of crushed limestone over part of the deposited dust (TetraTech, 1985c). The material at the FDS facility exceeds the RCRA EP Toxicity Limits for cadmium and arsenic when tested for EP toxicity.

- **Main Flue** - The Main Flue is located on the north slope of Smelter Hill and occupies an area of approximately 8.6 acres. The flue was used for the passage of flue gases from the reverberator and electric furnaces on Smelter Hill to the stack. Flue dust was periodically removed through cleanout tunnels located along the flue system during routine operations.

During demolition, brick and other rubble from the walls and roof of the Main Flue system were collapsed directly on top of the flue dust. This also included scrap metal from the flue roof and support structures, additional fill material consisting of brick and masonry from the Cottrells, and soil from the area immediately adjacent to the flue and stack. To divert runoff to the sides of the flue, the earth and rubble fill was shaped into a dome. The soil cover was treated with Perma-zyme stabilizing agent following contouring to form an impermeable surface to prevent seepage into the flue and control erosion. A runoff collection has been installed. It is estimated that approximately 41,000 tons of Flue dust still remains in the collapsed flue system. Flue dust in the main flue system exceeds the RCRA limit for cadmium when tested for EP toxicity.

The information in the above descriptions and in Table 2.1 was taken from the RI/FS Summary Report produced by Dames and Moore (June 7, 1989) and the Final Draft Baseline Risk Assessment for the Flue Dust Operable Unit prepared by LSI and dated November 15, 1990. When inconsistencies between the two sources arose, precedence was given to the RI/FS summary.

## 2.2 TYPES OF WASTE AT THE FLUE DUST OPERABLE UNIT

Two sets of elemental analyses of flue dust are available. These results are presented in Tables 2.2 and 2.3. The first set, collected by Steffen, Robertson and Kirsten, Inc. (SRK 1982a,b), was analyzed by using an acidic digestion procedure on composite samples. Twenty one metals (averaging 56% of the sample weight) were detected in the flue dust (Table 2.2). These data are screening quality data. That is, they are adequate for site characterization and evaluation of remedial technologies, but are not of a high enough quality to support a public health evaluation and risk assessment (LSI, 1990).

The second set, collected by Dames & Moore (1990), was analyzed through Contract Laboratory Program (CLP) composite sample analysis for total metals and EP toxicity. Fourteen metals were measured in the flue dust (averaging 35% of the sample weight) (Table 2.3). These data are of enforcement quality. That is, they have been determined to be valid, defensible, comparable and of known accuracy and precision. These data are adequate for use in calculations involving the estimation of risks from exposure to flue dust.

Ten coincident metals were analyzed for and detected in both sampling sets. They are arsenic, cadmium, copper, iron, lead, magnesium, mercury, molybdenum, silver and zinc. The mass percentage of total metals detected in the analyses range from 20.4 to 60.9 (Tables 2-2 and 2-3). The major metal constituents are copper and iron, with lesser amounts of zinc, calcium, aluminum, arsenic, cadmium and lead. The samples of limed flue dust show relatively high percentages of calcium and silica.

Dames & Moore (1990) performed extract procedure (EP) toxicity tests on composite samples of flue dust and compared the results to regulatory limits (Table 2.4). Measured values for cadmium exceeded RCRA regulatory limits at all nine locations. Arsenic results exceeded regulatory limits at three locations. Exceedance of regulatory limits has been used by USEPA to classify a waste as hazardous under RCRA based on the potential for the waste to adversely impact human health and the environment.

## 2.3 RECENT REGULATORY CHANGES

The Resource Conservation and Recovery Act excludes from coverage under Subtitle C "solid wastes from the extraction, benefication, and processing of ores and minerals" until six months after the completion of certain required studies.[3] The studies have now been completed, see 54 F.R. 36614, September 1, 1989, and 55 F.R. 2353, January 23, 1990. These regulations conclude that all extraction and benefication wastes, and 20 processing wastes will continue to be excluded from coverage under Subtitle C. Flue dusts are not among the 20 specified processing wastes, and therefore are now subject to the requirements of Subtitle C.

Flue dust at the Anaconda Smelter Site was produced as a (by-product) of copper smelting and, to a small degree, zinc roasting. The Final Draft Baseline Risk Assessment for the Flue Dust Operable Unit prepared by LSI and dated November 15, 1990, defined five different types of flue dust:

A) Limed sludge from the Ducon Scrubber. The Ducon Scrubber began operations in 1976 and was associated with the electric furnace.

[3] 40 U.S.C. 6921(b)(3)(A)(ii)

## Table 2.2

### Summary of Flue Dust Constituents: 1982 Data[a]

| Constituent | Limed Sludge from Ducon Scrubber mg/kg | Pelletized Dust from Baghouse mg/kg | Reverb. Furnace Flue Dust mg/kg | Zinc Roaster Flue Dust mg/kg | Limed Sludge . Flue Dust mg/kg | FDS,[b] mg/kg | Average Conc.,[c] mg/kg |
|---|---|---|---|---|---|---|---|
| Aluminum (Al) | 6,300 | 5,700 | 4,500 | 4,300 | 4,500 | 4,992 | 5,049 |
| Antimony (Sb) | 820 | 1,830 | 2,120 | 1,700 | 1,330 | 2,001 | 1,650 |
| Arsenic (As) | 4,300 | 8,000 | 17,700 | 12,300 | 7,000 | 13,700 | 10,500 |
| Barium (Ba) | 21 | 12 | 12 | 8 | 24 | 12 | 15 |
| Beryllium (Be) | 0.29 | 0.35 | 0.25 | 0.14 | 0.26 | 0.29 | 0.26 |
| Cadmium (Cd) | 1,550 | 2,050 | 1,240 | 280 | 2,270 | 1,572 | 1,494 |
| Calcium (Ca) | 78,000 | 8,700 | 11,900 | 6,800 | 71,000 | 10,588 | 31,165 |
| Chromium (Cr) | 21 | 30 | 28 | 20 | 23 | 29 | 25 |
| Copper (Cu) | 109,000 | 147,000 | 153,000 | 148,000 | 153,000 | 150,540 | 143,423 |
| Iron (Fe) | 91,000 | 145,000 | 148,000 | 143,000 | 187,000 | 146,770 | 143,462 |
| Lead (Pb) | 17,900 | 25,400 | 24,000 | 7,700 | 29,000 | 24,574 | 21,429 |
| Magnesium (Mg) | 4,200 | 2,130 | 1,420 | 660 | 3,900 | 1,711 | 2,337 |
| Manganese (Mn) | 318 | 340 | 300 | 350 | 500 | 316 | 354 |
| Mercury (Hg) | 13.50 | 204 | 153 | 230 | 36 | 174 | 135 |
| Molybdenum (Mo) | 432 | 1,650 | 880 | 119 | 880 | 1,196 | 860 |
| Potassium (K) | 1,140 | 1,600 | 1,330 | 1,330 | 1,350 | 1,441 | 1,365 |
| Selenium (Se) | 32 | 47 | 46 | 45 | 49 | 46 | 44 |
| Silica ($SiO_2$) | 265,000 | 104,000 | 79,000 | 56,000 | 93,000 | 89,250 | 114,375 |
| Silver (Ag) | 153 | 224 | 172 | 182 | 221 | 193 | 191 |
| Sodium (Na) | 159 | 162 | 174 | 280 | 157 | 169 | 184 |
| Zinc (Zn) | 28,200 | 56,000 | 33,600 | 30,000 | 41,400 | 42,784 | 38,664 |

(a) Source: SRK 1982a.
(b) Composite of Pelletized Baghouse Dust and Reverb. Furnace Flue Dust.
(c) Arithmetic mean.

## TABLE 2.3
## SUMMARY OF FLUE DUST CONSTITUENTS: 1990 DATA[a]

| | Flue Dust Locations[b] | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Constituent | Thickener | Bradley Ponds | Coal Pile Tracks | FDS | Iron Ponds | Main Flue | Miscellaneous Piles | Switchback | Area Cut | Average Concentration |
| Arsenic | 16,500 | 13,700 | 78,400 | 79,200 | 22,300 | 58,200 | 52,800 | 80,000 | 42,800 | 49,32[illegible] |
| Bismuth | 1,820 | 1,330 | 3,220 | 2,180 | 1,440 | 1,250 | 1,090 | 1,200 | 2,630 | 1,79[illegible] |
| Cadmium | 989 | 1,250 | 2,940 | 1,700 | 1,310 | 557 | 176 | 315[c] | 3,590 | 1,56[illegible] |
| Cobalt | 44.0 | 27.0 | 71.6 | 30.4 | 32.8 | 57.7 | 43.0 | 19.0 | 22.0 | 38.6 |
| Copper | 244,000 | 69,400[c] | 166,000 | 157,000 | 103,000 | 172,000 | 172,000 | 82,100 | 146,000 | 155,263 |
| Gold | --[d] | -- | -- | -- | -- | -- | 18.9[c] | -- | -- | NA[e] |
| Iron | 118,000 | 77,100 | 77,100 | 111,000 | 175,000 | 138,000 | 141,000 | 77,400 | 107,000 | 119,056 |
| Lead | 14,400 | 16,100 | 32,300 | 20,300 | 21,300 | 9,260 | 10,900 | 10,200 | 20,300 | 17,229 |
| Magnesium | 2,640 | 4,560 | 3,070 | 2,110 | 2,510 | 2,040 | 5,040 | 1,870 | 2,340 | 2,909 |
| Mercury | 27.0 | 8.3 | 59.3 | 218 | 25.0 | 86.4 | 20.5 | 206[c] | 141 | 73.2 |
| Molybdenum | 1,150 | 255 | 857 | 715 | 534 | 469 | 250 | 169 | 974 | 597 |
| Nickel | 110 | 29.5 | 84.9 | 39.5 | 36.1 | 82.3 | 92.2 | 33.8 | 22.7 | 59.0 |
| Silver | 290 | 106 | 240 | 219 | 154 | 186 | 211 | 122 | 256 | 196 |
| Zinc | 28,600 | 20,900 | 46,000 | 32,000 | 29,200 | 32,000 | 20,40[illegible] | 19,200 | 49,000 | 30,81[illegible] |

(a) All concentrations in mg/kg. Average concentration is arithmetic mean. Source: Dames & Moore (February 1990).
(b) Flue dust site numbers defined on Figure 2-1.
(c) Estimated value. Not used in calculation of average concentration.
(d) -- = undetected.
(e) NA = not applicable.

## TABLE 2.4
## COMPARISON OF EP-TOXICITY DATA TO REGULATORY LIMITS[a]

| Contaminant | EP Toxicity Limit, mg/L[b] | Site Locations Exceeding Limits | Exceedance Value, mg/L |
|---|---|---|---|
| Arsenic | 5.0 | Coal Pile Tracks | 22.6 |
| | | FDS Facility | 106.0 |
| | | Switchback | 81.4 |
| Barium | 5.0 | None | –[c] |
| Cadmium | 1.0 | Area Cut | 18.0 |
| | | Bradley Ponds | 22.1 |
| | | Coal Pile Tracks | 43.7 |
| | | FDS Facility | 14.0 |
| | | Iron Ponds | 24.9 |
| | | Main Flue | 13.8 |
| | | Miscellaneous Piles | 7.1 |
| | | Switchback | 2.9 |
| | | Thickener | 66.4 |
| Chromium | 5.0 | None | – |
| Lead | 5.0 | None | – |
| Mercury | 0.2 | None | – |
| Selenium | 1.0 | None | – |
| Silver | 5.0 | None | – |

[a] Source: Dames & Moore (1990)

[b] RCRA regulations, 40 CFR, Part 261.24

[c] No exceedance

B) Pelletized dust from the baghouse. The production of this type of flue dust also began in 1976, and the baghouse was also associated with the electric furnace.

C) Reverberatory furnace flue dust. This flue dust was collected primarily in the Main Flue system, although there may have been some dust collected in a precipitator or baghouse associated with the reverberatory furnace.

D) Zinc roaster flue dust. This flue dust came from the zinc roaster flues leading from that unit.

E) Limed sludge from the baghouse. Before 1976, the flue dust from the reverberatory furnace baghouse was slurried and piped to the Iron Ponds for settling. After 1976, the slurry was piped to the Bradley ponds.

The flue dust at the Anaconda site was apparently of some value while the smelter works was in operation, and some of this material was reprocessed. When the Anaconda smelter shut down in 1980, however, the flue dust was abandoned at various areas around the site. Much of the flue dust remains where it was left in 1980, but a considerable amount was consolidated into the interim Flue Dust Storage (FDS) facility. This consolidation appears to have occurred during May and June, 1983 (before the site was listed on the NPL, but after the November 29, 1980 effective date of relevant parts of RCRA). At that time, however, flue dust was excluded as a hazardous waste, and RCRA did not apply to the storage of this dust. In any case, the FDS facility was not completed, the Anaconda smelter site was listed on the NPL, and demolition of the smelter facility commenced late in 1983 (Table 1.1). During demolition, the flue dust piles were further consolidated to the present nine locations.

The flue dust at this site is "hazardous waste" as provided for at 40 CFR 261.3(a)(1), and 40 CFR 261.3(a)(2)(i). As mentioned, previously, flue dust material tested for EP toxicity from each of the flue dust locations exceeded the RCRA limit for cadmium and, in some cases, for arsenic. Thus it is a characteristic hazardous waste. Additionally, the sludge at the two pond locations is categorizable as K064 waste (40 CFR 264.32). K064 wastes are defined as sludge resulting from the thickening of blowdown slurry from primary copper production. As settling and dredging of the slurry from the scrubber is considered a thickening process, the sludge at the two pond locations may be categorized as K064 waste.

Since aspects of RCRA are applicable, CERCLA response actions at this Flue Dust Operable Unit will need to reflect the most recent Toxicity Characteristic Rule or will characterize the wastes by TCLP.

## 2.4 PROPOSED REMEDIAL ALTERNATIVES

The remedial alternatives considered in this document here are those which have survived screening in the FS Phase II Initial Alternatives Screening Document which submitted by ARCO to EPA and the State on August 7, 1989.[4] Listed below are all remedial alternatives which were screened, and the designation for those which have not survived the screening.

Alternative 1 - "No Action" alternative. (Alternative 1 has been screened from further consideration as a remedial alternative by the Baseline Risk Assessment).

Alternative 2 - (Alternative 2 has been screened from further consideration as a remedial alternative).

Alternative 3 - Disposal of untreated flue dust in an on-site repository.

Alternative 4 - Off-site disposal of untreated flue dust at a RCRA Subtitle C TSD facility.

Alternative 5 - On-site stabilization/fixation treatment, with disposal of stabilized/fixed materials in an on-site repository. This alternative may include in-situ stabilization of flue dust materials in the main flue.

Alternative 6 - On-site hydrometallurgical treatment of flue dust with disposal of process residues in an on-site repository. Salable products generated by this process would not be disposed of on-site.

Alternative 7 - On-site pyrometallurgical treatment using an electric arc furnace or a flame reactor furnace, with disposal of process residues on-site.

Alternative 8 - Off-site commercial processing.

This list of alternatives is presented here only for base of reference when reviewing the ARARs, particularly Action-specific ARARs. The analysis in this document is not meant to establish a preference for any of the above alternatives. However, in Section 5, the role that ARARs play in the selection of a remedial alternative is outlined.

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[4]ARCO 1990

## 3.0 FEDERAL ARARS

The screening of potential Federal applicable or relevant and appropriate requirements for the Flue Dust Operable Unit remedial action and rationale for designating these as ARARs are described below.

## 3.1 FEDERAL CONTAMINANT-SPECIFIC ARARS

For Federal contaminant specific ARARs, applicable or relevant and appropriate Federal regulations are identified as standards which must be achieved during on-site remedial activities. These standards set forth in Table 3.1. Contaminant-specific standards for water under RCRA and the Clean Water Act are within the scope of this action with regard to the creation of new sources of water contamination resulting from the cleanup action as they apply to the final waste disposition, only.

### 3.1.1 Soils

No standards exist for soils and sediments. A baseline risk assessment for the geographical area will ultimately assess what levels of residual contaminants in soils will meet the goal of a site-specific risk between $10^{-4}$ to $10^{-6}$ for carcinogens, present No Adverse Effects Levels (NAEL) for non-carcinogens, and achieve appropriate levels for environmental protection. EPA will continue to assess the appropriate method for determining the extent of cleanup for soils in a future remedial action. While final cleanup of soils is beyond the scope of the Flue Dust Operable Unit cleanup, it will be addressed in connection with the Anaconda Smelter Operable Unit cleanup.

### 3.1.2 Air

The ambient air quality standards presented in 40 CFR part 50 (pursuant to Section 109 of the Clean Air Act, 42 U.S.C. § 7409) would be applicable to the Flue Dust OU cleanup if there were no more-stringent State Standards. However, Montana ambient air standards (ARM 16.8.811-16.8.822) are equivalent to or, in most cases, more stringent than the National Ambient Air Quality Standards at this time.

**Table 3.1**

**Summary of Preliminary Analysis of Contaminant-Specific Federal ARARs**
**Flue Dust Operable Unit**

| Standard, Requirement, Criteria, or Limitation | Citation | Applicable | Relevant and Appropriate |
|---|---|---|---|
| CONTAMINANT-SPECIFIC | | | |
| 1. Soils | 42 USC § 7401-7642 | No | No |
| 2. Air | | | |
| Clean Air Act | | | |
| National Primary and Secondary Air Quality Standards | 40 CFR Part 50 | No | Yes |
| National Emission Standards for Hazardous Air Pollutants | 40 CFR Part 61 | No | Yes |
| 3. Occupational Health and Safety Act | 29 USC § 651-678 | | |
| OSHA Standards | 29 CFR Part 1910 | No | Yes |
| 4. Radioactive Materials | | | |
| Radiation Control Act | 42 USC § 2022 | | |
| Standards for Remedial Actions at Uranium Processing Sites | 40 CFR Parts 191 and 192 | No | No |
| Atomic Energy Act and Energy Reorganization Act | | | |
| Standards for Protection Against Radiation | 10 CFR Part 20 | No | No |
| 5. RCRA | | | |
| Identification | 40 CFR Part 261 | Yes | No |
| Maximum Concentration Limits | 40 CFR Part 264.94 | No | Yes |
| 6. Clean Water Act | | | |
| Water Quality Criteria | 40 CFR Part 131 | No | Yes |

**Table 3.1** (Continued)

**Summary of Preliminary Analysis of Contaminant-Specific Federal ARARs**
**Flue Dust Operable Unit**

| Standard, Requirement, Criteria, or Limitation | Citation | Applicable | Relevant and Appropriate |
|---|---|---|---|
| 7. Safe Drinking Water Act | 40 CFR Part 141.11-141.16 | No | Yes |
| 8. National Pollutant Discharge Elimination System | 40 CFR Part 125 | No | No |

The more stringent standards will control as ARARs. Amendments to the Clean Air Act (CAA) passed in November of 1990 may affect the ARARs determination for Air. National Emissions Standards for Hazardous Air Pollutants (NESHAPs, 40 CFR Part 60) presents emissions standards for certain sources of hazardous air pollutants. This regulation has been wholly adopted by the State of Montana (ARM 16.8.1424). The State has not adopted more stringent standards. The Federal and State regulations are relevant and appropriate. Some of the emissions sources in 40 CFR Part 60 may be sufficiently similar to the Anaconda Smelter site situation, that parts of this regulation should be considered relevant and appropriate. The portions of this regulations deemed to be relevant and appropriate will be set forth at the time of the proposed plan.

### 3.1.3 Occupational Safety and Health

Occupational exposure limitations for air contaminants found at 29 CFR §§ 1910.1000 to 1910.1101, including inorganic arsenic (29 CFR § 1910.1018) and lead (29 CFR § 1910.1025) are relevant and appropriate for occupational exposure during remedial action.

### 3.1.4 RCRA

Due to recent changes, the mining waste exclusion provision in RCRA has been narrowed as it applies to solid wastes from the processing of minerals and ores. Only 20 processing wastes are now within the exclusion. These twenty materials are listed in Table 3.2. The flue dust waste is defined to be a hazardous waste under RCRA as explained previously in Section 2.3. The potential RCRA hazardous waste categories for the flue dust materials at the Anaconda site have been listed in Table 2.1. Since flue dust is a hazardous waste as defined by RCRA, substantive requirements of RCRA are applicable.

If disposal of flue dust occurs at any onsite final Flue Dust Facility or an offsite facility, then this facility is a regulated hazardous waste storage facility under Subtitle C. Subtitle C, 264.94, states that the EPA Regional Administrator will establish ground water protection standards for any final disposal facility to ensure that the contaminants entering the ground water supply do not exceed the maximum concentration limits (MCLs).

## TABLE 3.2
## THE STATUS OF MINING WASTES EXCLUSION WITHIN THE BEVILL AMENDMENT AS OF OCTOBER 10, 1990

Exemptions Retained in the Bevill Amendment

FR September 21, 1989

1. Slag from Primary Copper Smelting;
2. Slag from Primary Lead Smelting;
3. Red and Brown Muds from Primary Bauxite Refining;
4. Phosphogypsum from phosphoric acid production, and
5. Slag from elemental phosphorus production.

Exemptions Removed from the Bevill Amendment

FR January 23, 1990

6. Treated residue from roasting/leaching of chrome ore;
7. Gasifier ash from coal gasification;
8. Process wastewater from coal gasification;
9. Calcium sulfate wastewater treatment plant sludge from primary copper processing;
10. Slag tailings from primary copper processing;
11. Fluorogypsum from hydrofluoric acid production;
12. Process wastewater from hydrofluoric acid production;
13. Air pollution control dust/sludge from iron blast furnaces;
14. Iron blast furnace slag;
15. Process wastewater from primary magnesium production by the anhydrous process;
16. Process wastewater from phosphoric acid production;
17. Basic oxygen furnace and open hearth furnace air pollution control dust/sludge from carbon steel production;
18. Basic oxygen furnace and open hearth furnace slag from carbon steel production;
19. Chloride process waste solids from titanium tetrachloride production; and
20. Slag from primary zinc processing.

The MCLs for contaminants that may be released from the flue dust waste are listed in 40 CFR Part 264.94.

### 3.1.5 Safe Drinking Water Act 40 CFR Part 141.11-141.16) (141.50-141.51)

Safe Drinking Water Act Maximum Contaminant Levels are enforceable standards for public drinking water systems. Maximum Contaminant Level goals are non-enforceable health goals for public water systems. EPA has stated in the NCP (March 1990) that an MCL or non-zero MCLG is generally the relevant and appropriate requirement for ground water that is a current or potential source of drinking water. Furthermore, the EPA believes that the MCLs or non-zero MCLGs will be relevant and appropriate standards for surface water designated as a drinking water supply, unless the State has promulgated water quality standards for the water body.

### 3.1.6 Clean Water Act, Water Quality Criteria, 40 CFR Part 131; Gold Book Water Quality Criteria for Water (51 Fed Reg 43665, EPA 44/5-86-001, May 1, 1986)

CERCLA Section 121 states that remedial actions shall attain Federal Water Quality criteria where they are appropriate under circumstances of the release or threatened release. This determination is to be based on the designated or potential use of water, the media affected, the purpose of the criteria, and current information. In the NCP (March 1990) (53 FR 51442), EPA has stated that water quality criteria may be relevant and appropriate when the criteria is intended to protect the uses designated for the water body at the site or when the exposures for which the water quality criteria are protective are likely to occur. EPA has further stated when an MCL for the particular contaminant exists, the water quality criteria would not be relevant and appropriate for a current or potential water supply unless the State has adapted the criteria as water quality standards.

More stringent standards exist for certain contaminants and for certain designations of water use. The Water Quality Criteria in 40 CFR Part 131 are relevant and appropriate to the flue dust response action except when a more stringent standard exists.

### 3.1.7 National Pollutant Discharge Elimination System 40 CFR Parts 122-125

The National Pollutant Discharge Elimination System (NPDES) is the national program for issuing, monitoring and enforcing permits for direct discharges. The Clean Water Act established the NPDES program under §402 of the Act to implement the regulations, limitations and standards promulgated pursuant to §§ 301, 304, 306, 307, 308 and 403 of the CWA for point source direct discharges. The NPDES program is administered by the EPA and by State Agencies authorized by the EPA to administer a program. Since the State of Montana has an equivalent program, the federal NPDES program is not applicable or relevant and appropriate.

## 3.2 FEDERAL LOCATION-SPECIFIC ARARS

The potential Federal location-specific ARARs requirements listed previously in the IASD have been screened as they relate to the Flue Dust OU. The ARARs are listed in Table 3.3 and are further defined in the text below.

### 3.2.1 National Historic Preservation Act (NHPA). 16 USC § 470, 40 CFR § 6.301(b), 36 CFR Part 800

This statute and implementing regulations require Federal agencies or Federal projects to take into account the effect of any Federally assisted undertaking or licensing on any district, site, building, structure or object that is included in or is eligible for the Register of Historic Places. Compliance with the substantive portions of this ARAR requires the EPA to consult with the State Historic Preservation Officer (SHPO) to identify any cultural resources which are on or near the operable unit. If any cultural resources exist, SHPO assesses whether the proposed remedial actions will have possible effects on the resources. If the activity is likely to have an effect, the EPA should examine whether feasible alternatives exist that would avoid such effects. If effects cannot reasonably be avoided, measures should be implemented to minimize or mitigate the potential effect.

**Table 3.3**

**Summary of Preliminary Screening Analysis of Location-Specific Federal ARARs**
**Flue Dust Operable Unit**

| Standard, Requirement, Criteria, or Limitation | Citation | Applicable | Relevant and Appropriate |
|---|---|---|---|
| LOCATION-SPECIFIC | | | |
| 1. National Historic Preservation Act | 16 USC § 470<br>40 CFR § 6.301(b)<br>36 CFR Part 800 | Yes | No |
| 2. Historic Sites, Buildings and Antiques Act | 16 USC §§ 461-467<br>40 CFR § 6.301(a) | Yes | No |
| 3. Archeological and Historic Preservation Act | 16 USC § 469<br>40 CFR 469<br>40 CFR § 6.301(c) | Yes | No |
| 4. Endangered Species Act | 16 USC §§ 1531-1543,<br>50 CFR Part 17<br>50 CFR Part 402<br>40 CFR Part 6.302(n) | Yes | No |
| 5. Fish and Wildlife Coordination Act | 16 USC §§ 661-666 | Yes | No |
| 6. Executive Order on Floodplain Management | Exec. Order No. 11988 | No | No |
| 7. Protection of Wetlands | 40 CFR Part 6, Appendix A<br>Executive Order No. 11990 | Yes | No |
| 8. Wild and Scenic River Act | 16 USC §§ 1271-1287<br>40 CFR §§ 6.302(e) | No | No |
| 9. Resource Conservation and Recovery Act | 42 USC §§ 6901 et seq.<br>40 CFR 264.18(a)and(b) | Yes | No |

NHPA regulations reserve formal determination of eligibility for the National Register of Historic Places and "no adverse effects" determinations for federal agencies. Compliance with this requirement, including the appropriate Federal determination will be done after the report is submitted for public comment. This is an applicable requirement.

3.2.2 Historic Sites, Buildings and Antiquities Act. 16 USC §§ 461-467; 40 CFR § 6.301(a).

40 CFR § 6.301(a) states that "(in) conducting an environmental review of a proposed EPA action, the responsible official shall consider the existence and location of natural landmarks using information provided by the National Park Service pursuant to 36 CFR § 62.6(d) to avoid undesirable impacts upon such landmarks." "National natural landmarks" are defined under 36 CFR § 62.2 as:

> area(s) of national significance located within [the U.S.] that contain(s) an outstanding representative example(s) of the nation's natural heritage, including terrestrial communities, aquatic communities, landforms, geological features, habitats of native plant and animal species, or fossil evidence of the development of life on earth.

Under the Historic Sites Act of 1935, the Secretary of the Interior is authorized to designate areas as National Natural Landmarks for listing on the National Registry of Natural Landmarks. This an applicable requirement.

3.2.3 The Archaeological and Historic Preservation Act. 16 U.S.C. § 469, 40 CFR § 469, 40 CFR § 6.301(c).

This statute and implementing regulations establish requirements for the evaluation and preservation of historical and archaeological data that may be destroyed through alteration of terrain as a result of a Federal construction project or a Federally licensed activity or program. This act requires EPA or the PRP, during the RI/FS process, to survey the site for covered scientific, prehistorical or archaeological artifacts. The results of this survey will be reflected in the administrative record. Preservation of appropriate data concerning the artifacts is hereby identified as an ARAR requirement, to be done during the implementation of the remedial action. This is an applicable requirement.

3.2.4 The Endangered Species Act. 16 U.S.C. §§ 1531-1543, 50 CFR Parts 17 and 402, 40 CFR 6.302(h).

This statute and implementing regulations require that any Federal activity or authorized activity may not jeopardize the continued existence of any threatened or endangered species or destroy or adversely modify critical habitat.

Compliance with this requirement involves consultation between EPA and the U.S. Fish and Wildlife Service, resulting in a determination as to whether there are listed or proposed species or critical habitats present in the operable unit area, and, if so, whether any proposed activities will impact such wildlife or habitat.

ARCO has completed an Endangered Species investigation and submitted a draft report to EPA. The EPA will use this information to consult with the U.S. Fish and Wildlife Service concerning this requirement. Further consultation will occur during the public comment period on the RI/FS report, and specific mitigative measures will be identified, in consultation with the appropriate agencies, in the ROD. This is an applicable requirement.

3.2.5 The Fish and Wildlife Coordination Act. 16 U.S.C. §§ 1531-1566, 40 CFR 6.302(g).

This standard requires that Federal agencies or Federally funded projects ensure that any modification of any stream or other water body affected by any action authorized or funded by the Federal agency provides for adequate protection of fish and wildlife resources.

Compliance with this Act requires EPA to consult with the U.S. Fish and Wildlife Service and the Wildlife Resources Agency of the affected State. Further consultation will occur during the public comment period on the RI/FS report, and specific mitigative measures may be identified, in consultation with the appropriate agencies. Specific mitigative measures may be identified in the ROD. This is an applicable requirement.

3.2.6 Floodplain Management. 40 CFR Part 6, Appendix A, Executive Order No. 11988.

This requirement mandates that federally funded or authorized actions within the 100 year floodplain avoid, to the maximum extent possible, adverse impacts associated with development of a floodplain therefore, the determination of this potential ARAR is deferred to the Federal Action Specific Section of this document (Section 3.3).

3.2.7 Protection of Wetlands. 40 CFR Part 6, Appendix A, Executive Order No. 11990.

This ARAR requires Federal agencies and PRPs to avoid, to the extent possible, the adverse impacts associated with the destruction or loss of wetlands and to avoid support of new construction in wetlands if a practicable alternative exists.

Wetlands are defined as those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

ARCO has completed a wetlands inventory and submitted a report to EPA. The EPA shall consult with the U.S. Army Corps of Engineers (COE) or the U.S. Fish and Wildlife Service, as to whether wetlands exist at the operable unit and what category of wetland they qualify for. Compliance will be addressed in a manner similar to the floodplain requirements described above. Consultation and determinations will continue to be pursued in the public comment period for the RI/FS report, and mitigative measures identified from that consultation will be identified in the ROD. This is an applicable requirement.

3.2.8 Resource Conservation and Recovery Act, as amended, 42 U.S.C. Section 6901 et seq., 40 CFR § 264.18(a) and (b).

This requirement provides that (a) any hazardous waste facility must not be located within 61 meters (200 feet) of a fault (see Appendix VI of Part 264), and (b) any hazardous waste facility within the 100 year flood plain must be designed, constructed, operated and maintained to avoid washout. Any discrete disposal or storage facilities which remain on-site as part of this response action must meet these standards. This is an applicable requirement.

## 3.3 FEDERAL ACTION-SPECIFIC ARARs

ARARs identified for actions proposed in the RI/FS Work Plan are specific to the remedial action alternatives listed in Section 2.4. The following Section identifies those requirements that are general to all on-site actions contemplated for the Flue Dust Operable Unit remedial action.

For action-specific ARARs, the (Federal) Occupational Safety Health Act regulations are within the scope of this action. The Federal RCRA regulations are within the scope of this action with respect to removal, disposal, and treatment activities. The (Federal) Clean Air Act regulations are within the scope of this action during performance of the selected remedial action. The Federal mining reclamation regulations are within the scope of this action to the extent that they address above ground excavation and revegetation (see Table 3.4).

### 3.3.1 Occupational Health and Safety Act, 29 U.S.C. Sections 651-678, 29 CFR §§ Part 1926, 29 CFR § 1910.120, and 29 CFR 1910.132.

These requirements are applicable with respect to all work conducted on site during performance of the response action. Specifically, the standards require the establishment of an occupational health and safety program for workers. The plan would have to address the standards set forth in Part 1926 of Title 29 of the CFR, relating to construction industry standards, and, if disturbance of contaminated soil or sediments is deemed potentially harmful to workers, to the standards set forth in 29 CFR section 1910.132, relating to protective equipment. In addition, the requirements of 29 CFR § 1910.120 must be complied with at the site.

OSHA sets forth certain contaminant-specific exposure standards. Suspended flue dust in the Deer Lodge Valley Area could contribute to the exceedance of these standards not only currently, but also during site remediation and after cleanup. OSHA standards are promulgated to protect workers from contaminants generated within the workplace. Therefore, the OSHA standards are not applicable to the Flue Dust Operable Unit, but are designated as applicable.

**Table 3.4**

**Summary of Preliminary Analysis of Action Specific Federal ARARs**
**Flue Dust Operable Unit**

| Standard, Requirement, Criteria, or Limitation | Citation | Applicable | Relevant and Appropriate |
|---|---|---|---|
| ACTION-SPECIFIC | | | |
| 1. Occupational Safety and Health Act | 29 USC §§ 651-678 | Yes | No |
| OSHA Standards | 29 CFR Part 1910 | Yes | No |
| | 29 CFR Part 1926 | Yes | No |
| 2. On-Site Containment and Disposal | | | |
| Solid Waste Disposal Act | 42 USC §§ 6901-6987 | | |
| Guidelines For Land Disposal of Solid Waste | 40 CFR Part 241 | No | No |
| Criteria For Solid Waste Classification and Disposal | 40 CFR Part 257 | No | No |
| 3. RCRA | | | |
| Hazardous Waste Management Systems: General | 40 CFR Part 260 | No | No |
| Standards Applicable To Generators of Hazardous Waste | 40 CFR Part 262 | Yes | Yes |
| Standards Applicable To Transporters of Hazardous Waste | 40 CFR Part 263 | Yes | Yes |
| Standards For Owners and Operators of Hazardous Waste Treatment Storage and Disposal Facilities | 40 CFR Part 264 | Yes | Yes |
| General Facility, Standards | Subpart B | Yes | Yes |
| Preparedness and Prevention | Subpart C | Yes | Yes |
| Contingency Plan and Emergency Procedures | Subpart D | Yes | Yes |
| Releases From Solid Waste Management For Units | Subpart F | Yes | Yes |

Table 3.4 (Continued)

**Summary of Preliminary Analysis of Action Specific Federal ARARs**
**Flue Dust Operable Unit**

| Standard, Requirement, Criteria, or Limitation | Citation | Applicable | Relevant and Appropriate |
|---|---|---|---|
| Closure and Post Closure | Subpart G | Yes | Yes |
| Use and Management of Containers | Subpart I | Yes | Yes |
| Waste Piles | Subpart L | Yes | Yes |
| Landfills | Subpart N | Yes | Yes |
| Standards for Management of Specific Types of Hazardous Waste Management Facilities | 40 CFR Part 266, Subpart F | Yes | Yes |
| Underground Storage Tanks | 40 CFR Part 280 | No | No |
| Hazardous Materials Transportation Act | 49 USC §§ 1801-1813 | No | No |
| 4. Surface Mining Control and Reclamation Act | 30 USC §§ 1201-1326, 30 USC §§ 816.11 and 784.13 | No | Yes |
| 5. Clean Water Act | | | |
| Discharge of Effluent | 40 CFR § 125, Subpart K | Yes | No |
| 6. Air Quality | | | |
| New Source Performance Standards | 40 CFR § 60 | No | Yes |
| 7. Transportation | | | |
| DOT Hazardous Material Transportation Regulations | 49 CFR Parts 107, 171-177 | Yes | No |
| 8. Executive Order on Floodplain Management | Exec. Order No. 11988 | Yes | No |

### 3.3.2 Solid Waste Disposal Act

#### 3.3.2.1 Criteria for Classification of Solid Waste Disposal Facilities

40 CFR Part 257 establishes criteria for use under the Resource Conservation and Recovery Act in determining which solid waste disposal facilities and practices pose a reasonable probability of adverse effects on health or the environment [40 CFR Section 257.1(a)]. The criteria in 40 CFR Part 257 do not apply to hazardous waste disposal facilities which are subject to regulation under Subtitle C of RCRA [40 CFR Section 257.1(c)(7)]. Upon completion of the selected remedial alternatives aspects of the criteria may be information to be considered towards the final disposition of what may eventually become nonhazardous solid waste materials.

### 3.3.3 RCRA

The Resource Conservation and Recovery Act of 1980, 42 U.S.C. § 6901 et seq., and accompanying regulations set for the standards for hazardous waste. EPA has stated that the test for determining whether such standards are applicable to cleanups at Superfund sites is

> . . . RCRA Subtitle C requirements for the treatment, storage, or disposal of hazardous waste will be applicable if a combination of the following requirements is met: a) the waste is a listed or characteristic waste under RCRA; and b) either 1) the waste was treated, stored, or disposed after the effective date of the RCRA requirements under consideration; or 2) the activity at the CERCLA site constitutes treatment, storage or disposal as defined under RCRA (CERCLA Compliance with Other Laws Manual p. 2-4).

Regulations governing the definition of hazardous waste regulated by RCRA are found at 40 CFR Part 261. Listed wastes, or wastes automatically regulated because of the particular process of generation, are found at 40 CFR §§ 261.31, 261.32, and 261.33. The State of Montana has adopted these regulations as part of its RCRA-equivalent hazardous waste program. Wastes determined to be characteristic wastes following 40 CFR Part 261 Subpart C are also regulated.

Flue dust materials at the Anaconda site have been identified earlier in this document as both listed and characteristic hazardous wastes. Accordingly, EPA determines that the RCRA and

corresponding State regulations are applicable to the flue dust wastes which are the subject of this action.

The RCRA Subtitle C regulations listed in Table 3.4 are applicable or relevant and appropriate requirements. These requirements would govern cleanup of the current waste locations, including the possible stabilization of flue dust wastes or the disposal of wastes in an on-site repository. Further consideration of the Subtitle C requirements is presented in Section 3.4.

### 3.3.4 Surface Mining Control and Reclamation Act

The Surface Mining Control and Reclamation Act, 30 U.S.C. §§ 1201 through 1326, and implementing regulations found at 30 CFR §§ 816.111 and 784.13 require that revegetation be used to stabilize soil covers over reclaimed areas. Here, these requirements are relevant and appropriate for any covers of waste management units at discrete areas of contamination, whether hybrid clean closed or hybrid landfill closed. These requirements have been interpreted at other Clark Fork Basin site cleanups (i.e., Timber Butte Area) to mean that at least 18 inches of non-phytotoxic soil be used to provide an adequate medium for vegetative cover. However, the relevance and appropriateness of 18 inches of cover has not been established for this selected action but may be in the ROD. The regulations also require that revegetation be performed according to a plan which specifies schedules, species which are diverse and effective, planting methods, mulching techniques, irrigation if appropriate, and appropriate soil testing. The same interpretation is found to be appropriate here, and the requirements are identified as relevant and appropriate requirements.

### 3.3.5 Clean Water Act

The sections of the CWA regulations cited in Table 3.4 have been determined to be applicable to the proposed remedial actions. These sections require best management practices and monitoring for direct discharges of pollutants into water, and requires that certain standards be met.

If the selected remedial action involves a point source discharge, then the standards would be applicable.

### 3.3.6 Air Quality

40 CFR § 60 presents New Source Performance Standards (NSPS) for many industrial classes and types of processes. Some of the remedial Alternatives being considered can be categorized among the listed processes, so the Federal NSPS requirements are relevant and appropriate. The State of Montana has wholly adopted 40 CFR Part 60 in ARM 16.8.1423. Revisions necessary because of changes to the Clean Air Act will be reflected later as appropriate.

### 3.3.7 Transportation

49 CFR § 107 and 171-177 presents specific transportation requirements and limitations for offsite materials movements. For any remedial alternative which involves offsite transport, these requirements govern directly.

### 3.3.8 Floodplain Management 40 CFR Part, Appendix A, Executive Order No. 11988.

If the remedial action is found to affect floodplains, the ROD will contain a Statement of Findings which will set forth a discussion as to whether the proposed action will be located in (or affect) the floodplain; a description of significant facts considered in making the decision to locate in or affect the floodplain or wetlands including alternative sites or actions; a statement indicating whether the selected action conforms to applicable State or local floodplain protection standards; a description of the steps to be taken to design or modify the proposed action to minimize potential harm to or within the floodplain; and a statement indicating how the proposed action affects the natural or beneficial values of the floodplain.

The Deer Lodge Valley is drained to the north by the Clark Fork River, which is part of the Columbia River drainage. Warm Springs Creek and Mill Creek roughly bound the site on the north and south sides, respectively, joining Silver Bow Creek to form the Clark Fork River near Warm Springs Ponds.

The Anaconda Smelter site lies primarily within the Warm Springs Creek watershed. The eastern part of the site, including the FDS facility is located within the Mill Creek watershed. The nine flue dust site locations are not situated in the floodplains of Warm Springs Creek or Mill Creek. Runoff from a large portion of the site is diverted to a number of ditches which flow through, or

are adjacent to, the Opportunity tailings ponds and discharge to Silver Bow Creek. Surface runoff from the southeast and eastern part of the site flows through a series of man-made diversions to Mill Creek. Since the flue dust locations are not situated in the floodplains of Warm Springs Creek or Mill Creek, the requirements of this section are not ARARs for the Flue Dust Operable Unit cleanup but may apply to future remedial actions which would involve construction in, or discharges to the Floodplain.

## 3.4 REMEDIAL ALTERNATIVE ACTION CONSIDERATION

This Section discusses how certain parts of RCRA are applicable or relevant and appropriate requirements for each of the six remedial alternatives to be discussed in the RI/FS report. Some of the alternatives constitute treatment, storage, and disposal under RCRA, while others do not. The Flue Dust OU ARARs analysis do not address existing problems that are attributable to past or present flue dust storage piles (such as groundwater degradation from the leaching piles of flue dust). However, addressing environmental and health issues posed by the creation of new potential sources of hazardous waste problems, such as those created by new flue dust storage or disposal piles, will be within the scope of this operable unit.

In addition to the no action alternative, the remaining viable alternatives for the cleanup of the flue dust operable unit are: onsite disposal, offsite disposal at a TSD facility, onsite fixation/stabilization with onsite disposal, on-site hydrometallurgical treatment, on-site pyrometallurgical treatment, and off-site commercial processing. The applicability or relevance and appropriateness of the RCRA regulations to each of these cleanup alternatives is presented below.

### 3.4.1 Onsite Disposal Of Untreated Flue Dust Materials

Remedial Alternative No. 3 as set forth in the IASD consists of the onsite disposal of untreated flue dust materials in the existing FDS facility, in the FDS facility after upgrade, or in a new facility or repository to be constructed onsite. Discussion as to whether various regulatory and statutory provisions are applicable or relevant and appropriate to Alternative 3 as provided at 40 C.F.R. § 300.400(g) is set forth below.

40 CFR Part 257

This Part sets forth criteria for use under RCRA in determining which solid waste disposal facilities and practices pose a reasonable probability of adverse effects on health or the environment. Because RCRA Subtitle C does not apply to Alternative 3, see discussion below, portions of Part 257 are applicable or relevant and appropriate. 40 CFR 257.1(c)(8). The substantive portions of Part 257 are discussed section by section below. All subparts except 257.3-5 are either applicable or relevant and appropriate to onsite disposal of flue dust.

257.3-1 Floodplains

Although it is not anticipated that any storage facility will be placed in a flood plain, this requirement would be applicable if that were to happen. Since this is at least a possibility, the floodplain requirement is identified as an applicable requirement.

257.3-2 Endangered Species

This provision will be an applicable requirement should any practice with respect to the flue dust "contribute to the taking of any endangered or threatened species of plants, fish, or wildlife." 40 C.F.R. 257.3-2(a).

257.3-3 Surface Water

While it is not expected that there will be discharges to waters of the United States as a result of any onsite disposal of flue dust materials, it is possible that such a discharge could occur. Therefore, depending on the precise method of onsite disposal, this is an applicable requirement. If not applicable, it is at least relevant and appropriate. This subpart is meant to prevent or reduce pollution to waters of the United States by solid waste facilities. Since flue dust is a solid waste, and since it is presently, or as a result of remedial action under this alternative may be located in a facility or something similar to a facility under Part 257, this situation would meet the criteria of 40 CFR 300.400(g)(2)(i)-(viii).

257.3-4 Groundwater

This is an applicable requirement. While it is true that cleanup of existing groundwater contamination is outside the scope of the Flue Dust OU, it is also true that onsite disposal of untreated flue dust could contribute to "contamination" of groundwaters within the meaning of this part. Therefore, this part is an applicable requirement, insofar as it pertains to any contribution to groundwater contamination caused by onsite disposal of untreated flue dust.

257.3-7 Air

Burning is not anticipated in connection with this alternative, so 257.3-7(a) is neither applicable nor relevant and appropriate. However subpart 257.3-7(b) may be either applicable or relevant and appropriate depending on whether disposal of untreated flue dust results in emissions governed by any such requirements.

40 C.F.R. 257.3-8 Safety

Only subpart (d), pertaining to access by the public, is applicable.

Applicability of Subtitle C

RCRA subtitle C requirements are applicable only if hazardous waste is treated, stored, or disposed[12] after the effective date of the RCRA requirements being considered as a result of the implementation of this alternative. 55 F.R. 8758, March 8, 1990. While flue dust is hazardous waste, Subtitle C requirements are not applicable to this alternative, since there will be no treatment, storage or disposal outside the existing contaminated area. As explained below, however, certain portions of Subtitle C may be relevant and appropriate. If wastes are disposed on a new onsite facility not within the contamination areas, the RCRA Regulations are applicable.

[12] The term is actually "land disposal," see 55 F.R. 8759. The term "land disposal" is narrower than the term "disposal" and apparently governs the application of Subtitle C only. "Disposal" governs RCRA provisions other than Subtitle C.

Subtitle C as Relevant and Appropriate

Certain portions of Subtitle C are potentially relevant and appropriate to the onsite disposal option. The various regulatory provisions which implement RCRA Subtitle C and which are relevant and appropriate are discussed below.

40 CFR Part 260 Hazardous Waste Management System: General

This provision is relevant and appropriate only insofar as it provides definitions which govern the operation of substantive regulatory provisions which implement RCRA Subpart C.

40 CFR Part 262 Standards Applicable to Generators of Hazardous Waste

This provision is relevant and appropriate insofar as it provides definitions which govern the operation of substantive regulatory provisions which implement RCRA Subpart C.

40 CFR Part 264 Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities

Subpart B General Facility Standards

40 CFR 264.14

This is a substantive requirement setting forth standards for the control of access by animals and people. It is for the purpose of keeping animals and people away from hazardous waste, which is precisely what the Flue Dust OU remedial action is attempting to accomplish. Therefore, this requirement is relevant and appropriate for the onsite disposal alternative.

40 CFR 264.18

This provision sets forth standards for hazardous waste disposal facilities to prevent damage to those facilities from seismic events and from floods. This provision is relevant and appropriate to the onsite disposal of untreated flue dust.

Subpart F Releases From Solid Waste Management Units

Subpart F sets forth requirements for groundwater protection for land disposal units. The Flue Dust OU remedial action is not intended to address groundwater contamination at this time. Problems with groundwater are to be addressed later in connection other operable units. Subpart F is nevertheless identified as relevant and appropriate for this OU at this time, with the understanding that the requirements of this subpart will be implemented later in connection with another operable unit.

It is possible that without the implementation of certain protective measures required by Subpart F, the onsite disposal of flue dust could exacerbate at Smelter Hill whatever groundwater contamination already exists. Therefore, it may be necessary to implement certain portions of Subpart F at the time of the Flue Dust OU remedial action. So as not to aggravate present contamination and so as not to make remedial action in connection with future OUs more difficult, the portions of Subpart F that would address and would assist in preventing any incremental contamination of groundwater caused by the onsite disposal of flue dust, including but not limited to detection monitoring requirements, are hereby identified as relevant and appropriate for present implementation.

Subpart G Closure and Post Closure

The purposes of Subpart G are to minimize the need for maintenance after closure and to minimize the post closure escape of hazardous waste or its constituents so as to minimize the threat to human health. These are also among the purposes of this remedial action. The substantive requirements of Subpart G are therefore identified as relevant and appropriate for the onsite disposal of untreated flue dust. Given the exact remedial action decided upon, it is possible that only certain portions if Subpart G will be relevant and appropriate. If this turns out to be the case, these portions will be identified at the time of the proposed plan.

Subpart I Use and Management of Containers

This subpart governs owners and operators of hazardous waste facilities that store containers of hazardous waste. While it is not expected that any untreated flue dust materials will be placed into containers as part of the onsite disposal alternative, the possibility that containers could be

used in some way as part of this alternative has not yet been eliminated. Therefore, if containers are used, parts of this provision are relevant and appropriate, and the entire provision is therefore so identified. The specific portions of Subpart I which are relevant and appropriate will be identified at the time of the proposed plan.

Subpart J Tank Systems

This subpart governs owners and operators of hazardous waste facilities that use tank systems for storing or treating hazardous waste. While it is not expected that any untreated flue dust materials will be placed into any tank system as part of the onsite disposal alternative, the possibility that such a system could be used in some way as part of this alternative has not yet been eliminated. Therefore, if a tank system is used, parts of this provision are relevant and appropriate, and the entire provision is therefore so identified. The specific portions of Subpart J which are relevant and appropriate will be identified at the time of the proposed plan.

Subpart K Surface Impoundments

This subpart governs owners and operators of facilities using surface impoundments to treat, store or dispose of hazardous waste. While it is not expected that any untreated flue dust materials will be placed into any surface impoundment as part of the onsite disposal alternative, the possibility that such could happen as part of this alternative has not yet been eliminated. Therefore, if a surface impoundment is used, parts of this provision are relevant and appropriate, and the entire provision is therefore so identified. The specific portions of Subpart K which are relevant and appropriate will be identified at the time of the proposed plan.

Subpart L Waste Piles

This subpart governs owners and operators of facilities which store or treat hazardous waste in piles. The purpose of Subpart L is to prevent dispersion of waste in piles by wind and by leaching. Under the alternative calling for the onsite disposal of untreated flue dust, it is possible that flue dust materials would be stored in piles. The problems addressed by Subpart L are similar to those addressed by the Flue Dust OU. Subpart L is meant to control the dispersion of hazardous waste from piles while the Flue Dust OU is meant to remediate and control the

dispersion of a hazardous waste, flue dust. Subpart L is therefore identified as relevant and appropriate.

Subpart M Land Treatment

This subpart regulates owners and operators of facilities that treat or dispose of hazardous waste in land treatment units. While it is not expected that any untreated flue dust materials will be placed into a land treatment unit as part of Alternative 3, the possibility that this could happen has not yet been eliminated. Therefore, if land treatment is used, parts of this provision are relevant and appropriate, and the entire provision is therefore so identified. The specific portions of Subpart M which are relevant and appropriate will be identified at the time of the proposed plan.

Subpart N Landfills

This subpart applies to owners and operators of facilities that dispose of hazardous waste in "landfills" as defined at 40 CFR 260.10. Under Alternative 3, it is possible that flue dust materials could be placed in a facility similar to a landfill. The problems addressed by the Flue Dust OU could therefore be similar to problems contemplated by Subpart N. At this time it is not possible to identify specifically each and every subsection which may be deemed to be relevant and appropriate. Subpart N in its entirety is therefore identified as relevant and appropriate. Specific portions of Subpart N will be identified at the time of the proposed plan.

Alternatives No. 5, 6, and 7 - Onsite Treatment Alternatives With Onsite Disposal

The three treatment alternatives are discussed together because the statutory and regulatory provisions pertinent to each are virtually identical.

### 3.4.2 Alternative No. 5 - Onsite Stabilization/Fixation Treatment

Under Alternative No. 5, flue dust materials would be excavated from the nine site locations and transported to a central location onsite where debris would be separated and flue dust materials treated with stabilization/fixation. Debris and treated flue dust would be disposed onsite.

## Alternative No. 6 - Onsite Hydrometallurgical Treatment

Under Alternative No. 6, flue dust materials would be excavated from the nine site locations and transported to a central location onsite for hydrometallurgical treatment. This treatment process would extract and recover metals from flue dust materials using one of several leaching processes. Salable products would be removed from the site, while residual waste would be disposed onsite.

## Alternative No. 7 - Onsite Pyrometallurgical Treatment

Under Alternative No. 7, flue dust materials would be excavated from the nine site locations and transported to a central location onsite for pyrometallurgical treatment. This treatment alternative would extract and separate metals from flue dust materials using one of several types of heat treatment. Residual wastes would be disposed onsite.

### RCRA as Applicable or Relevant and Appropriate

RCRA provisions governing facilities which treat hazardous waste are applicable. Under Alternatives No. 5, 6, and 7, a hazardous waste, flue dust, would receive "treatment" as defined at 40 CFR 260.10. As explained in the Compliance With Other Laws Manual, page 2-5, when activity at a CERCLA site constitutes treatment, storage or disposal under RCRA, then portions of the RCRA requirements become applicable.

It will not be possible to determine whether treated flue dust is hazardous waste or is similar to hazardous waste until the treated flue dust has been properly analyzed. That will not happen until some flue dust has actually been treated. The discussion below attempts to address how portions of Subtitle C of RCRA might be either applicable or relevant and appropriate depending on how treated flue dust might be classified under RCRA. Of course, if treated flue dust is not a hazardous waste and is not similar to a hazardous waste, RCRA Subtitle C requirements would be neither applicable nor relevant and appropriate.

Those regulatory requirements promulgated under RCRA Subtitle C which are applicable or relevant and appropriate as action specific requirements for Alternatives 5, 6, and 7 are discussed below.

40 CFR Part 262 Standards Applicable to Generators of Hazardous Waste

This provision is applicable insofar as it provides definitions which govern the operation of substantive regulatory provisions which implement RCRA Subpart C.

40 CFR Part 264 Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities

Subpart B General Facility Standards

Subpart B applies to owners and operators of all hazardous waste facilities. Substantive requirements setting forth standards for the control of access by animals and people are set forth at 264.14,, standards for the control of ignitable, reactive or incompatible wastes are set forth at 264.17, and location standards are set forth at 264.18. These provisions are applicable requirements for Alternatives 5, 6, and 7.

Subpart F Releases From Solid Waste Management Units

Subpart F sets forth requirements for groundwater protection for land disposal units. Problems with groundwater are to be addressed later in connection with other operable units, not now in connection with the Flue Dust OU. It is possible that if certain protective measures required by Subpart F are not implemented along with other actions to be taken on the Flue Dust OU, however, the treatment of flue dust materials and subsequent onsite disposal of treated flue dust could exacerbate at Smelter Hill whatever groundwater contamination already exists. Therefore, it may be necessary to implement certain portions of Subpart F at the time of the Flue Dust OU remedial action. Therefore, the portions of Subpart F that would address and would assist in preventing any incremental contamination of groundwater caused by the onsite disposal of flue dust, including but not limited to detection monitoring requirements, are hereby identified as applicable, to be implemented contemporaneously with action to be taken in connection with the Flue Dust OU.

The remainder of Subpart F is identified as applicable for this OU at this time, with the understanding that the requirements of this subpart will be implemented later in connection with another operable unit.

Subpart G Closure and Post-Closure

As mentioned above, onsite disposal of treated flue dust materials could constitute "disposal" if the treated materials are hazardous wastes. Therefore, certain portions of Subpart G would be applicable to any onsite disposal of treated flue dust materials. See 40 CFR 264.110(b)(1). If the treated materials are not hazardous wastes, but are similar to hazardous wastes, then portions of this subpart may be relevant and appropriate. It is not possible now for EPA to determine whether flue dust materials are hazardous wastes or are sufficiently similar to hazardous wastes such that this subpart is applicable or is relevant and appropriate. This determination can only be made when treated flue dust is available for analysis.

Subpart I Use and Management of Containers

This subpart applies to all owners and operators of hazardous waste facilities that store hazardous waste in containers. It is not expected that flue dust or treated flue dust will be stored in containers. If it is however, then this subpart would be applicable to any such storage. If treated flue dust is not a hazardous waste, but is sufficiently similar to a hazardous waste, then this provision may be relevant to any storage of treated flue dust.

Subpart J Tank Systems

This subpart applies to owners and operators of facilities using tank systems for the storage or treatment of hazardous waste. It is not expected that tank facilities will be used in connection with Alternatives 5, 6, and 7 at the Flue Dust OU. If any tank systems are used however, then this provision is applicable.

Subpart K Surface Impoundments

This subpart applies to owners and operators of facilities that use surface impoundments to treat, store, or dispose of hazardous waste. It is not expected that surface impoundments will be used as a part of Alternatives 5, 6, or 7. However, if flue dust or treated flue dust are treated, stored, or disposed in a surface impoundment, then this provision would be applicable. If treated flue dust is not a hazardous waste, but is sufficiently similar to a hazardous waste, then this provision

may be relevant and appropriate to any treatment, storage, or disposal of treated flue dust in a surface impoundment.

Subpart L Waste Piles

This subpart applies to owners or operators of hazardous waste facilities that store or treat hazardous waste in piles. If flue dust or treated flue dust are stored or treated in piles, then this provision is applicable. If treated flue dust is not a hazardous waste, but is sufficiently similar to a hazardous waste, then this provision would be relevant and appropriate for the storage or treatment of treated flue dust in piles.

Subpart M Land Treatment

This subpart applies to owners and operators of facilities that treat or dispose of hazardous waste in land treatment units. It is not expected that land treatment will be used as part of Alternatives 5, 6, or 7. However, if flue dust or treated flue dust are treated or disposed in a land treatment unit, then this subpart would be applicable. If treated flue dust is not a hazardous waste, but is sufficiently similar to hazardous waste, then this subpart would be relevant and appropriate for the disposal of that treated flue dust.

Subpart N Landfills

This subpart applies to owners and operators of facilities that dispose of hazardous waste in landfills. Flue dust will probably not be disposed in a landfill as part of Alternatives 5, 6, and 7. If treated flue dust is disposed in a landfill as part of Alternatives 5, 6, or 7, then this provision is applicable. If treated flue dust is not a hazardous waste, but is sufficiently similar to a hazardous waste, then this provision is relevant and appropriate.

### 3.4.3 Onsite Hydrometallurgical Treatment

This alternative also constitutes RCRA treatment, and any waste by-products generated will be subject to RCRA disposal and/or storage requirements. Therefore, the same requirements that are applicable to the solidification alternative outlined in Section 3.4.2 are applicable to the hydrometallurgical treatment alternative.

### 3.4.4 On-Site Pyrometallurgical Treatment

Similar to the hydrometallurgical treatment alternative, all of the requirements set forth in Section 3.4.2 are applicable to this alternative.

### 3.4.5 Off-Site Commercial Processing

Once the waste is taken off-site, it is no longer under the jurisdiction of CERCLA. Similar to the off-site disposal alternative, the party responsible for the cleanup action will be a RCRA hazardous waste generator and will be required to follow the RCRA requirements directly.

## 4.0 MONTANA STATE ARARS

Response actions undertaken pursuant to Superfund must satisfy applicable or relevant and appropriate State and Federal requirements. In this Section, applicable or relevant and appropriate Montana State statutory and regulatory requirements for the Flue Dust Operable Unit remedial action RI/FS are identified and reviewed as potential ARARs. Remedial Alternative selection and therefore, ARARs refinement will be presented in the ROD. As provided by Section 121 of CERCLA, 42 U.S.C. § 9621, where more than one ARAR applies to a contaminated medium or cleanup activity, the more stringent standard, requirement, criteria or limitation will apply.

The EPA must consult the state in identifying ARARs. ARARs identified by the State of Montana are presented in Appendix A. In the Proposed and Final NCP, EPA distinguishes between substantive and administrative requirements. Only substantive requirements may be ARARs. Administrative requirements, which do not in and of themselves define a level or standard of control, are excluded from being ARARs.[12]

The Flue Dust Operable Unit will not address existing groundwater concerns on Smelter Hill that are attributable to past or present flue dust storage piles/areas as long as these groundwater concerns are adequately addressed in the Smelter Hill Operable Unit. However, addressing environmental and health issues posed by the creation of new potential sources of groundwater or surface water contamination in the form of new flue dust residue or disposal sites/areas will be within the scope of this operable unit.

The Environmental Protection Agency (EPA) has reviewed the State of Montana's (State) submittal of State standards, limitations, or criteria that the State has identified as applicable or relevant and appropriate to the Flue Dust Operable Unit cleanup pursuant to Section 121(d) of CERCLA, 42 U.S.C. § 9621(d). The State ARARs in Appendix A form the basis of the analysis of State ARARs presented here. EPA has not approved all these requirements as ARARs, as that term is defined in Section 121(d) of CERCLA, 42 U.S.C. § 9621(D), but recognizes that they form

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[12] 53 FR 51443; the Preamble to the Final National Contingency Plan, 55 Fed. Reg. 8666 - 8813 (March 8, 1990); and the Final National Contingency Plan, 40 CFR Part 300 (55 Fed. Reg. 8813 - 8865, March 8, 1990).

a useful basis for identifying an acceptable design plan and may otherwise affect the conduct of the cleanup action at the site.

A final determination by the EPA of both State and Federal ARARs will occur in the ROD for Flue Dust Operable Unit response action.

## 4.1 MONTANA CONTAMINANT-SPECIFIC ARARS

For contaminant specific ARARs, applicable or relevant and appropriate State standards are identified as standards that must be achieved during and after on-site removal activities. Potential contaminant-specific State ARARs are listed in Table 4.1.

### 4.1.1 Air Quality

The Clean Air Act of Montana and regulations promulgated thereunder, establish emission limitations for certain pollutants. These restrictions are applicable at the Flue Dust Operable Unit during site cleanup. The air quality standards that are a part of this Act are generally more stringent than, or in some cases, equivalent to the National Ambient Air Quality Standards. Thus, the state air quality standards take precedence as ARARs.

The Clean Air Act of Montana - MCA 75-2-102 (Applicable) sets out the purpose of the Clean Air Act of Montana: "to achieve and maintain such levels of air quality as will protect human health and safety and, to the greatest degree practicable, prevent injury to plant and animal life and property, foster the comfort and convenience of the people, promote the economic and social development of this State, and facilitate the enjoyment of the natural attractions" of the State of Montana. Although a policy statement, a substantive standard similar to the Water Quality Nondegradation Policy, is included in the words to achieve and maintain air quality.

ARM § 16.8.815 (Applicable). This Section defines a 90-day average standard for lead in ambient air, not to be exceeded, and defines the method of measurement. Lead is a likely component of emissions from the flue dust cleanup. No person may cause or contribute to concentrations of lead which exceed 1.5 micrograms per standard cubic meter of air (90 day average).

**Table 4.1**
**Screening Analysis of Contaminant-Specific Montana ARARs**
**Flue Dust Operable Unit**

| Standard Requirements Criteria or Limitation | Citation | Applicable | Relevant and Appropriate |
|---|---|---|---|
| **CONTAMINANT-SPECIFIC** | | | |
| 1. Air Quality | | | |
| The Clean Air Act of Montana | MCA 75-2-102 | No | Yes |
| Ambient Air Quality Standards: | | | |
| Lead | ARM § 16.8.815 | Yes | No |
| Ozone | ARM § 16.8.817 | Yes | No |
| Settled Particulate Matter | ARM § 16.8.818 | Yes | No |
| PM-10 | ARM § 16.8.821 | Yes | No |
| Visibility | ARM § 16.8.822 | Yes | No |
| Prevention of Significant Deterioration (PSD) Program | ARM §§ 16.8.925-926 | Yes | No |
| Airborne Particulate Matter | ARM §§ 16.8.1401(4), 16.8.1403 | Yes | No |
| Visible Air Contaminants | ARM § 16.8.1404 | Yes | No |

**Table 4.1 (Continued)**
**Screening Analysis of Contaminant-Specific Montana ARARs**
**Flue Dust Operable Unit**

| Standard Requirements Criteria or Limitation | Citation | Applicable | Relevant and Appropriate |
|---|---|---|---|
| Public Nuisances | ARM § 16.8.707(2) and 16.8.701(20) | No | No |
| Standards of Performance | ARM § 16.8.1423 | Yes | No |
| Emissions Standards for Hazardous Air Pollutants (ESHAPS) | ARM § 16.8.1424 | Yes | No |
| 2. Water Quality Act | MCA § 75-5-303 | Yes | No |
| 3. Surface Water Quality Standards | ARM §§ 16.20.604, 605, 616, 617, 618, 631, 632, 633, 641, 702, 703, 1011 | Yes | No |
| 5. Groundwater Pollution Control System | ARM §§ 16.20.1002, 1003, 1011 | Yes | No |
| 6. Public Water Supply | MCA § 75-5-303 | | |
| 7. Water Quality Act | ARM § 16.20.203, 205 | Yes | No |

ARM §16.8.817 (Applicable). This Section specifies the ambient air quality standard and measurement method for ozone. This Section is an applicable requirement. The standard is:

0.10 ppm $O_3$, hourly average, not to be exceeded more than 1 X per year.

ARM § 16.8.818 (Applicable). This Section defines a 30-day average standard for the accumulation of atmospheric particulate matter, not to be exceeded. The standard in terms of settled particulate is:

30 day average: 10 grams of settled particulate per square meter.

ARM § 16.8.821 (Applicable). No person may cause or contribute to concentrations of PM-10 in the ambient air which exceed the standard. This Section is an applicable standard in the Flue Dust Operable Unit cleanup. The standard is:

24 hour average: 150 micrograms/cubic meter of air, not to be exceeded more than 1 X per year.
Annual average: 50 micrograms/cubic meter of air, not to be exceeded.

ARM § 16.8.925 (Applicable). Ambient air increments. This section provides for the maximum allowable increases over he baseline concentrations for sulfur dioxide, particulate matter, and nitrogen dioxide.

ARM § 16.8.926 (Applicable). Ambient air limits. This section adopts state ambient air quality standards and federal ambient air quality standards as state ambient air limits. No concentration of a pollutant may exceed any state or federal ambient air quality standard.

ARM §§ 16.8.1401(4) and (5) and 16.8.1403 (Applicable). These Sections preclude the operation of a construction site unless reasonable precautions are taken to control emissions of airborne particulate matter. These Sections require reasonable precautions to control particulate matter during handling or transportation. These Sections also require the lowest achievable emission rate from any new source emitting more than 100 tons per year of particulates. For any industrial process, a table is established that restricts particulate emissions based on process weight per hour.

ARM § 16.8.1404 (Applicable). This Section sets visible emissions standards. Emissions of airborne particulate matter from any stationary source shall not exceed the standard.

ARM § 16.8.1423 (Applicable). Standard of performance for new stationary sources. 40 CFR Part 60 is adopted and incorporated by reference.

ARM § 16.8.1424 (Applicable). Emissions standards for hazardous air pollutants. This section adopts and incorporates by reference 40 CFR Part 61 which requires minimization of emissions, specifies appropriate emission tests and monitoring requirements and adopts limits on numerous pollutants.

### 4.1.2 Surface Water Quality Standards

MCA § 75-5-303 (Applicable). Nondegradation policy. This section establishes Montana's standard for nondegradation of water quality. It applies to high-quality waters, and, therefore it is applicable for all constituents for which pertinent portions of the Clark Fork River is not high-quality waters. This section will also be applicable or well suited if any remedial action constitutes a new source of pollution or an increased source of pollution to high-quality waters to require the degree of waste treatment necessary to maintain that existing high water quality.

ARM 16.20.604, 617, 618

These Sections establish classifications for Clark Fork River and tributaries. The standards are dependent on the surface water classification. All waters in the Clark Fork Basin are classified as B-1 unless otherwise identified. Certain waters in the Warm Springs drainage are classified as A-1. These laws also set standards for individual contaminants to protect public health and the environment. The State of Montana has classified Warm Spring Creek and Mill Creek as B-1 Streams ARM 16.20.604(i). Waters classified B1 are suitable for drinking, culinary and food processing purposes, after conventional treatment: bathing, swimming and recreation; growth and propagation of salmon fishes and associated aquatic life, water fowl and furbearers; and agricultural and water supply.

ARM 16.20.631, 632, 633, 641, 702, 703,

ARM § 16.20.631 (Applicable). Treatment standards. This section imposes water treatment requirements to restore and maintain the quality of surface water to applicable water use categories. Treatment standards are based on the State's policy of nondegradation, and present and anticipated beneficial sues of the receiving waters. This section contains certain specific treatment standards.

ARM § 16.20.632 (Applicable). Operation standards. Requires best practicable water treatment. Also requires temperature variations in discharging water. These include a temperature range below 40°F during January and February and above 44° during June through September. Any water impoundment, manmade or otherwise, must comply with these requirements.

ARM § 16.20.633 (Applicable). Prohibitions. Surface waters must be free from substances attributable to municipal, industrial, agricultural practices or certain other discharges. No wastes may be discharged and no activities conducted that will violate any standards. Various other specific prohibitions on discharges are contained in this section.

ARM § 16.20.702 (Applicable). Applicability and limitation of state water nondegradation--general. Any human activity which would cause a new or increased source of pollution to state waters is subject to the nondegradation policy. However, if, based on necessary economic or social development, degradation may be allowed, but "in no event may degradation of state waters interfere with or become harmful, detrimental or injurious to public health, recreation, safety, welfare, livestock, wild birds, fish and other wildlife or other beneficial uses." Degradation of national resource waters is prohibited.

ARM § 16.20.703 (Applicable). Permit Conditions to Ensure Nondegradation. Permitted discharges of waters must meet conditions which will ensure that the receiving waters are not degraded. The substantive portions of this regulation are applicable.

Montana Groundwater Pollution Control System

16.20.1002 Classification of Groundwater (Applicable). This Section classifies groundwater into Classes I through IV based on the present and future most beneficial uses of the groundwater, and states that groundwater is to be classified to actual quality or actual use, whichever places the groundwater in a higher class.

16.20.1003 Groundwater Quality Standards (Applicable). This Section adopts MCLs for groundwater and also specifies that present and future most beneficial uses must be protected. The Section also specifies that concentrations of substances for which no MCLs exist "must not exceed levels which render the waters harmful, detrimental or injurious to public health". In addition, maximum allowable concentrations of substances for which no MCLs exist must not exceed acute or chronic criteria levels as set out in the EPA Gold Book. MCLs apply to groundwaters classes I, II or III. Acute or chronic criteria levels apply to all groundwater.

ARM 16.20.1011

ARM § 16.20.1011 (Applicable). Nondegradation. This section provides that any groundwater whose existing quality is higher than the standard for its classification must be maintained at that high quality unless the board is satisfied that a change is justifiable for economic or social development and will not preclude present or anticipated use of such water. The section also defines degradation.

Public Water Supply

MCA § 75-6-112 (Applicable). Pursuant to this provision it is illegal for a person to (1) discharge drainage or other wastes that will cause pollution of state waters used for domestic use or as a source for a public water supply; and (2) discharge drainage or other waste into any state waters, on the banks of any state waters or into any abandoned or operating water well unless such waste is properly treated.

ARM § 16.20.203 (Relevant and Appropriate). Maximum inorganic chemical contaminant levels. This section establishes the following maximum contaminant levels ("MCLs") for inorganic chemicals in community water systems:

| Constituent | Level (mg/l) |
|---|---|
| Arsenic | 0.05 |
| Barium | 1.0 |
| Cadmium | 0.010 |
| Chromium | 0.05 |
| Lead | 0.05 |
| Mercury | 0.002 |

| | |
|---|---|
| Nitrate (as N) | 10.0 |
| Selenium | 0.01 |
| Silver | 0.05 |
| Fluoride | 2.4 |

The MCL for nitrate may not be exceeded by a non-community water supply system except that levels not to exceed 20 mg/l may be allowed in a non-community water system if no adverse health effects will result. Water within the Anaconda Smelter site may impact a future drinking water source; therefore, this section is relevant and appropriate.

ARM § 16.20.205 (Relevant and Appropriate). Maximum turbidity contaminant levels. This section established the following maximum turbidity contaminant level for public water supply systems which use surface water in whole or in part:

1. One turbidity unit ("TU"), as determined by a monthly average, except that a level not exceeding 5 TU may be allowed if the supplier of water can demonstrate to the department that the higher turbidity does not: (a) interfere with disinfection; (b) prevent maintenance of an effective disinfectant agent throughout the distribution system; or (c) interfere with microbiological determination.

2. 5 TU based on an average for two consecutive days.

If results of turbidity analyses indicate the maximum contaminant level has been exceeded, a second sample must be taken within one hour. The repeat sample, and not the initial one, must be used in calculating the monthly average. ARM § 16.20.205(3). Water within the Anaconda Smelter site may impact a drinking water source in the future; therefore, this section is relevant and appropriate.

## 4.2 MONTANA LOCATION-SPECIFIC ARARS

For location specific ARARs, all of the State ARARs identified in the screening document are within the scope of this action. (See Table 4.2).

### 4.2.1 Floodplain and Floodway Management

The Flue Dust Operable Unit locations are not situated in or near the floodplains of the Warm Springs Creek or Mill Creek. However, it is possible that the response action will have an effect on these floodplains, or even intrude upon them. Hence, some of the state floodplain and floodway management regulations are ARARs.

The State of Montana has developed certain restrictions on the construction, operation or maintenance of obstructions within the floodway or the floodplain. The floodway is defined as the channel of a watercourse and areas adjoining the channel that are reasonably required to carry the floodwater of the watercourse. Floodplain is defined as the area adjoining a watercourse which would be covered by floodwater during a flood of 100-year frequency. The floodway is a narrower channel than the floodplain. The State of Montana imposes fewer restrictions on land use within the floodplain. Land use restrictions within both the floodway and floodplain are imposed to prevent or alleviate flooding threats to life and health and reduce private and public economic losses. Accordingly, some obstructions, designed for floodway control are, in fact, encouraged. Other obstructive or potentially obstructive uses are authorized, subject to permit. Pursuant to CERCLA, activities conducted wholly within the NPL site are not required to obtain Federal, State or local permits.

The requirements of the Floodplain and Floodway Management Act and regulations promulgated thereunder are discussed below.

The Floodplain and Floodway Management Act

MCA 76-5-402 (Applicable). Certain structures listed in this provision are authorized to be constructed in the floodplain, outside of the designated floodway, including parks, wildlife management areas, natural areas and fish hatcheries.

## Table 4.2

### Screening Analysis of Location Specific Montana ARARs
### Flue Dust Operable Unit

| Standard Requirements Criteria or Limitation | Citation | Applicable | Relevant and Appropriate |
|---|---|---|---|
| **LOCATION-SPECIFIC** | | | |
| 1. Floodplain and Floodway Management | | | |
| The Floodplain and Floodway Management Act | MCA 76-5-402 | Yes | No |
| | MCA 76-5-1101 | No | Yes |
| | MCA 76-5-1102 | No | Yes |
| Floodplain Management Regulations | ARM § 36.15.216 | No | Yes |
| | ARM § 36.15.606 | No | Yes |
| | ARM § 36.15.801 | Yes | No |
| 2. Streambeds and Stream Protection | | | |
| The Natural Streambed and Land Preservation Act of 1975 | MCA 75-7-102 | No | No |
| Minimum Standards and Guidelines for Natural Streambed and Land Preservation Act of 1975 | ARM § 36.2.404 | No | Yes |
| 3. Major Facility Siting Act | ARM §§ 36.7.2502, 2503-2505 | No | Yes |

MCA 76-5-1101 (Relevant and Appropriate). This provision recognizes that water conservation and flood control projects, including projects for conservation, recreation and wildlife, streamflow stabilization and pollution abatement may be conducive to public convenience and welfare. This section is relevant and appropriate because it constitutes a statutory recognition that watercourse improvements for pollution abatement may be an appropriate part of a floodplain management system.

MCA 76-5-1102 (Relevant and Appropriate). This Section authorizes the construction or improvement of dikes, embankments, impounding reservoirs, conduits, and other water course improvements and authorizes municipal and country governmental entities to establish such projects. Accordingly, this Section is not directly applicable to the Flue Dust Operable Unit response action, but is relevant and appropriate because it constitutes a statutory recognition that on-site repository and associated improvements for pollution abatement may be an appropriate part of a floodplain management system.

Floodplain Management Regulations

ARM § 36.15.216 (Relevant and Appropriate). This Section sets out the criteria for establishing or altering an artificial obstruction or nonconforming use in the floodplain. Typically, the criteria are evaluated in the context of a permit application. At a Superfund site, however, ability to meet the criteria is determined through the detailed evaluation of alternatives. Accordingly, the following criteria are relevant and appropriate in determining whether to establish or alter an artificial obstruction or nonconforming use (i.e., whether to alter or construct an upstream impoundment or basin) to consider:

1. The danger to life and property from backwater or diverted flow caused by the obstruction;

2. The danger that the obstruction will be swept downstream to the injury of others;

3. The availability of alternative locations;

4. The construction of alteration of the obstruction in such a manner as to lessen the danger;

5. The permanence of the obstruction;

6. The anticipated development in the foreseeable future of the area which may be affected by the obstruction; and

7. Such other factors as are in harmony with the purposes of the Act and these Rules.

ARM § 36.15.606 (Relevant and Appropriate). This Section enumerates flood control works that are allowed within designated floodways; it provides that: (1) flood control levies and flood walls are allowed if they are designed and constructed to safely convey a flood of 100-year frequency and their cumulative effect combined with allowable flood fringe encroachments does not increase the unobstructed elevation of a flood of 100-year frequency more than 0.5 of a foot at any point; (2) riprap, if not hand placed, is allowed if it is designed to withstand a flood of 100-year frequency, does not increase the elevation of the 100-year frequency flood, and will not increase erosion upstream, downstream, or across stream from the riprap site; and (3) channelization projects are allowed if they do not significantly increase the magnitude, velocity, or elevation of the flood of 100-year frequency downstream from such projects.

This Section is relevant and appropriate, rather than directly applicable to the Flue Dust Operable Unit remedial action for two reasons. First, the channelization, diversion and impoundment stability improvements proposed in some of the alternatives are not solely for flood control and the majority of such improvements are located in the floodplain but not the floodway. Second, a permit will not be required for Flue Dust Operable Unit response activities. Rather, compliance with this Section will be evaluated in the RI/FS, and response selection and implementation processes under CERCLA.

ARM § 36.15.801 (Applicable). This Section is applicable in floodplain areas where the floodway has not been designated and authorizes a variety of uses pertinent to the Flue Dust Operable Unit, including parks, wildlife management and natural areas and hunting and fishing areas. It further provides that if a proposed development within the designated floodplain may significantly

increase flood velocities or depths, additional hydraulic and survey information may be required, including but not limited to valley cross sections of the water course and adjoining floodplain; certification by a qualified professional engineer that flood proofing measures are reasonably adequate to protect against major flood damage; or a hydrologic study documenting probable effect on upstream or downstream property owners. The requirements of this Section are applicable, except to the extent that this Section includes a permit requirement and other administrative requirements. The adequacy of information provided and the need for additional information will be evaluated in the context of the RI/FS and response selection and implementation in accordance with CERCLA.

### 4.2.2 Streambeds and Stream Protection

Because the Flue Dust Operable Unit lies within the Mill Creek watershed, activities within the remedial action are subject to location specific requirements for stream and streambed protection. These protective provisions are set out in the Natural Streambed and Land Preservation Act of 1975 and implementing regulations and the Stream Protection Act.

#### The Natural Streambed and Land Preservation Act of 1975

MCA 75-7-102. It is the policy of the State of Montana that its "natural rivers and streams and the lands and property immediately adjacent to them within the State are to be protected and preserved to be available in their natural or existing State and to prohibit unauthorized projects and in so doing to keep soil erosion and sedimentation to a minimum, except as may be necessary and appropriate after due consideration of all factors involved." (Emphasis added.) This is a policy statement, and policies that are not substantive are not ARARs. However, this policy should be implemented by compliance with the preservation standards set out below, to minimize soil erosion and sedimentation during Flue Dust Operable Unit response activities and after cleanup work has been completed.

#### Minimum Standards and Guidelines For Natural Streambed and Land Preservation Act of 1975

ARM § 36.2.404 (Relevant and Appropriate). Proposed projects are to be evaluated by the appropriate conservation district based on the following criteria: (1) the purpose of the project; (2) the necessity and justification of the proposed project; (3) whether the proposed project is

a reasonable means of accomplishing the purpose; (4) whether there are modifications or alternative solutions that are reasonably possible and would reduce the disturbance to the stream channel and its environment and accomplish the purposes of the proposed project; (5) whether the project will pass anticipated sediment loads without creating harmful flooding or erosion problems upstream or downstream; (6) whether the project will minimize the amount of stream channel alteration; (7) whether the project will be as permanent a solution as possible and whether the method used will create a reasonably permanent and stable situation; (8) whether the project will minimize effects on fish and aquatic habitat; (9) whether the project will minimize turbidity or other water pollution problems; and (10) whether the project will minimize adverse effects on the natural beauty of the area. These criteria are appropriate for consideration in the detailed analysis of alternatives and in the response selection and implementation pursuant to CERCLA. However, this provision is identified as relevant and appropriate because it would require the criteria to be evaluated in a permit context, whereas for a Superfund site remedy that includes project activities addressed by this regulation, an actual permit to construct such project is not required.

### 4.2.3 Major Facility Siting Act

The State of Montana has developed criteria which must be taken into account when siting an energy-related facility. No energy-related facility as defined by the law (MCA 75-20-104(10)) is anticipated for the Flue Dust Operable Unit Areas. However, the siting criteria are relevant and appropriate.

The major facility siting regulations require that the owners and operators of energy generation or conversion facilities place their facilities in areas where the facilities will not adversely impact the existing environment. These goals are accomplished through an application process in which the various environmental impacts associated with the construction and operation of energy generation and conversion facilities, including powerlines, are analyzed.

The jurisdictional prerequisite for the applicability of the major facility siting requirements is that the proposed facility is an energy generation or conversion facility. None of the response actions for the Flue Dust Operable Unit contemplates the construction and operation of an energy generation or conversion facility. Therefore, the major facility siting requirements are not applicable requirements.

Although the Act and its implementing regulations are not applicable, they are relevant and appropriate. The Act and regulations are intended to prevent the siting of major facilities with the potential to disrupt the environment or cause damage to the environment from being located in environmentally sensitive areas. These regulations address situations sufficiently similar to the removal action and their use is well suited to this site.

Areas of concern for the major facility siting requirements include active fault zones; winter distribution areas of elk, deer, and pronghorn; mountain sheep seasonal habitats; 100 year floodplains; and nesting colonies of white pelicans, great blue heron, gulls and terns.

ARM § 36.7.2502 (Relevant and Appropriate). Preferred site criteria are specified. These include geologically stable areas in flat or rolling terrain and areas where atmospheric conditions and topography are favorable for dispersion of airborne pollutants.

ARM § 36.7.2503 (Relevant and Appropriate). No facilities can be located in the following areas:

(1) National wilderness areas.
(2) National primitive areas.
(3) National parks.
(4) Rivers in the national wild and scenic river system.
(5) National wildlife refuges and ranges.

ARM §§ 36.7.2504-2505 (Relevant and Appropriate). This Section identifies sensitive areas and areas of concern which should not be used unless a demonstration of no significant adverse impact can be made or that mitigation of significant adverse impacts is possible. Sensitive areas and areas of concern include:

(1) State game ranges and game management areas.
(2) State parks and national and State monuments.
(3) National and State recreation areas.
(4) Rivers under active study for inclusion in the national wild and scenic river system.
(5) Roadless areas of 5,000 acres or more managed by federal or State agencies to retain their roadless character.

(6) Areas designated Class I under prevention of significant deterioration provisions or areas under active consideration for such designation.

(7) Areas designated as "non-attainment" under the Montana Clean Air Act.

(8) Designated critical habitat for State or federally listed threatened or endangered species.

(9) National historic landmarks and national register historic districts and sites.

(10) Land areas covered by conservation easements where the presence of the facility would be incompatible.

(11) Unique habitats and natural areas designated by the National Park Service, the USDA Forest Service, the Bureau of Land Management or the State as national natural landmarks, natural areas, research natural areas, areas of critical environmental concern, special interest areas, research botanical areas or outstanding natural areas.

(12) National trails.

(13) Municipal water sheds.

(14) Streams and rivers designated Class I or II by the Montana Dept. of Fish, Wildlife and Parks.

(15) State or federal waterfowl production areas.

(16) Specially managed buffer areas surrounding areas excluded under 36.7.2503.

(17) Active faults showing evidence of post-miocene movement.

(18) Wintering areas of elk, deer and pronghorn as designated by the Montana Dept. of Fish, Wildlife and Parks.

(19) Major elk summering areas which are forested and greater than 1/2 mile in radius, more than 1/2 mile from an existing road and designated by the Montana Dept. of Fish, Wildlife and Parks, the Bureau of Land Management or USDA Forest Service.

(20) Seasonal habitat of mountain sheep as designated by the Montana Dept. of Fish, Wildlife and Parks.

(21) Any undeveloped areas of land or water that contain known natural features of unusual scientific or educational significance, and any undeveloped areas of land or water that contain known natural features of unusual recreational significance that have public access provided.

(22) Areas with geologic formations that show a high probability of containing significant paleontological resources.

(23) Sites with evidence of contemporary use that have religious or heritage significance and value to Indians.

(24) Proposed national natural landmarks under active study.

(25) Riparian forests defined as a stand of nature cottonwood or mixed cottonwood-conifer forests greater than 100 meters long where average canopy height is 50 feet or more and average density of mature trees is greater than 20 stems per acre.

(26) Nesting or mating areas of white pelicans, great blue herons, double-crested cormorants, gulls or terns.

(27) Sage grouse and sharp-tailed grouse breeding areas and wintering areas as designated by the Montana Dept. of Fish, Wildlife and Parks.

(28) Habitats occupied at least seasonally and critical to species listed as "species of special interest or concern" by the Montana Dept. of Fish, Wildlife and Parks or the U.S. Fish and Wildlife Service.

## 4.3 MONTANA ACTION-SPECIFIC ARARS

For action specific ARARs, the Montana Safety Act and Employee and Community Hazardous Chemical Information Act are within the scope of this action; the Montana Hazardous Waste and Underground Storage Tank Act and State RCRA regulations are within the scope of this action, for removal and disposal activities; the State Clean Air Act regulations are within the scope of this action; and the State mining waste regulations are within the scope of this action, to the extent that they address above ground excavation and revegetation. These standards will be further defined in the narrative section of the ARAR analysis for the Flue Dust RI/FS.

### 4.3.1 Montana Reclamation Requirements

The State of Montana has developed extensive statutory and regulatory requirements for reclamation in connection with strip and underground mining, coal and uranium mining, metal mining, and open cut mining. These provisions are relevant and appropriate, but are not directly applicable for two reasons. First, although the contamination and hazardous substance occurrences at the Flue Dust Operable Unit result from mining and demolition activities, the reclamation activities contemplated to be performed at the site will be performed in conjunction

## Table 4.3

## Screening Analysis of Action-Specific Montana ARARs
## Flue Dust Operable Unit

| Standard Requirements Criteria or Limitation | Citation | Applicable | Relevant and Appropriate |
|---|---|---|---|
| **ACTION-SPECIFIC** | | | |
| 1. Montana Reclamation Requirements | | | |
| The Montana Strip and Underground Mine Reclamation Act | MCA 82-4-231, 233 | No | Yes |
| Strip and Underground Mine Reclamation Backfilling and Grading Requirements | ARM §§ 26.4.501, 501(A), 505, 520, 631, 633, 634, 636, 638, 639, 640, 641, 642 | No | Yes |
| Strip and Underground Mine Reclamation Top Soiling, Revegetation, and Protection of Wildlife and Air Resources Restrictions | ARM §§ 26.4.703, 711, 713, 714, 716-719, 721, 723-730, 751, 761 | No | Yes |
| 2. Montana Hazardous Waste Management Regulations | | | |
| Hazardous Waste Management Regulations | ARM §§ 16.44.701-703 | Yes | No |
| 3. Solid Waste | | | |
| The Montana Solid Waste Management Act | MCA 75-10-212 | Yes | No |
| Solid Waste Management Regulations | ARM §§ 16.14.505, 520, 523 | Yes | No |
| 4. Air Quality | | | |
| The Clean Air Act of Montana | | | |
| Emissions Control Regulations | ARM § 16.8.1103, .1401(2) & (3) | Yes | No |

Table 4.3 (Continued)

**Screening Analysis of Action-Specific Montana ARARs**
**Flue Dust Operable Unit**

| Standard Requirements Criteria or Limitation | Citation | Applicable | Relevant and Appropriate |
|---|---|---|---|
| New Source Performance Standards | ARM § 16.8.1423 | Yes | No |
| Odors and Fumes, Public Nuisance | ARM § 16.8.1427 | Yes | No |
| Ambient Air Quality Standards | | | |
| Carbon Monoxide | ARM § 16.8.811 | Yes | No |
| Hydrogen Sulfide | ARM § 16.8.814 | Yes | No |
| Nitrogen Dioxide | ARM § 16.8.816 | Yes | No |
| Sulfur Dioxide | ARM § 16.8.820 | Yes | No |
| 5. Occupational Health and Safety | | | |
| The Montana Safety Act | MCA 50-71-201 | Yes | No |
| The Employee and Community Hazardous Chemical Information Act | MCA 50-78-202-204, 305 | Yes | No |
| 6. Water Quality | MCA § 75-5-605 | Yes | No |
| | MCA § 85-2-505 | Yes | No |

with response action, rather than mining. Second, many of the statutory programs governing reclamation at different types of mine sites contain "grandfather" provisions which exclude older mining operations from reclamation requirements. Nevertheless, to the extent that particular reclamation provisions were designed to address conditions or activities sufficiently similar to the conditions found at the site or activities to be performed in conjunction with site remediation, such reclamation provisions are relevant and appropriate. The Strip and Underground Mine Reclamation Act is particularly well-suited for the Flue Dust Operable Unit remedial activities because it was developed to address conditions, such as those found at the site, caused by earth moving and other disturbances on the ground surface.

The Montana Strip and Underground Mine Reclamation Act

MCA 82-4-231 (Relevant and Appropriate). As rapidly, completely and effectively as the most modern technology and the most advanced State of the art will allow, each operator shall reclaim and revegetate the land affected by his operation. This section requires reclamation activities such as grading, backfilling, subsidence stabilization, water control, topsoiling and other measures necessary to eliminate damage to landowners and members of the public, their real and personal property, public roads, streams, and all other public property from soil erosion, subsidence, landslides, water pollution, and hazards dangerous to life and property. Additionally, this Section requires that the owner: (1) impound, drain or treat all runoff or underground mine water so as to reduce soil erosion, damage to grazing and agricultural lands, and pollution of surface and subsurface water; (2) to the extent possible using the best technology currently available, minimize disturbances and adverse impacts of the operation on fish, wildlife, and related environmental values and achieve enhancement of such resources where practicable; (3) avoid acid or other toxic mine drainage; (4) prevent, to the extent possible using the best technology currently available, additional contributions of suspended solids to streamflow or runoff; and (5) stabilize and protect all surface areas, including spoil piles, to effectively control air pollution. The substantive portions of this statute which address revegetation are relevant and appropriate (see explanation below). The substantive portions which address water drainage and protection are outside the scope of this action.

MCA 82-4-233 (Relevant and Appropriate). This section requires that after the operation has been backfilled, graded, topsoiled and approved, the operator "shall prepare the soil and plant such legumes, grasses, shrubs, and trees as are necessary to establish on the regraded areas

and all other lands affected a diverse, effective and permanent vegetative cover of the same seasonal variety native to the area of land to be affected and capable of self-regeneration and plant succession at least equal in extent of cover to the natural vegetation of the area." The vegetative cover must be capable of feeding and withstanding grazing pressure from wildlife and livestock, regenerating under natural conditions prevailing at the site and preventing soil erosion. These revegetation requirements are not applicable because a jurisdictional prerequisite for these requirements (i.e., prior coal or uranium mining) is not satisfied. However, the revegetation standards are relevant and appropriate requirements. The standards address cleanup of sites affected by mining and mining waste. This is a situation sufficiently similar to the situation at the Flue Dust Operable Unit, such that the standards are well-suited and relevant and appropriate for use here. These standards apply to cleanup of the existing waste pile and to the creation of a new disposal area.

Strip and Underground Mine Reclamation Act Backfilling and Grading Regulations

ARM § 26.4.501 (Relevant and Appropriate). This provision requires backfilling and grading to the approximate original contour of the land. Slope grade and methods for achieving approximate original contours are also identified. Backfill material must be placed to minimize adverse effects on groundwater, on- and off-site. This requirement is relevant and appropriate to certain Flue Dust Operable Unit response alternatives.

ARM § 26.4.501(A) (Relevant and Appropriate). All final grading on the area of land affected must be to the approximate original contour of the land, per this Section. No final graded soils may be steeper than 5 horizontal to 1 vertical, with limited exceptions. Moreover, the disturbed area must be blended with surrounding undisturbed ground to provide a smooth transition with the existing topography. For the same reasons stated above, these requirements are relevant and appropriate to cleanup associated with the selected remedial alternative.

ARM § 26.4.505 (Relevant and Appropriate). In accordance with this Section, acid-forming, toxic-forming, combustible or any other waste materials identified by the State of Montana that are exposed, used, or produced during mining shall be covered with the best available non-toxic and noncombustible material. "If necessary to protect against upward migration of salts or exposure by erosion, to provide an adequate depth for plant growth or to otherwise meet local conditions, . . thicker amounts of cover using noncombustible and nontoxic material or the use of special

compaction and isolation techniques to prevent contact of these materials with groundwater" may be required. Acid-forming or toxic-forming materials shall not cause or pose a threat of water pollution. This Section is relevant and appropriate for all portions of the site where exposed tailings or contaminated soils are to be consolidated and capped or capped in place.

ARM § 26.4.520 (Relevant and Appropriate). Spoil materials, tailings and contaminated soils may be disposed of on-site in accordance with the requirements of this section. Leachate and surface runoff from the fill must not degrade surface or groundwater or exceed effluent limitations. The disposal area must not contain springs, natural watercourses, or wet weather seeps unless lateral drains are constructed from the wet areas to prevent water infiltration. Underdrains must consist of durable rock or pipe and be designed and constructed consistent with current, prudent engineering practices. Slope protection must be provided to minimize surface erosion. The material must be transported and placed in a controlled manner, in horizontal lifts not exceeding 4 feet in thickness, concurrently compacted as necessary to ensure mass stability and prevent mass movement, covered and graded to allow surface and subsurface drainage compatible with the natural surroundings and to ensure a long-term static safety factor of 1.5. Inspection for stability is required quarterly. Color photographs of the underdrain must be taken as the underdrain system is being formed. An earthquake safety factor of at least 1.1 must be used. Surface water runoff from areas adjacent to and above the fill must not be allowed to flow into the fill and must be diverted into stabilized diversion channels designed to safely pass the runoff from a 100-year, 24-hour precipitation event. All disturbed areas, including diversion ditches that are not riprapped, must be vegetated upon completion of construction. For the same reasons stated above, these requirements are relevant and appropriate for certain Flue Dust Operable Unit response alternatives.

Section 26.4.631 (Relevant and Appropriate). In accordance with this section, reclamation operations must be planned and conducted to minimize disturbance to the prevailing hydrologic balance and to prevent material damage to the prevailing hydrologic balance outside the operable unit. Thus, changes in water quality and quantity must be minimized and reclamation practices that will prevent or minimize water pollution should be emphasized. Proper pollution control and minimization practices include, but are not limited to, stabilizing disturbed areas, diverting runoff, regulating channel velocity of water, achieving quickly germinating and growing stands of temporary vegetation, lining drainage channels with proper vegetation, and mulching.

Section 26.4.633 (Relevant and Appropriate). This section specifies that "all surface draining from the disturbed area, including disturbed areas that have been graded, seeded, or planted, must be treated by the best technology currently available." Sediment control must be maintained until the disturbed area has been restored and revegetation requirements have been met.

Section 26.4.634 (Relevant and Appropriate). Design of reclaimed drainages must emphasize channel and floodplain dimensions that will blend with the undisturbed drainage above and below the area to be reclaimed. Further, this section requires that reclamation establish or restore the channel to its natural habitat or characteristic pattern with a geomorphically acceptable gradient. The drainage must safely pass through a 24-hour precipitation event with a 100-year recurrence interval or larger event as determined by the agency. In addition, reclamation must provide for long-term stability of the landscape, establishment or restoration of the stream to include a diversity of aquatic habitats (generally a series of riffles and pools) and restoration, enhancements or maintenance of natural riparian vegetation.

Section 26.4.636 (Relevant and Appropriate). Some remedial activities at the site may include temporary diversion structures. If so, this section requires that temporary diversions be constructed to safely pass the peak runoff from a precipitation event with a 10-year, 24-hour recurrence interval. Channel lining must be designed using standard engineering practices, such as riprap, to safety pass designed velocity. Free board must be no less than 0.3 feet. Energy dissipators must be installed in streams where existing velocity of the diversion is greater than the receiving water.

Section 26.4.638 (Relevant and Appropriate). This section specifies sediment control measures and requires that such measures be designed, constructed, and maintained using the best technology currently available to prevent additional contributions of sediment to stream flow or runoff, to meet the most stringent applicable state or federal effluent limitations, and to minimize erosion to the extent possible.

Section 26.4.639 (Relevant and Appropriate). This section specifies in greater detail the requirements for sedimentation ponds. Sedimentation ponds must provide the required detention time adequate to meet effluent limitations for the water inflow or runoff entering the pond from a 10-year, 24-hour precipitation event (design event), plus the average underground inflow applicable. The water storage resulting from inflow must be removed by a non-clogging

dewatering device or a conduit spillway and must have a discharge rate to achieve and maintain the required theoretical detention time. The dewatering device must not be located at a lower elevation than the maximum elevation of the sediment storage volume. The design must prevent short-circuiting to the extent possible. There must not be out-flow through the emergency spillway during the passage of the runoff resulting from the 10-year, 24-hour precipitation event or lesser events through the sedimentation pond. Sediment must be removed from the ponds when the volume of sediment accumulates to 60 percent of the design sediment storage volume. An appropriate combination of principal and emergency spillways must be provided to safely discharge the runoff from a 24-year, 24-hour precipitation event.

The minimum elevation at the top of the settled embankment must be 1 foot above the water surface in the pond with the emergency spillway flowing at designed depths; the construction height of the dam must be increased a minimum of 5 percent over the design height to allow for settlement. The minimum top width of the embankment must be less than the quotient of (H + 35)/5, where H is the height, in feet, of the embankment as measured from the upstream toe of the embankment. The combined upstream and downstream side slopes of the settlement embankment must not be less than 5h:lv, with neither slope steeper than 2h:lv. If the sedimentation pond has an embankment that is more than 20 feet in height or has a storage volume of 20-acre feet or more, an appropriate combination of principal and emergency spillways that will discharge safely the runoff resulting from a 100-year, 24-hour precipitation event must be provided. The embankment must be designed and constructed with a static safety factor of at least 1.5, and a seismic safety factor of at least 1.2. The entire embankment, including the surrounding areas disturbed by construction, must be stabilized with a vegetative cover or other means immediately after the embankment is completed in order to protect against erosion and sudden drawdown. The active upstream face may be riprapped or otherwise stabilized. Areas in which vegetation is not successful or where rills and gullies develop must be repaired and revegetated.

Section 26.4.640 (Relevant and Appropriate). This section describes control requirements for discharges from sedimentation ponds, permanent and temporary impoundments and diversions. Such discharges must be controlled by energy dissipators, riprapped channels or other devices to reduce erosion, to prevent deepening or enlargement of stream channels and to minimize disturbance of the hydrologic balance.

Section 26.4.641 (Relevant and Appropriate). This section requires that drainage from acid- and toxic-forming spoil into ground and surface water must be avoided and, further, specifies the methodology for avoiding such drainage, including preventing water from coming into contact with spoil material and storing spoil on impermeable material, protected from erosion and contact with surface water.

Section 26.4.642 (Relevant and Appropriate). This section prohibits permanent impoundments unless they can be constructed and operated in compliance with the following requirements: discharge of water from the impoundment will not degrade the quality of receiving water; the level of water will be sufficiently stable to support the intended use, water impoundments will not result in the diminution of the quality or quantity of water used by adjacent or surrounding landowners; design, construction and maintenance will achieve the minimum design requirements applicable to structures constructed and maintained under the Water shed Protection and Flood Prevention Act (16 U.S.C. § 1006), the impoundment will have a minimum static safety factor of 1.5 with steady seepage saturation conditions and a seismic safety factor of at least 1.2; slope protection to minimize surface erosion at the site and sediment control measures must be provided for all embankments; the surrounding areas and diversion ditches disturbed or created by construction must be graded, fertilized, seeded and mulched immediately after the embankment is completed; and embankments must be routinely inspected and maintained.

ARM § 26.4.644 (Relevant and Appropriate). Protection of groundwater recharge. This section pertains to the restoration and maintenance of recharge capacity.

Strip and Underground Mine Reclamation Act Top Soiling, Revegetation, and Protection of Wildlife and Air Resources Regulations

ARM § 26.4.703 (Relevant and Appropriate). Materials other than, or along with, soil for final surfacing of disturbances may be allowed if the resulting medium is at least as capable as soil of supporting the approved vegetation and post-remedial activity land use. Moreover, the medium must be the best available within the area to support vegetation. The substantive parts of this regulation are relevant and appropriate.

ARM § 26.4.711 (Relevant and Appropriate). In accordance with this section, "a diverse, effective, and permanent vegetative cover of the same seasonal variety native to the area . . . affected and

capable of meeting the criteria set forth in 82-4-233 shall be established on all areas of land affected except water areas and surface areas of roads . . ." This regulation is relevant and appropriate.

ARM § 26.4.713 (Relevant and Appropriate). This section specifies that seeding and planting of disturbed areas must be conducted during the "first normal period for favorable planting and final preparation" but in no case more than ninety days after top soil has been replaced. This regulation is relevant and appropriate.

ARM § 26.4.714 (Relevant and Appropriate). Pursuant to this Section, as soon as practicable, a mulch or cover crop of small grains, grasses or legumes or both must be used on all regraded and resoiled areas to control erosion, promote germination of seeds and increase the moisture retention of the soil until adequate permanent cover is established. This regulation is relevant and appropriate.

ARM § 26.4.716 (Relevant and Appropriate). Revegetation must encourage a prompt vegetative cover and recovery of productivity levels. A permanent diverse vegetative cover shall be established by drill or broadcast seeding or planting, by seedling transplant, by establishing sod plugs or by other methods. Revegetation must be capable of self-regeneration. Seed and seedlings genotypical adapted to the area must be used when available. Seed mixes free of weedy or other undesirable species shall be used.

ARM § 26.4.717 (Relevant and Appropriate). Whenever tree species are necessary, trees adapted for local site conditions and climate shall be used.

ARM § 26.4.718 (Relevant and Appropriate). Soil amendments must be used as necessary to aid in the establishment of permanent vegetative cover. Irrigation, management, fencing or other measures may also be used after review and approval by the agencies.

ARM § 26.4.719 (Relevant and Appropriate). Livestock grazing on reclaimed land is prohibited until revegetation is established to sustain managed grazing.

ARM § 26.4.721 (Relevant and Appropriate). In accordance with this Section, rills and gullies must be filled, graded or otherwise stabilized and the area reseeded.

ARM § 26.4.723 (Relevant and Appropriate). This Section requires the site operator to conduct periodic measurements of vegetation, soils and water to identify conditions during the period of liability. Administrative requirements are not ARARs. However, EPA will require operation and maintenance activities for any past or new disposal site at which waste remains. The substantive portions of this regulation are relevant and appropriate.

ARM § 26.4.724 (Relevant and Appropriate). Success of revegetation shall be measured on the basis of unmined reference areas approved by the agencies. At least one reference area shall be established for each native community if found within the area.

ARM § 26.4.726 (Relevant and Appropriate). This section sets out requirements on the revegetated area and the reference area for vegetation production cover, density, diversity and utility.

ARM § 26.4.728 (Relevant and Appropriate). Permanence of vegetation in the revegetated areas must be established by showing that the revegetated area is composed of at least 51% native species and introduced species are present in a minority.

ARM § 26.4.730 (Relevant and Appropriate). The revegetated area must furnish palatable forage in comparable quantity and quality during the same grazing period as the reference areas.

ARM § 26.4.751 (Relevant and Appropriate). Pursuant to this Section, required site activities must be conducted so as to avoid or minimize impacts to important fish and wildlife species, including critical habitat and threatened or endangered species identified at the site. Proper mitigation measures may include fencing, cover or other appropriate methods to exclude wildlife from ponds that contain hazardous concentrations of toxic-forming material. Reclamation must provide for habitat needs for various wildlife species in an equal or greater capacity than was provided prior to mining. Plant groupings and water sources must be distributed to fulfill the requirements of fish and wildlife. Wetlands and other habitats of unusually high value for fish and wildlife must not be disturbed and where practicable, shall be enhanced. Natural riparian vegetation shall not be disturbed and, where practicable, shall be enhanced. Stream channels must be restored.

ARM § 26.4.761 (Relevant and Appropriate). This Section requires fugitive dust control measures and specifies a variety of options for such measures, including: watering of unpaved roads, chemical stabilization, paving roads, prompt removal of dust-forming debris, restricting vehicle speed, revegetating, mulching or otherwise stabilizing the surface of all areas adjoining roads that are the sources of fugitive dust, restricting travel of unauthorized vehicles, enclosing, covering, watering or otherwise treating loaded haul trucks, substituting conveyer systems for haul trucks and covering conveyer systems when conveyed loads are subject to wind erosion, minimizing the area of disturbed lands, prompt revegetation of regraded lands, planting of special windbreak vegetation at critical points, restricting activities causing fugitive dust during periods of air stagnation, reducing the period of time between initially disturbing the soil and revegetating. Air monitoring equipment must be installed and monitoring must be conducted.

ARM § 26.4.1819 (Relevant and Appropriate). Water quality treatment. Drainage of any water with a pH of less than 6 or more than 9 or which contains iron concentration in excess of 7 milligrams/liter must be prevented. The total alkalinity must exceed the total acidity and the turbidity shall not exceed 100 J.C.U. This section also specifies the maximum total increase to naturally occurring stream turbidity, limits the amount of contaminant concentrations from surface discharges and specifies that water is to be treated to meet acceptable concentrations.

### 4.3.2 Montana Hazardous Waste Management Regulations

The Flue Dust Operable Unit currently contains discrete waste management units. Some of these are similar to waste piles regulated pursuant to Montana hazardous waste management statutory and regulatory requirements. In addition, the disposal cell or repository would resemble a landfill unit regulated by Montana hazardous waste management requirements. Accordingly, certain landfill, waste pile, groundwater monitoring, maintenance, closure, post-closure and related hazardous waste management requirements ARARs for purposes of site cleanup. The justification for this determination is found in the Federal ARARs Section 3.0.

#### Hazardous Waste Management Regulations

ARM §§ 16.44.701 - 16.44.703 (Applicable). These regulations incorporate sections of 40 CFR Part 264 as part of the Administrative Rules of Montana. These federal regulations have already

been designated relevant and appropriate (see Section 3). The State of Montana has an authorized hazardous waste program and thus its regulations are applicable.

### 4.3.3 Solid Waste

All waste materials within the Flue Dust Operable Unit that are not regulated under or subject to hazardous waste management requirements are subject to Montana solid waste management requirements.

#### The Montana Solid Waste Management Act

MCA 75-10-212 (Applicable). This Section makes it unlawful to dispose of solid waste except as prescribed by the Montana Solid Waste Management Act. Such disposal is also prohibited on privately owned property where hunting, fishing or other recreation is permitted, with certain exceptions.

#### Solid Waste Management Regulations

ARM § 16.14.505 (Applicable). The standards for solid waste disposal are set forth in this provision and include: preclusion against location of solid waste disposal sites in a 100-year floodplain; location of sites only in areas that will prevent the pollution of ground and surface waters and public and private water supplies; installation of drainage structures where necessary to prevent surface runoff from entering disposal areas; and location of sites to allow for reclamation and reuse of the land.

ARM § 16.14.520 (Applicable). General operational and maintenance requirements for solid waste management systems are established pursuant to this Section. This Section requires that solid waste disposal be confined to areas within the disposal site that can be effectively maintained and operated.

ARM § 16.14.523 (Applicable). Solid waste must be transported in such a manner as to prevent its discharge, dumping, spilling or leaking from the transport vehicle.

### 4.3.4 Air Quality

The Clean Air Act of Montana and implementing regulations include certain action-specific requirements to ensure that the specific standards set forth are met. These ARARs are discussed in detail below.

Air Quality Regulations

ARM § 16.8.1103 (Applicable). This Section identifies emission control requirements applicable to operators of new or altered sources for which an air quality permit is required. In the event that the removal action creates a new or altered source for which an air permit is required under ARM § 16.8, Subchapter 11, the substantive provisions of Section 16.8.1103 are applicable ARARs for the Flue Dust Operable Unit cleanup. It should be noted that Section 121(e) of CERCLA exempts on-site actions from requirements to obtain a permit. It is not anticipated that a new or altered source will be created in this action.

ARM § 16.8.1401(2) and (3) (Applicable). "No person shall cause or authorize the production, handling, transportation or storage of any material unless reasonable precautions to control emissions of airborne particulate matter are taken." Moreover, "no person shall cause or authorize the use of any street, road or parking lot without taking reasonable precautions to control emissions of airborne particulate matter."

ARM § 16.8.1424 (Applicable). Adopts by reference the Federal New Source Performance Standards (NSPS) found in 40 CFR part 61.

ARM § 16.8.1427 (Applicable). This section prohibits any person from operating any business or using any machine, equipment, device or facility in such a manner as to create a public nuisance arising from emissions of odor bearing gasses, vapors, fumes or dusts.

ARM § 16.8.811 (Applicable). This Section identifies ambient air quality standards and measurement methods for carbon monoxide. Montana's hourly average concentration standard is more stringent than the Federal hourly average concentration standard. Section 16.8.811 is an applicable requirement for the Flue Dust Operable Unit cleanup. The standard is:

23 ppm CO, hourly averages, not to be exceeded more than 1 X per year.

9 ppm CO, 8 hour average, not to be exceeded more than 1 X per year.

ARM § 16.8.814 (Applicable). This Section specifies the ambient air quality standard and measurement method for hydrogen sulfide. This Section is an applicable requirement. The standard is:

0.05 ppm $H_2S$, hourly average, not to be exceeded more than 1 X per year.

ARM § 16.8.816 (Applicable). This Section specifies the ambient air quality standard and measurement method for nitrogen dioxide. This Section is an applicable requirement. The standard is:

0.03 ppm NOx, hourly average, not to be exceeded more than 1 X per year.

0.05 ppm NOx, annual average, not to be exceeded.

ARM § 16.8.820 (Applicable). This Section specifies the ambient air quality standard and measurement method for sulfur dioxide. This Section is an applicable requirement. The standard is:

0.50 ppm, hourly average, not to be exceeded more than 18 X per 12 month period.

0.10 ppm, 24 hour average, not to be exceeded more than 1 X per year.

0.02 ppm, annual average, not to be exceeded.

4.3.5 Occupational Safety

The Montana Safety Act

MCA 50-71-201 (Applicable). This section requires that every employer furnish a safe place of employment, provide safety devices and safeguards and use practices, operations and processes as are reasonably adequate to render the place of employment safe. The employer must also do every other thing reasonably necessary to protect the life and safety of its employees.

The Employee and Community Hazardous Chemical Information Act

MCA 50-78-202 (Applicable). This Section requires that each employer compile and maintain a work place chemical list which contains the chemical name of each hazardous chemical in the

work place, cross-referenced to generally used common names. This list must indicate the work area in which each such hazardous chemical is stored or used.

MCA 50-78-203 (Applicable). Every employer must maintain the most current material safety data sheets for each hazardous chemical in the work place.

MCA 50-78-204 (Applicable). This Section requires that an employee who may be exposed to hazardous chemicals must be informed of potential or actual exposure and provided access to the work place chemical list and the material safety data sheets for each hazardous chemical.

MCA 50-78-305 (Applicable). This Section requires that every employer provide, at least annually, an education and training program for all employees using or handling hazardous chemicals.

4.3.6 Water Quality

MCA § 75-5-605 (Applicable). This section provides that actions which place or cause pollution of any state waters are prohibited. Discharges or other activities affecting state waters wholly within the Operable Unit are not subject to permit requirements.

MCA § 85-2-505 (Applicable). This section precludes the wasting or contamination of groundwater. Any well producing waters which contaminates other water must be plugged or capped and wells must be constructed and maintained so as to prevent waste, contamination, or pollution of groundwater.

## 5.0 ARARS SUMMARY AND INFORMATION TO BE CONSIDERED

CERCLA §121 requires selection of a remedial action that is protective of human health and the environment. EPA's approach to protecting public health and the environment involves ARARs, TBC's and risk assessment. The risk assessment includes consideration of site-specific factors such as types of hazardous substances present, potential for exposure, and the presence of sensitive populations. Acceptable exposure levels are generally determined by Federal and State ARARs and the following factors: (1) for systemic toxicants, concentration levels to which the human population (including sensitive subgroups) could be exposed on a daily basis without appreciable risk of significant adverse effects during a lifetime; (2) for known or suspected carcinogens, concentration levels that represent an excess upperbound lifetime cancer risk to an individual of between $10^{-4}$ and $10^{-6}$; and (3) other factors related to exposure (such as multiple contaminants at a site or multiple exposure pathways) or to technical limitations (such as detection/quantification limits for contaminants).

The preceding Sections of this document have established the basis and scope for defining ARARs. In this section, the list of ARARs is presented along with TBCs for the cleanup of the Flue Dust Operable Unit.

### 5.1 SUMMARY OF FEDERAL AND STATE ARARs

In Sections 3 and 4, Federal and State Environmental and Facility Siting Laws were reviewed and screened as potential ARARs for the Flue Dust Operable Unit. Tables 5.1 and 5.2 present the applicable (A) or relevant and appropriate (RA) requirements that passed the screening review. Contaminant-, Action- and Location-specific ARARs for the Federal government (Table 5.1) and the State (Table 5.2) are listed. The Alternatives referred to by number in the action-specific sections are those listed in Section 2.4.

The ARARs in Tables 5.1 and 5.2 represent the collection of standards and requirements that must be met or maintained during and after the cleanup action. They are to be used along with health and environmental risk considerations and TBCs in the selection of a remedial alternative.

Table 5.1

**Summary of Screening Analysis of Federal ARARs**
**Flue Dust Operable Unit**

| Standard, Requirement Criteria, or Limitation | Citation | Alternatives | Applicable (A) or Relevant/Appropriate (RA) | Considerations |
|---|---|---|---|---|
| CONTAMINANT SPECIFIC | | | | |
| 1. Clean Air Act | | | | |
| National Emission Standards for Hazardous Air Pollutants | 40 CFR Part 61 | All Alternatives | RA | |
| National Primary and Secondary Air Quality Standards | | All Alternatives | RA | |
| 2. RCRA | | | | |
| Identification | 40 CFR Part 261 | All Alternatives | A | |
| Maximum Concentration Limits | 40 CFR Part 264.94 | All Alternatives | RA | |
| 3. Clean Water Act, Water Quality Criteria, Gold Book Water Quality Criteria | 40 CFR Part 131, 125 | All Alternatives | RA | |
| 4. Safe Drinking Water Act | 40 CFR Part 141.11-141.16, 141.50-141.51 | All Alternatives | RA | |
| 5. OSHA Standards | 29 CFR Part 1910 | All Alternatives | RA | |

Table 5.1 (Continued)

**Summary of Screening Analysis of Federal ARARs**
**Flue Dust Operable Unit**

| Standard, Requirement Criteria, or Limitation | Citation | Alternatives | Applicable (A) or Relevant/Appropriate (RA) | Considerations |
|---|---|---|---|---|
| LOCATION-SPECIFIC | | | | |
| 1. National Historic Preservation Act | 16 USC § 470<br>40 CFR § 6.301(b)<br>36 CFR Part 800 | All Alternatives | A | |
| 2. Historic Sites, Buildings and Antiques Act | 16 USC §§ 461-467<br>40 CFR § 6.301(a) | All Alternatives | A | |
| 3. Archeological and Historic Preservation Act | 16 USC § 469<br>40 CFR Part 469<br>40 CFR Part 6.301(c) | All Alternatives | A | |
| 4. Endangered Species Act | 16 USC §§ 1531 and 1543<br>50 CFR Part 17<br>50 CFR Part 402<br>40 CFR Part 6.302(n) | All Alternatives | A | |
| 5. Fish and Wildlife Coordination Act | 16 USC §§ 661-666 | All Alternatives | A | |
| 6. Protection of Wetlands | 40 CFR Part 6, Appendix A<br>Executive Order No. 11990 | All Alternatives | A | |
| 7. Resource Conservation and Recovery Act | 42 USC §§ 6901 et seq.<br>40 CFR 264.18(a)and(b) | All Alternatives | A | |

Table 5.1 (Continued)

**Summary of Screening Analysis of Federal ARARs**
**Flue Dust Operable Unit**

| Standard, Requirement Criteria, or Limitation | Citation | Alternatives | Applicable (A) or Relevant/Appropriate (RA) | Considerations |
|---|---|---|---|---|
| ACTION SPECIFIC | | | | |
| 1. Resource Conservation and Recovery Act | 40 CFR Part 260 | 3,4,5,6,7,8 | A/RA | |
| Standards Applicable to Generators of Hazardous Waste | 40 CFR Part 262 | 3,4,5,6,7,8 | A/RA | If treatment byproducts are hazardous waste or if waste taken off-site |
| Standards Applicable to Transporters of Hazardous Waste | 40 CFR Part 263 | 3,4,7,8 | A/RA | May not be applicable for on-site transportation, but may be appropriate and relevant |
| Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities | 40 CFR Part 264 | 3,4,5,6,7,8 | A/RA | |
| • General Facility Standards | Subpart B | 3,4,5,6 | A/RA | |
| • Preparedness and Prevention | Subpart C | 3,4,5,6 | A/RA | |
| • Contingency Plan and Emergency Procedures | Subpart D | 3,4,5,6 | A/RA | |
| • Releases from Solid Waste Management Units | Subpart F | 3,4,5,6 | A/RA | |
| • Closure and Post Closure | Subpart G | 3,4,5,6 | A/RA | |

Table 5.1 (Continued)

**Summary of Screening Analysis of Federal ARARs**
**Flue Dust Operable Unit**

| Standard, Requirement Criteria, or Limitation | Citation | Alternatives | Applicable (A) or Relevant/Appropriate (RA) | Considerations |
|---|---|---|---|---|
| • Use and Management of Containers | Subpart I | 3 | A/RA | |
| • Waste Piles | Subpart L | All Alternatives | A/RA | |
| • Landfills | Subpart N | 3,4,5,6,7,8 | A/RA | |
| Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities | 40 CFR Part 266 Subpart F | 4,5,6,7,8 | A/RA | |
| Land Disposal Restrictions | 40 CFR Part 268 | 3,4,5,6 | A/RA | |
| 2. Surface Mining Control and Reclamation Act | 30 USC §§ 1201-1326, 30 USC §§ 816.11 and 784.13 | 3,4,5,6,7,8 | RA | |
| 3. Occupational Safety and Health Act | 29 USC §§ 651-678 | All Alternatives | A | |
| | 29 CFR Part 1910 | All Alternatives | A | |
| | 29 CFR Part 1926 | All Alternatives | A | |
| 4. DOT Hazardous Material Transportation Regulations | 49 CFR Parts 107, 171-177 | 3,7,8 | A | |
| 5. Clean Water Act | | | | |
| Discharge of Effluent | 40 CFR § 125, Subpart K | 3,4,5,6 | A | |

Table 5.1 (Continued)

**Summary of Screening Analysis of Federal ARARs**
**Flue Dust Operable Unit**

| Standard, Requirement Criteria, or Limitation | Citation | Alternatives | Applicable (A) or Relevant/Appropriate (RA) | Considerations |
|---|---|---|---|---|
| 6. Air Quality | | | | |
| New Source Performance Standards | 40 CFR § 60 | 5,6,7,8 | RA | |

Table 5.2

**Summary of Screening Analysis of Montana ARARs**
**Flue Dust Operable Unit**

| Standard, Requirement Criteria, or Limitation | Citation | Alternatives | Applicable (A) or Relevant/Appropriate (RA) | Considerations |
|---|---|---|---|---|
| CONTAMINANT SPECIFIC | | | | |
| 1. Air Quality | | | | |
| The Clean Air Act of Montana | MCA 75-2-102 | All Alternatives | RA | |
| Ambient Air Quality Standards: | | | | |
| Lead | ARM § 16.8.815 | All Alternatives | A | |
| Ozone | ARM § 16.8.817 | All Alternatives | A | |
| Settled Particulate Matter | ARM § 16.8.818 | All Alternatives | A | |
| PM-10 | ARM § 16.8.821 | All Alternatives | A | |
| Visibility | ARM § 16.8.822 | | | |
| Prevention of Significant Deterioration | ARM § 16.28.925-926 | All Alternatives | A | |
| Airborne Particulate Matter | ARM §§ 16.8.1401(4) & (5), 16.8.1403 | All Alternatives | A | |
| Visible Air Contaminants | ARM § 16.8.1404 | All Alternatives | A | |
| 2. Surface Water Quality Standards | MCA 75-5-303, ARM §§ 16.20.601, 602, 604, 605, 616, 617, 618, 631, 632, 633, 702, 703 | All Alternatives | A | |

Table 5.2 (Continued)

**Summary of Screening Analysis of Montana ARARs**
**Flue Dust Operable Unit**

| Standard, Requirement Criteria, or Limitation | Citation | Alternatives | Applicable (A) or Relevant/Appropriate (RA) | Considerations |
|---|---|---|---|---|
| 3. Groundwater Pollution Control System | ARM §§ 16.20.1002, 1003, 1011 | All Alternatives | A | |
| 4. Public Water Supply | MCA 75-6-112, ARM § 16.20.203, 205 | All Alternatives | A | |
| LOCATION-SPECIFIC | | | | |
| 1. Floodplain and Floodway Management | | | | |
| The Floodplain and Floodway Management Act | MCA 76-5-402 | All Alternatives | A | |
| | MCA 76-5-1101 | All Alternatives | RA | |
| | MCA 76-5-1102 | All Alternatives | RA | |
| Floodplain Management Regulations | ARM § 36.15.216 | All Alternatives | RA | |
| | ARM § 36.15.606 | All Alternatives | RA | |
| | ARM § 36.15.801 | All Alternatives | A | |
| 2. Streambeds and Stream Protection | | | | |
| The Natural Streambed and Land Preservation Act of 1975 | | | | |

Table 5.2 (Continued)

**Summary of Screening Analysis of Montana ARARs**
**Flue Dust Operable Unit**

| Standard, Requirement Criteria, or Limitation | Citation | Alternatives | Applicable (A) or Relevant/Appropriate (RA) | Considerations |
|---|---|---|---|---|
| Minimum Standards and Guidelines for Natural Streambed and Land Preservation Act of 1975 | ARM § 36.2.404 | All Alternatives | RA | |
| 3. Major Facility Siting Act | ARM §§ 36.7.2502, 2503-2505 | All Alternatives | RA | Pertains to those alternatives that result in the construction of a permanent facility at the site or in Montana. |
| ACTION-SPECIFIC | | | | |
| 1. Montana Reclamation Requirements | | | | |
| The Montana Strip and Underground Mine Reclamation Act | MCA 82-4-231, 233 | All Alternatives | RA | |
| Strip and Underground Mine Reclamation Backfilling and Grading Requirements | ARM §§ 26.4.501, 501(A), 505, 520, 631, 633, 634, 636, 638, 639, 640, 641, 642, 643, 642, 644, 703, 711, 713, 714, 716, 719, 723, 730, 751, 761, 1819 | All Alternatives | RA | |
| Hazardous Waste | ARM §§ 16.44.701-703 | | A | |

Table 5.2 (Continued)

**Summary of Screening Analysis of Montana ARARs**
**Flue Dust Operable Unit**

| Standard, Requirement Criteria, or Limitation | Citation | Alternatives | Applicable (A) or Relevant/Appropriate (RA) | Considerations |
|---|---|---|---|---|
| 2. Solid Waste | | | | |
| Solid Waste Management Regulations | MCA 75-10-212, ARM §§ 16.14.505, 520, 523 | 5,6,7,8 | A | Applicable only if waste-treatment byproduct waste is not a RCRA hazardous waste. |
| | ARM § 16.40.1103 | All Alternatives | A | |
| 3. Air Quality | | | | |
| The Clean Air Act of Montana | | | | |
| Emissions Control Regulations | ARM §§ 16.8.1103, 1401 (2) & (3) | All Alternatives | A | |
| Air Standards | | | | |
| Carbon Monoxide | ARM § 16.8.811 | All Alternatives | A | |
| Hydrogen Sulfide | ARM § 16.8.814 | All Alternatives | A | |
| Nitrogen Dioxide | ARM § 16.8.816 | All Alternatives | A | |
| Sulfur Dioxide | ARM § 16.8.820 | All Alternatives | A | |
| 5. Occupational Health and Safety | | | | |
| The Montana Safety Act | MCA 50-71-201 | All Alternatives | A | Protects workers on-site during cleanup. |

Table 5.2 (Continued)

**Summary of Screening Analysis of Montana ARARs**
**Flue Dust Operable Unit**

| Standard, Requirement Criteria, or Limitation | Citation | Alternatives | Applicable (A) or Relevant/Appropriate (RA) | Considerations |
|---|---|---|---|---|
| The Employee and Community Hazardous Chemical Information Act | MCA 50-78-202-204, 305 | All Alternatives | A | |
| 6. Water Quality | MCA § 75-5-605 | All Alternatives | A | |
| | MCA § | All Alternatives | A | |

## 5.2 INFORMATION TO BE CONSIDERED (TBCs)

TBCs are criteria, advisories, guidance and proposed standards that are not legally binding, but provide useful information or recommended procedures. These criteria cannot be ARARs, but are evaluated along with ARARs in the feasibility study. Contaminant-specific TBC values, such as health advisories and reference doses are used in the absence of ARARs or where ARARs are not sufficiently protective to develop cleanup goals. Other TBCs may include guidance and policy documents that address a particular situation. Both Federal and State criteria, policy and other guidance may be considered as TBCs.

Potential TBCs from both Federal and State sources have been identified. A list of these TBCs is presented in Table 5.3. Appendix B is the State's designation of TBCs as of December, 1989.

## TABLE 5.3

### List of Criteria, Advisories and Guidance To Be Considered (TBCs)

| | |
|---|---|
| ARM § 26.4.311 | Air monitoring for fugitive dust. |
| ARM § 26.4.312 | Plan for minimizing fish and wildlife impacts. |
| ARM § 26.4.313 | Establishes a Reclamation Plan |
| ARM § 26.4.314 | Establishes informational needs to preserve and protect the hydrologic balance. |
| ARM § 26.4.315 | Establishes requirements of a plan for any surface impoundments or sedimentation ponds. |
| ARM § 26.4.648 | |
| ARM § 26.4.725 | Establishes a period of performance when a bond covers revegetation plantings. |

Chemical Specific Guidance

For the following Flue Dust constituents (based on detected levels and degree of toxicity):

| | | | |
|---|---|---|---|
| Antimony | Chromium | Manganese | Silver |
| Arsenic | Copper | Mercury | Zinc |
| Beryllium | Iron | Molybdenum | |
| Bismuth | Lead | Nickel | |
| Cadmium | Magnesium | Selenium | |

Refer to the appropriate documents for RfDs and Cancer Potency Slope factors.

- Health Profiles. Agency for Toxic Substances and Disease Registry. U.S. Public Health Service.
- Integrated Risk Information Service (IRIS). EPA. Office of Research and Development.
- Health Effects Summary Table. EPA Environmental Criteria and Assessment Office. Published Quarterly.
- Health Effects Assessments and Health Advisory Documents EPA. Office of Research and Development.
- Health Advisories for Drinking Water. EPA. Office of Water.
- Water Quality Criteria. EPA. Office of Water.

General Policy Documents (EPA)

- Risk Assessment Guidance for Superfund. Human Health Evaluation Manual Part A. July 1989. Office of Solid Waste and Emergency Response.
- Risk Assessment Guidance for Superfund. Environmental Evaluation Manual. 1989.
- RCRA Design Guidelines for Surface Impoundments. EPA.
- RCRA Water Pile Design - Liner Systems.
- RCRA Landfill Design - Liner Systems and Final Cover.
- RCRA Land Treatment Units.
- EPA's Ground-Water Protection Strategy.
- Guidance on Remedial Actions for Contaminated Ground Water at Superfund Sites (draft, October 1986).
- Guidance Manual on Hazardous Waste Compatibility
- Management of Hazardous Waste Leachate
- Guide to Disposal of Chemically Stabilized and Solidified Waste
- Evaluating Cover Systems for Solid and Hazardous Waste
- Test Methods for Evaluating Solid Wastes
- Solid Waste Leaching Procedure Manual
- Guidance Manual on Closure and Post-Closure Interim Standards
- Evaluation of the Potential Carcinogenicity of Lead and Lead Compounds in Support of Reportable Quantity Adjustments Pursuant to CERCLA Section 102. EPA/600/8-89/045A, Office of Health and Environmental Assessment.
- Interim Guidance on Establishing Soil Lead Cleanup Levels at Superfund Sites. OSWER Dir # 9355.-02.
- Recommended Agency Policy of the Carcinogenicity Risk Associated with the Ingestion of Inorganic Arsenic. June 21, 1988. Lee Thomas, EPA Administrator.

Regulations and Standards that are not ARARs but may contain information to be considered towards the final site disposition or management of treated waste.

- Solid Waste Disposal Act. 42 USC §§ 6901-6987
- Guidelines for Land Disposal of 40 CFR Part 241 and Disposal
- Stream Protection Act. MCA 87-5-501
- Montana Strip and Underground Mine Reclamation Act. MCA 82-4-202
- Montana Hazardous Waste Act. MCA 75-10-402
- Montana Solid Waste Management Act. MCA 75-10-202, 212, 214
- Ground Water. MCA § 85-2-412
- Water Quality. MCA § 85-5-506
- Water Quality. MCA § 85-7-104
- Other TBCs designated by the State of Montana in December, 1989.

## 6.0 REFERENCES


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USEPA. 1989b. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. Risk assessment guidance for Superfund. Human Health Evaluation Manual Part A. Washington, DC: U.S. Environmental Protection Agency. OSWER Directive 9285.701A.

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APPENDIX A

STATE OF MONTANA ARARS IDENTIFIED TO EPA
JANUARY 1990

**STATE OF MONTANA**
**ARARS**
**FLUE DUST OPERABLE UNIT**

INTRODUCTION

Remedial actions undertaken pursuant to Superfund must satisfy applicable or relevant and appropriate state and federal requirements ("ARARs"). ARARs, with few exceptions, serve as threshold criteria for site cleanup. In this portion of Appendix B, Montana has identified applicable or relevant and appropriate state statutory and regulatory requirements for the Flue Dust Operable Unit. Montana's ARARs may be narrowed to address specifically the remedy that is selected. Remedy selection and, therefore, ARARs refinement will be presented in the Record of Decision. As provided by Section 121 of CERCLA, 42 U.S.C. § 9621, where more than one ARAR applies to a contaminated medium or cleanup activity, the more stringent standard, requirement, criteria or limitation will apply.

A distinction exists between "applicable" requirements and those that are "relevant and appropriate." "Applicable" requirements are those requirements that would legally apply at the site regardless of the CERCLA action. "Relevant and appropriate" requirements are those requirements that are not applicable, but address situations or problems sufficiently similar to those at the site and, therefore, are well suited for use at the site.[1] Attainment of both "applicable" as well as "relevant and appropriate" requirements is equally mandatory under Superfund.[2]

ARARs have been grouped into three categories: chemical-specific, action-specific, and location-specific. Chemical-specific ARARs include those laws and regulations governing the release to the environment of materials possessing certain chemical or physical characteristics or containing specific chemical compounds. chemical-specific ARARs generally set health- or risk-based numerical values or methodologies which, when applied to site-specific conditions, result in the establishment of numerical values. These values establish the acceptable amount or concentration of a chemical that may be found in, or discharged to, the ambient environment.[3] Location-specific ARARs are restrictions placed on the concentration of hazardous substances or the conduct of cleanup activities because they are in specific locations. Location-specific ARARs relate to the geographic or physical

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[1]CERCLA § 121(d)(2)(A), 42 U.S.C. § 9621(d)(2)(A); 40 C.F.R. 300.6 (1987). See also, Memorandum on CERCLA Compliance with Other Laws, 50 Fed. Reg. 47,946, 47,947 (Nov. 20, 1985); and USEPA, 1988a.

[2]Id.

[3]USEPA, 1988a.

position of the site, rather than to the nature of the site contaminants. Lastly, action-specific ARARs are usually technology- or activity-based requirements or limitations on actions taken with respect to hazardous substances. A particular remedial activity will trigger an action-specific ARAR. Unlike chemical-specific and location-specific ARARs, action-specific ARARs do not, in themselves, determine the remedial alternative. Rather, action-specific ARARs indicate how the remedy, once selected, must be achieved.[4]

In addition to ARARs, the NCP states that "pertinent other federal criteria, advisories, and guidance and State standards will be considered and may be used in developing alternatives, with adjustments for site-specific circumstances."[5] Montana has identified certain such criteria, advisories and guidance "to be considered" to ensure protection of human health and the environment (also known as "to be considereds" or "TBCs"). These TBCs are identified in a separate list following Montana's ARARs identification.

Superfund defines as ARARs only federal environmental laws and state environmental or facility siting laws. Remedial design, implementation, operation and maintenance must, nevertheless, comply with all other applicable laws, both state and federal. Many such laws, while not strictly environmental or facility siting laws, have environmental impacts. The State of Montana has identified, in a separate list attached to the State's ARARs list, a non-comprehensive identification of state law requirements to be incorporated in the record of decision, during remedial design, or for remedy implementation, operation or maintenance.

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[4] Id.

[5] 42 C.F.R. § 300.68(i)(4).

**State ARARs**
**Summary of Preliminary Analysis of Montana ARARs**
**Flue Dust Operable Unit**

| Standard, Requirement, Criteria or Limitation | Citation | Applicable | Relevant and Appropriate |
|---|---|---|---|
| Contaminant Specific | | | |
| **Occupational Health** | MCA-50-70-101 50-70-113 | Yes | Yes |
| Noise and Air Contaminants | ARM 16.42 101 | Yes | Yes |
| Occupational air Contaminants | ARM 16.42.102 | Yes | Yes |
| **Clean Air Act** | MCA 75-2-102 | | |
| Ambient Air Quality Standards for Lead | ARM 16.8.815 | Yes | Yes |
| Ambient Air Quality for Ozone | ARM 16.8.817 | Yes | Yes |
| Ambient Air Quality Standard for Settled Particulate Matter | ARM 16.8.818 | Yes | Yes |
| Ambient Air Quality Standard for PM-10 | ARM 16.8.821 | Yes | Yes |
| Ambient Air Increments | ARM 16.8.925 | Yes | Yes |
| Ambient Air Limits | ARM 16.8.926 | Yes | Yes |
| Particulate Matter Limits | ARM 16.8.1401 and 1403 | Yes | Yes |
| Visible air Contaminants | ARM 16.8.1404 | Yes | Yes |
| New Source Performance Standards | ARM 16.8.1423 | No | Yes |
| National Emission Standards for Hazardous Air Pollutants | ARM 16.8.1424 | Yes | Yes |
| **Water Quality** | MCA 75-5-101 | | |
| Non Degradation Policy | MCA 75-5-303 | Yes | Yes |
| Water Use Classification | ARM 16.20.604 | Yes | Yes |

| Standard, Requirement, Criteria or Limitation | Citation | Applicable | Relevant and Appropriate |
|---|---|---|---|
| A-1 Classification | ARM 16.20.617 | Yes | Yes |
| B-1 Classification | ARM 16.20.618 | Yes | Yes |
| Treatment Standards | ARM 16.20.631 | Yes | Yes |
| Operations Standards | ARM 16.20.632 | Yes | Yes |
| Prohibition | ARM 16.20.633 | Yes | Yes |
| Radiological Criteria | ARM 16.20.641 | Yes | Yes |
| Non Degradation | ARM 16.20.702 | Yes | Yes |
| Classification of Groundwater | ARM 16.20.1002 | Yes | Yes |
| Groundwater Quality Standards | ARM 16.20.1003 | Yes | Yes |
| Non Degradation of Groundwater | ARM 16.20.1011 | Yes | Yes |
| **Public Water Supplies** | MCA 75-6-101 et seq. | | |
| Procedural Rules | ARM 16.20.201 | No | Yes |
| Maximum Inorganic Chemical Contaminant Levels | ARM 16.20.203 | No | Yes |
| Maximum Turbidity Contaminant Levels | ARM 16.20.205 | No | Yes |
| Maximum Radiological Contaminant Levels | ARM 16.20.206 | No | Yes |
| **Water Use Act** | | | |
| Standards for Determining Fresh Water | MCA 85-2-504 | Yes | Yes |
| Waste and Contamination of Groundwater Prohibited | MCA 85-2-505 | Yes | Yes |
| Groundwater Protection | ARM 16.44.702 | No | Yes |

| Standard, Requirement, Criteria or Limitation | Citation | Applicable | Relevant and Appropriate |
|---|---|---|---|
| **Hazardous Waste Management Act** | MCA 75-10-402 | | |
| Hazardous Waste Management Regulations | ARM 16.44.701-703 | No | Yes |
| **Solid Waste Management** | MCA 75-10-202, 212, 214 | | |
| Solid Waste Management Regulations | ARM 16.14.505, 520, 523 | Yes | Yes |
| **Nuclear Regulations** | | | |
| Stabilization of Mill Tailings | ARM 16.40.1103 | Yes | Yes |
| **Clean Air Act** | MCA 75-2-102 | | |
| Air Quality Regulations | ARM 16.8.1103, 1401, 1424, 1427 | Yes | Yes |
| **Occupational Health** | MCA 50-70-101 et seq. | | |
| Montana Safety Act | MCA 50-70-201 | Yes | Yes |
| Employee and Community Hazardous Chemical Information Act | MCA 50-78-202-204, 307 | Yes | Yes |
| **Water Resources** | MCA 85-2-101 | | |
| Montana Water Program | MCA 85-1-601 | Yes | Yes |
| Development Program Act | MCA 85-2-101,412 | Yes | Yes |
| Natural Streambed and Land Preservation Act | MCA 75-7-104 | Yes | Yes |
| Streambed Protection Act | MCA 87-5-506 | Yes | Yes |
| **Nuclear Regulation** | MCA 75-3-304 | | |
| Permissible Doses | ARM 16.40.401-402, 404-406 | Yes | Yes |
| **Dept. of State Lands** | MCA 82-4-101 et seq. | | |

| Standard, Requirement, Criteria or Limitation | Citation | Applicable | Relevant and Appropriate |
|---|---|---|---|
| Abandoned Pits: Objectionable Effluents | ARM 26.4.109 | No | Yes |
| Water Quality Standards and Effluents | ARM 26.4.633 | No | Yes |
| Water Quality Treatment | ARM 26.4.1819 | No | Yes |
| Location Specific | | | |
| **Flood Plain and Flood Way Management** | MCA 75-5-101 et seq. | | |
| Floodplain and Floodway Management Act | MCA 76-5-203<br>MCA 76-5-402<br>MCA 76-5-1101<br>MCA 76-5-1102 | Yes<br>Yes<br>No<br>No | Yes<br>Yes<br>Yes<br>Yes |
| Floodplain Management Regulations | ARM 36.15.216<br>ARM 36.15.606<br>ARM 36.15.801 | No<br>No<br>Yes | Yes<br>Yes<br>Yes |
| **Streambeds and Stream Protection** | MCA 75-7-102 | | |
| Minimum Standards and Guidelines | ARM 36.2.404 | No | Yes |
| Stream Protection Act | MCA 87-5-501 | Yes | Yes |
| **Major Facility Siting Act** | ARM 36.7.2502-2505 | No | Yes |
| Action Specific | | | |
| **Montana Reclamation Requirements** | | | |
| Strip and Underground Mine Reclamation Act | MCA 82-4-202<br>MCA 82-4-231,233 | No<br>No | Yes<br>Yes |
| Strip and Underground Mine Reclamation Permit Application Regulations | ARM 26.4.311<br>ARM 26.4.312-315 | No<br>No | Yes<br>Yes |
| Strip and Underground Mine Reclamation Act | ARM 26.4.501<br>ARM 26.4.501(A) | No<br>No | Yes<br>Yes |

| Standard, Requirement, Criteria or Limitation | Citation | Applicable | Relevant and Appropriate |
|---|---|---|---|
| Backfilling and Grading Regulations | ARM 26.4.505<br>ARM 26.4.520 | No<br>No | Yes<br>Yes |
| Strip and Underground Mine Reclamation Hydrology Regulations | ARM 26.4.631<br>633, 634, 636<br>638-642,644,648 | No<br>No<br>No | Yes<br>Yes<br>Yes |
| Strip and Underground Mine Reclamation Act Top Soiling, Revegetation and Protection of Wildlife and Air Resources | ARM 26.4.703, 711, 713, 714, 716-719, 721, 724-730, 751, and 761 | No | Yes |
| **Water Quality** | MCA 75-5-101<br>MCA 75-5-605 | | |
| Surface Water Quality | ARM 16.20.633 | Yes | Yes |
| **Public Water Supplies** | MCA 75-6-112 | | |
| Disposal Wells | ARM 16.20.916 | Yes | Yes |
| Groundwater Pollution Control | ARM 16.20.1016 | No | Yes |

**CONTAMINANT-SPECIFIC ARARS**

1. Occupational Health

50-70-113 EMISSIONS PROHIBITIONS. Emissions prohibition of various pollutants. On-site construction work will require protection of health for workers.

APPLICABLE

Chapter 42 - Occupational Health

Sub-Chapter 1
Noise and Air Contaminants

16.42.101 OCCUPATIONAL NOISE. States purpose of chapter is to establish maximum noise levels. In accordance with this section, no worker shall be exposed to noise levels in excess of the following values (expressed in decibels measured on the A-weighting network (dbA)):

Continuous or Intermittent Noise Exposures

| Duration per Day (in hours) | Noise Level (dbA) |
|---|---|
| 8 | 90 |
| 6 | 92 |
| 4 | 95 |
| 3 | 97 |
| 2 | 100 |
| 1 1/2 | 102 |
| 1 | 105 |
| 3/4 | 107 |
| 1/2 | 110 |
| 1/4 | 115 |

These values apply to the total time of exposure per working day regardless of whether this is one continuous exposure or a number of short-term exposures. If a worker is exposed to noise levels in excess of these values, feasible administrative or engineering controls must be used by the employer to reduce noise levels. If these controls are inadequate, the employer must provide personal hearing protective equipment to achieve the foregoing maximum permissible noise exposure levels.

16.42.102 OCCUPATIONAL AIR CONTAMINANTS. This section establishes maximum threshold limit values for air contaminants under which it is believed that nearly all workers may be repeated exposed day after day without adverse health effects. In accordance with this rule, no worker shall be exposed to air contaminant levels in excess of the threshold limit values listed in each of the tables below. Compliance with the rule is determined by calculating the worker's exposure to air contaminants as individual substances or as the exposure to a mixture of substances in accordance with

formulas established by this rule. A worker's exposure to any contaminant in the following table, shall at no time exceed the threshold limit value listed:

| Air Contaminant | Concentration (in $mg/^3$) |
|---|---|
| Arsenic and compounds (as As) | 0.5 |
| Copper dusts and mists | 1.0 |
| Lead | 0.15 |
| Manganese | 5.0 |
| Selenium compounds (as Se) | 0.2 |
| Silver, Metal and soluble compounds | 0.01 |

A worker's exposure to any air contaminants listed in the following table, in any 8-hour work shirt of a 40-hour work week, shall not exceed the following 8-hour time weighted average limit nor shall a worker's exposure exceed at any time during a 8-hour shift the acceptable ceiling concentration:

| Air Contaminant | 8-Hour Time Weighted Average | Acceptable Ceiling Concentration |
|---|---|---|
| Cadmium dust | 0.2 $mg/m^3$ | 0.6 $mg/m^3$ |
| Mercury | | 0.1 $mg/m^3$ |

A worker's exposure to any of the following air contaminants in an 8-hour work shift of a 40-hour work week shall not exceed the 8-hour time weighted average limit for that air contaminant:

| Air Contaminant | Millions of Particles Per Cubic Foot of air (mppcf)e | Milligrams Per Cubic Meter ($mg/^3$) |
|---|---|---|
| Silica-crystalline quartz (respirable) | $\frac{250}{\% SiO2 + 5}$ | $\frac{10}{\% SiO2 + 2}$ |
| Inert or nuisance dust - | | |
| respirable fraction | 15 | 5 |
| total dust | 50 | 15 |

APPLICABLE

2. Air

75-2-102 POLICY AND PURPOSE. States policy as one to achieve and maintain air quality to protect human health and safety and, to the extent practicable, to prevent injury to plant and animal life and property, and to facilitate the enjoyment of the natural attractions of the state. Although a policy statement, a substantive standard similar to the Water Quality Nondegradation

Policy is included in the words "to achieve and maintain air quality."
APPLICABLE

Title 16
Sub-Chapter 8
Ambient Air Quality

16.8.815 AMBIENT AIR QUALITY STANDARD FOR LEAD. Defines a 90-day average standard for lead in ambient air, which may not be exceeded. Defines method of measurement. Lead may be a component of emissions from hazardous substances.

90-day average: 1.5 micrograms Pb per cubic meter

APPLICABLE

16.8.817 AMBIENT AIR QUALITY FOR OZONE. Ozone concentrations may not be increased more than .1 ppm in any one hour and the method of measurement is specified. A selected remedial action may cause an increase in ozone concentrations.

APPLICABLE

16.8.818 AMBIENT AIR QUALITY STANDARD FOR SETTLED PARTICULATE MATTER. Defines a 30-day average standard for particulate in ambient air which may not be exceeded. The standard is in terms of settled particulate. Defines measurement methods.

Settled particulate may be a component of emissions from the smelter.

30-day average: 10 grams per square meter

APPLICABLE

16.8.821 AMBIENT AIR QUALITY STANDARDS FOR PM-10. No person may cause or contribute to concentrations of PM-10 in the ambient air which exceed the following standard:

| | |
|---|---|
| 24-hour average: | 150 micrograms/cubic meter; not to be exceeded more than 1 time per year |
| annual average: | 50 micrograms/ cubic meter not to be exceeded. |

APPLICABLE

Total suspended particulate matter may be a component of emissions from the smelter.
Sub-Chapter 9
Prevention of Significant Deterioration of Air Quality

16.8.925 AMBIENT AIR INCREMENTS. In accordance with this section, the maximum allowable increases over the baseline

concentrations for sulfur dioxide and particulate matter are as follows:

| Constituent | Concentrations (in micrograms per cubic meter) |
|---|---|
| Total suspended particulate matter | |
| Annual Geometric Mean | 19 |
| 24-hour maximum | 37 |
| Sulfur Dioxide | |
| Annual Arithmetic Mean | 20 |
| 24-hour maximum | 91 |
| 3-hour maximum | 512 |

16.8.926 AMBIENT AIR LIMITS. Adopts federal ambient air quality standards as state standards. The state has received delegation from the federal program and enforces federal standards as state standards.

APPLICABLE

16.8.1401 & 1403 PARTICULATE MATTER LIMITS. Requires reasonable precautions to control particulate matter during handling or transportation. Also requires the lowest achievable emission rate from any new source emitting more than 100 tons per year of particulates. For any industrial process, a table is established that restricts particulate emissions based on process weight per hour. The table follows:

When the process weight exceeds 60,000 pounds per hour, the maximum allowable weight discharged per hour will be determined by use of the following equation:

$$E = 55.0\ P0.11- 40$$

Where E = maximum rate of emission in pounds per hour, P = process weight rate in tons per hour.

| Process Weight (lb./hr.) | Rate (tons/hr.) | Rate of Emission (lb./hr.) |
|---|---|---|
| 100 | 0.05 | 0.551 |
| 200 | 0.10 | 0.877 |
| 400 | 0.20 | 1.40 |
| 600 | 0.30 | 1.83 |
| 800 | 0.40 | 2.22 |
| 1,000 | 0.50 | 2.58 |
| 1,500 | 0.75 | 3.38 |
| 2,000 | 1.00 | 4.10 |
| 2,500 | 1.25 | 4.76 |
| 3,000 | 1.50 | 5.38 |
| 3,500 | 1.75 | 5.96 |
| 4,000 | 2.00 | 6.52 |
| 5,000 | 2.50 | 7.58 |
| 6,000 | 3.00 | 8.56 |
| 7,000 | 3.50 | 9.49 |
| 8,000 | 4.00 | 10.4 |
| 9,000 | 4.50 | 11.2 |
| 10,000 | 5.00 | 12.00 |
| 12,000 | 6.00 | 13.6 |
| 16,000 | 8.00 | 16.5 |
| 18,000 | 9.00 | 17.9 |
| 20,000 | 10.00 | 19.2 |
| 30,000 | 15.00 | 25.2 |
| 40,000 | 20.00 | 30.5 |
| 50,000 | 25.00 | 35.4 |
| 60,000 | 30.00 | 40.0 |
| 70,000 | 35.00 | 41.3 |
| 80,000 | 40.00 | 42.5 |
| 90,000 | 45.00 | 43.6 |
| 100,000 | 50.00 | 44.6 |
| 120,000 | 60.00 | 46.3 |
| 140,000 | 70.00 | 47.8 |
| 160,000 | 80.00 | 49.0 |
| 200,000 | 100.00 | 51.2 |
| 1,000,000 | 500.00 | 69.0 |
| 2,000,000 | 1,000.00 | 77.6 |
| 6,000,000 | 3,000.00 | 92.7 |

Interpolation of the data in this table for process weight rates up to 60,000 lb./hr. shall be accomplished by use of the equation:

$$E = 4.10\ P^{0.67}$$

Interpolation and extrapolation of the data for process weight rates in excess of 60,000 pounds per hour shall be accomplished by use of the equation:

$$E = 55.0\ P^{0.11} - 40$$

Where E = rate of emission in pounds per hour and P = process weight rate in tons per hour.

16.8.1404 VISIBLE AIR CONTAMINANTS. Sets opacity limits and averaging times for sources when started up and normal operation. These limits are over six conservative minutes. Specifies opacity levels which cannot be exceeded during construction or during operation of a selected alternative.

APPLICABLE

16.8.1423 NEW SOURCES PERFORMANCE STANDARDS. Adopts by reference 40 CFR part 60. Although none of the specific categories appear to be applicable to the various alternatives presently identified, four sections may be relevant and appropriate. Those four are Subpart E dealing with standards of performance for incinerators, Subpart F dealing with standards of performance for Portland cement plants, Subpart LL dealing with standards of performance for metallic mineral processing plants and Subpart OOO dealing with standards of performance for nonmetal mineral processing plants. In addition, Subparts G and H dealing with nitric acid and sulfuric acid plants may be relevant and appropriate depending on how the Cashman process works.

APPLICABLE

16.8.1424 NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS. Adopts by reference 40 CFR part 61 which requires minimization of emissions, specifies appropriate emission tests and monitoring requirements and adopts limits on inorganic arsenic emissions, radionuclide emissions, beryllium emissions and mercury emissions.

Beryllium emissions may not exceed 10 grams over a 24-hour period or, in the alternative, the ambient air concentration of beryllium may not exceed .01 $mg/m^3$, averaged over a 30-day period.

Mercury emissions may not exceed 2300 grams over a 24-hour period.

Radionuclide emissions may not exceed those amounts that cause a dose equivalent of 25 mrem/yr. to the whole body or 75 mrem/yr. to the critical organ of any member of the public. However, doses due to radon-220, radon-222 and their respective decay products are excluded. Uncontrolled inorganic arsenic emissions may not exceed .4 mg/year, and total arsenic emissions must be treated and reduced by at least 85%.

APPLICABLE

3. Water

75-5-303 NONDEGRADATION POLICY. Mandates no degradation of any state water. If water is of better quality than its classification, it may not be degraded even if final result is consistent with its classification. Hazardous substances cannot be allowed to degrade state waters.

APPLICABLE

Sub-Chapter 6
Surface Water Quality Standards

16.20.604 WATER-USE CLASSIFICATIONS -- CLARK FORK -- COLUMBIA RIVER DRAINAGE EXCEPT THE FLATHEAD AND KOOTENAI RIVER DRAINAGES. Establishes classifications for Clark Fork River and tributaries.

APPLICABLE

16.20.617 A-1 CLASSIFICATION. The A-1 classification means that waters so classified are "suitable for drinking, culinary and food processing purposes after conventional treatment for removal of naturally present impurities." The A-1 classification contains the following specific standards:

1. Dissolved oxygen concentrations must not be reduced to less than 7 milligrams per liter.

2. pH must be maintained.

3. Temperature may not be increased or decreased by more than 1° and 2° respectively in water with a temperature between 32° and 66° F.

4. Sediment may not be increased if doing so renders the water harmful, detrimental or injurious to public health.

5. National Secondary Drinking Water Regulations are adopted as are national aquatic water quality criteria.

By reference to the EPA "Gold Book" criteria, the A-1 classification imposes the following specific ambient water quality standards to ensure that appropriate water quality is maintained for the listed uses:

1. Concentrations of toxic or deleterious substances may not exceed the following levels to protect aquatic life:

| Constituent | Acute Level (mg/l) | Chronic Level (mg/l) |
|---|---|---|
| Arsenic (III) | 0.36 | 0.19 |
| Arsenic (V) | 0.85 | 0.048 |
| Cadmium | 0.0039* | 0.0011* |
| Copper | 0.018* | 0.012* |
| Iron | -- | 1.0 |
| Lead | 0.082* | 0.0032* |
| Mercury | 0.0024 | 0.000012 |
| Selenium | 0.28 | 0.036 |
| Silver | 0.0041* | 0.00012 |
| Zinc | 0.12* | 0.11* |

*A water hardness of 100 mg/l is assumed for these hardness dependent criteria.

2. Concentrations of toxic or deleterious substances may not exceed the following levels to protect public health from ingestion of contaminated water and fish:

| Constituent | Water and Fish Ingestion | Fish Consumption Only |
|---|---|---|
| Arsenic | 2.2 ng/l* | 17.5 ng/l* |
| Cadmium | 10.0 ug/l | -- |
| Iron | 0.3 mg/l | -- |
| Lead | 50.0 ug/l | -- |
| Mercury | 144.0 ng/l | 146.0 ng/l |
| Selenium | 10.0 ug/l | -- |
| Silver | 50.0 ug/l | -- |

mg/l equals milligrams per liter.
ug/l equals micrograms per liter.
ng/l equals nanograms per liter.
*Values presented represent a human risk level of 1 x 10-6 based on human health criteria for carcinogens.

3. Moreover, concentrations of toxic or deleterious substances may not exceed levels which render the waters harmful, detrimental, or injurious to public health.

APPLICABLE

16.20.618 B-1 CLASSIFICATION. The B-1 classification means that waters so classified are "suitable for drinking culinary and food processing purposes, after conventional treatment; bathing, swimming and recreation; growth and propagation of salmonid fishes and associated aquatic life, waterfowl and furbearers; and agricultural and industrial water supply." The B-1 classification contains the following specific standards:

1. Dissolved oxygen concentrations must not be reduced to less than 7 milligrams per liter.

2. pH may only be varied by .5 pH units in waters with a pH between 6.5 and 8.5.

3. Temperature may not be increased or decreased by more than 1° and 2° respectively in water with a temperature between 32° and 66°F.

4. Sediment may not be increased if doing so renders the water harmful, detrimental or injurious to public health.

5. National Secondary Drinking Water Regulations are adopted as are national aquatic water quality criteria.

By reference to the EPA "Gold Book" criteria, the A-1 classification imposes the following specific ambient water quality standards to ensure that appropriate water quality is maintained for the listed uses:

1. Concentrations of toxic or deleterious substances may not exceed the following levels to protect aquatic life:

| Constituent | Acute Level (mg/l) | Chronic Level (mg/l) |
|---|---|---|
| Arsenic (III) | 0.36 | 0.19 |
| Arsenic (V) | 0.85 | 0.048 |
| Cadmium | 0.0039* | 0.0011* |
| Copper | 0.018* | 0.012* |
| Iron | -- | 1.0 |
| Lead | 0.082* | 0.0032* |
| Mercury | 0.0024 | 0.000012 |
| Selenium | 0.28 | 0.036 |
| Silver | 0.0041* | 0.00012 |
| Zinc | 0.12* | 0.11* |

*A water hardness of 100 mg/l is assumed for these hardness dependent criteria.

2. Concentrations of toxic or deleterious substances may not exceed the following levels to protect public health from ingestion of contaminated water and fish:

| Constituent | Water and Fish Ingestion | Fish Consumption Only |
|---|---|---|
| Arsenic | 2.2 ng/l* | 17.5 ng/l* |
| Cadmium | 10.0 ug/l | -- |
| Iron | 0.3 mg/l | -- |
| Lead | 50.0 ug/l | -- |
| Mercury | 144.0 ng/l | 146.0 ng/l |
| Selenium | 10.0 ug/l | -- |
| Silver | 50.0 ug/l | -- |

mg/l equals milligrams per liter.
ug/l equals micrograms per liter.
ng/l equals nanograms per liter.
*Values presented represent a human risk level of 1 x 10-6 based on human health criteria for carcinogens.

3. Moreover, concentrations of toxic or deleterious substances may not exceed levels which render the waters harmful, detrimental, or injurious to public health.

APPLICABLE

16.20.622 Any point-source discharges from the Warm Springs Ponds are subject to the same numeric limitations set out in section 16.20.622, above. These numeric standards must be met when stream flows equal or exceed the minimum consecutive 7-day average flow, which may be expected to occur on the average of once in ten years.

APPLICABLE

16.20.631 TREATMENT STANDARDS. Specifies the degree of waste treatment ~~and~~ what the treatment is based on. Also specifies dilution requirements. This section contains the following specific standards:

1. Industrial waste must receive, as a minimum, treatment equivalent to the best practicable controlled technology available, as defined in 40 CFR Chapter N and subsequent amendments, or, where not defined, a minimum of secondary treatment or equivalent as determined by DHES.

2. Stream flow dilution requirements will be based on the minimum consecutive 7-day average flow which may occur in any ten-year period.

The pertinent federal provision 40 CFR part 440.104 for ore mining and dressing effluents establishes the following effluent standards:

| Constituent | Maximum for Any One Day (ppm) | Average of Daily Values for 30 Consecutive Days (ppm) |
|---|---|---|
| Copper | 0.30 | 0.15 |
| Zinc | 1.5 | 0.75 |
| Lead | 0.6 | 0.30 |
| Cadmium | 0.10 | 0.05 |
| Mercury | 0.002 | 0.001 |

Specifies treatment facility requirements if one is chosen.

APPLICABLE

16.20.632 OPERATION STANDARDS. Requires best practicable water treatment. Also requires temperature variations in discharging water. These include a temperature range below 40°F. during January and February and above 44° during June through September. Any water impoundment, manmade or otherwise, must comply with these requirements.

APPLICABLE

16.20.633 PROHIBITIONS. Surface waters must be free from substances attributable to municipal, industrial, agricultural or other practices. No discharge can result in a violation of any standards if that discharge is from a tailings ponds or holding facility. Also addresses what type of discharges may be allowed to streams which do not flow continuously. Finally, deals with total dissolved gas pressure. Prevents discharges from the smelter, especially tailings ponds, that may pollute surface waters.

APPLICABLE

16.20.641 RADIOLOGICAL CRITERIA. This section forbids any person from causing radioactive materials to become present in surface waters.

APPLICABLE

16.20.702 APPLICABILITY AND LIMITATION OF STATE WATER NONDEGRADATION--GENERAL. Any activity of man which would cause a new or increased source of pollution to state waters is subject to the nondegradation policy. However, if, based on necessary economic or social development, degradation may be allowed, but "in no event may degradation of state waters interfere with or become harmful, detrimental or injurious to public health, recreation, safety, welfare, livestock, wild birds, fish and other wildlife or other beneficial uses." Degradation of national resource waters is prohibited. This section is applicable for all constituents for which pertinent portions of the Mill or Warm Springs Creek are high quality, and is relevant and appropriate for all constituents for which pertinent portions of those creeks

are not high quality waters.

APPLICABLE

Sub-Chapter 10
Montana Groundwater Pollution Control System

16.20.1002 CLASSIFICATION OF GROUNDWATER. This section classifies groundwater into Classes I through IV based on the present and future most beneficial uses of the groundwater, and states that groundwater is to be classified to actual quality or actual use, whichever places the groundwater in a higher class.

APPLICABLE

16.20.1003 GROUNDWATER QUALITY STANDARDS. This section adopts MCLs for groundwater and also specifies that present and future most beneficial uses must be protected. The section also specifies that concentrations of substances for which no MCLs exist "must not exceed levels which render the waters harmful, detrimental or injurious to public health." In addition, maximum allowable concentrations of these substances also must not exceed acute or chronic problem levels as set out in the EPA Gold Book. MCLs apply to groundwaters classes I, II or III. Acute or chronic problem levels apply to all groundwater. The appropriate Montana MCLs for drinking water (based on the dissolved portion, after filtration through a 0.45 micron filter, of the contaminated substance):

| Constituent | Contaminant Level (in milligrams per liter(mg/l)) |
|---|---|
| Arsenic | 0.05 |
| Cadmium | 0.010 |
| Lead | 0.05 |
| Mercury | 0.002 |
| Nitrate (as N) | 10.00 |
| Selenium | 0.01 |
| Silver | 0.05 |

APPLICABLE

16.20.1011 NONDEGRADATION. Specifies that any groundwater whose quality is higher than it is classified must be maintained at that higher quality. This is non-numerical chemical-specific standard that nonetheless specifies particular numbers which cannot be exceeded.

APPLICABLE

4. Public Water Supplies

75-6-101 POLICY. The quality and potability of water for public supplies must be protected, maintained and improved. Activities involving hazardous substances cannot pollute waters or banks that may be used as a source for a public water supply.

APPLICABLE

Chapter 20 - Water Quality

Sub-Chapter 2
Public Water Supply Regulations

16.20.203 MAXIMUM INORGANIC CHEMICAL CONTAMINANT LEVELS. This section establishes the following maximum contaminant levels ("MCLs") for inorganic chemicals in community water systems:

| Constituent | Level (mg/l) |
|---|---|
| Arsenic | 0.05 |
| Barium | 1.0 |
| Cadmium | 0.010 |
| Chromium | 0.05 |
| Lead | 0.05 |
| Mercury | 0.002 |
| Nitrate (as N) | 10.0 |
| Selenium | 0.01 |
| Silver | 0.05 |
| Fluoride | 2.4 |

The MCL for nitrate may not be exceeded by a non-community water supply system except that levels not to exceed 20 mg/l may be allowed in a non-community water system if no adverse health effects will result. Water within the Anaconda Smelter site may be used in the future as a drinking water source; therefore, this section is relevant and appropriate.

RELEVANT AND APPROPRIATE

16.20.205 MAXIMUM TURBIDITY CONTAMINANT LEVELS. This section establishes the following maximum turbidity contaminant level for public water supply systems which use surface water in whole or in part:

1. One turbidity unit ("TU"), as determined by a monthly average, except that a level not exceeding 5 TU may be allowed if the supplier of water can demonstrate to the department that the higher turbidity does not: (a) interfere with disinfection; (b) prevent maintenance of an effective disinfectant agent throughout the distribution system; or (c) interfere with microbiological determination.
2. 5 TU based on an average for two consecutive days.

If results of turbidity analyses indicate the maximum contaminant level has been exceeded, a second sample must be taken within one hour. The repeat sample, and not the initial one, must be used in calculating the monthly average. ARM § 16.20.205(3). Water within the Anaconda Smelter site may become a drinking water source in the future; therefore, this section is relevant and appropriate.

RELEVANT AND APPROPRIATE

16.20.206 MAXIMUM RADIOLOGICAL CONTAMINANT LEVELS. The following maximum radiological contaminant levels may not be exceeded:

| | Constituent | Level pCi per liter |
|---|---|---|
| (1) | Combined radium-226 and radium-228 | 5 |
| (2) | Gross alpha particle activity (including radium-226 but excluding radon and uranium) | 15 |
| (3) | Tritium | 20,000 |
| (4) | Strontium-90 | 8 |
| (5) | Gross beta radioactivity | 50 |

In addition, the average annual concentration of beta particle and photon radioactivity from man-made radionuclides in drinking water may not produce an annual dose equivalent to the total body or any internal organ greater than 4 millirem/year. Water within the Anaconda Smelter site may be used as a drinking water source in the future.

RELEVANT AND APPROPRIATE

2.2.0 THE MONTANA WATER USE ACT. Section 85-2-504. This section establishes that fresh water is considered suitable for use for domestic, livestock or agricultural purposes.

APPLICABLE

Section 85-2-505. This section precludes the wasting or contamination of groundwater. Any well producing waters which contaminates other water must be plugged or capped and wells must be constructed and maintained so as to prevent waste, contamination, or pollution of groundwater.
APPLICABLE

5. Nuclear Regulation

75-3-304 POLICY. Specifies that in order to protect the citizens of the state, the disposal of radioactive material is prohibited. In the event that radioactive material is found on the site, it may not be disposed of in the state.

APPLICABLE

Sub-Chapter 4
Standards for Protection Against Radiation

16.40.401-402 PERMISSIBLE DOSES, LEVELS AND CONCENTRATIONS--RADIATION DOSE TO INDIVIDUALS IN RESTRICTED AREAS. Establishes standards for protection against radiation hazards. Mandates that every effort be made to minimize exposure. Also establishes that no individual may be exposed to levels in excess of those that follow:

| | Rems Per Calendar Quarter |
|---|---|
| Whole body; head and trunk; active blood-forming organs; lens of eyes; or gonads | 1 1/4 |
| Hands and forearms; feet and ankles | 18 3/4 |
| Skin of whole body | 7 1/2 |

APPLICABLE

Workers and the public may not be exposed to radiation levels either during construction or if radiation remains after construction on Flue dust.

16.40.404 PERMISSIBLE DOSES, LEVELS AND CONCENTRATIONS--EXPOSURE OF INDIVIDUALS TO CONCENTRATIONS OF RADIOACTIVE MATERIAL IN AIR IN RESTRICTED AREAS. No possession or transfer of materials is allowed if any individual is exposed to concentrations greater than that specified in Appendix A, Table 1, Column 1. Also provides method of calculating exposure numbers. No exposure can exceed ~~these numbers.~~

APPLICABLE

16.40.405 PERMISSIBLE DOSES, LEVELS AND CONCENTRATIONS--EXPOSURE OF MINORS. Specifies that any possession or transfer of radioactive materials that results in the exposure of anyone under 18 to greater than 10% of the limits specified in 16.40.402 is prohibited. In addition, no minor may be exposed to airborne radioactive material levels in excess of those in Appendix A, Table II. If radioactive material is found on site, fencing may be required to ensure that no children are able to get close.

APPLICABLE

16.40.406 PERMISSIBLE DOSES, LEVELS AND CONCENTRATIONS--EXTERNAL SOURCES IN UNRESTRICTED AREAS. No individuals should receive a radiation dose in excess of .5 rem in any one year. In addition, no person shall possess, use, or transfer sources of radiation in such a manner as to create in any unrestricted area from such sources of radiation in his possession:

(a) radiation levels which, if an individual were continuously present in the area, could result in his receiving a dose in excess of 2 millirems in any one hour; or

(b) radiation levels which, if an individual were continuously present in the area could result in his receiving a dose in excess of 100 millirems in any 7 consecutive days.

APPLICABLE

6. Department of State Lands

Title 26, Chapter 4

Sub-Chapter 6
Strip and Underground Mine Reclamation Act: Transportation Facilities, Use of Explosives and Hydrology

26.4.633 WATER QUALITY STANDARDS AND EFFLUENT. Requires passing all surface drainage through at least one sediment pond (on site). Department may require treatment facilities. This continues until discharge meets state and federal requirements. Specifies numerical effluent limitations for iron, manganese, total suspended solids and pH. Standards for ephemeral surface drainages from the smelter.

RELEVANT AND APPROPRIATE

Sub-Chapter 18
Rules and Regulations Governing the Montana Strip and Underground Mine Siting Act

26.4.1819 WATER QUALITY TREATMENT. Must prevent drainage of any water with a pH of less than 6 or more than 9 or which contains iron concentration in excess of 7 milligrams/liter. Also the total alkalinity must exceed the total acidity and the turbidity shall not exceed 100 J.C.U. Also specifies the maximum total increase to naturally occurring stream turbidity. Limits amount of contaminant concentrations from surface discharges and specifies that water is to be treated to meet acceptable concentrations.

RELEVANT AND APPROPRIATE

LOCATION-SPECIFIC ARARS

1. Floodplain and Floodway Management

The State of Montana has developed certain restrictions on the construction, operation or maintenance of obstructions within the floodway or the floodplain. The floodway is defined as the channel of a watercourse and areas adjoining the channel that are reasonably required to carry the floodwater of the watercourse. Floodplain is defined as the area adjoining a watercourse which would be covered by floodwater during a flood of 100-year frequency. The floodway is a narrower channel than the floodplain. Therefore, the State of Montana imposes fewer restrictions on land use within the floodplain. Land use restrictions within both the floodway and the floodplain are imposed to prevent or alleviate flooding threats to life and health and reduce private and public economic losses. Accordingly, some obstructions, designed for floodway control are, in fact, encouraged. Other obstructive or potentially obstructive uses are authorized, subject to permit. Pursuant to Superfund, activities conducted wholly within the operable unit are not required to obtain federal, state or local permits.

The requirements of the Floodplain and Floodway Management Act and regulations promulgated thereunder are discussed in greater detail below.

The Floodplain and Floodway Management Act

Section 76-5-102. It is the policy of the State of Montana to restrict or prohibit uses which are dangerous to health or safety of property in times of flood or which cause increased flood heights or velocities. Where uses vulnerable to floods are allowed in the floodway or floodplain, it is Montana's policy to require adequate flood protection for such uses. Because the boundary of the Flue Dust Operable Unit is in the floodplain, this policy is applicable.

APPLICABLE

Section 76-5-402. Certain structures listed in this provision are authorized to be constructed in the floodplain, outside of the designated floodway, including parks, wildlife management areas, natural areas and fish hatcheries.

APPLICABLE

Section 76-5-1101. This provision recognizes that water conservation and flood control projects, including projects for conservation, recreation and wildlife, streamflow stabilization and pollution abatement may be conducive to public convenience and welfare. Accordingly, this and Section 76-5-1102 (Relevant and Appropriate) authorize the construction or improvement of dikes, embankments, impounding reservoirs, conduits, and other watercourse

improvements. These provisions authorize municipal and county governmental entities to establish such projects. Accordingly, these sections are not directly applicable to the Flue Dust Operable Unit, but are relevant and appropriate because they constitute a statutory recognition that watercourse improvements for pollution abatement may be an appropriate part of a floodplain management system.

RELEVANT AND APPROPRIATE

Floodplain Management Regulations

Section 36.15.216. This section sets out the criteria for establishing or altering an artificial obstruction or nonconforming use in the floodplain. Typically, the criteria are evaluated in the context of a permit application. At a Superfund site, however, ability to meet the criteria is determined through the detailed evaluation of alternatives. Accordingly, the following criteria are relevant and appropriate in determining whether to establish or alter an artificial obstruction or nonconforming use (i.e., whether to alter or construct any berms or watercourse improvements) to consider:

> "1. The danger to life and property from backwater or diverted flow caused by the obstruction;
>
> 2. The danger that the obstruction will be swept downstream to the injury of others;
>
> 3. The availability of alternative locations;
>
> 4. The construction or alteration of the obstruction in such a manner as to lessen the danger;
>
> 5. The permanence of the obstruction;
>
> 6. The anticipated development in the foreseeable future of the area which may be affected by the obstruction; and
>
> 7. Such other factors as are in harmony with the purposes of the Act and these Rules."

Section 36.15.606. This section enumerates flood control works that are allowed within designated floodways; it provides that: (1) flood control levies and flood walls are allowed if they are designed and constructed to safely convey a flood of 100-year frequency and their cumulative effect combined with allowable flood fringe encroachments does not increase the unobstructed elevation of a flood of 100-year frequency more than 0.5 of a foot at any point; (2) riprap, if not hand placed, is allowed if it is designed to withstand a flood of 100-year frequency, does not increase the elevation of the 100-year frequency flood, and will not increase erosion upstream, downstream, or across stream from the riprap

site; and (3) channelization projects are allowed if they do not significantly increase the magnitude, velocity, or elevation of the flood of 100-year frequency downstream from such projects.

This section is relevant and appropriate, rather than directly applicable to the Flue Dust Operable Unit, first because berms of watercourse improvements are not solely for flood control. Second, a permit will not be required for remedial activities conducted within the operable unit. Rather, compliance with this section will be evaluated in the FS, remedy section and implementation processes under CERCLA.

RELEVANT AND APPROPRIATE

Section 36.15.801. This section is applicable in floodplain areas where the floodway has not been designated and authorizes a variety of uses pertinent to the Flue Dust Operable Unit, including parks, wildlife management and natural areas and hunting and fishing areas. It further provides that if a proposed development within the designated floodplain may significantly increase flood velocities or depths, additional hydraulic and survey information may be required, including but not limited to valley cross sections of the watercourse and adjoining floodplain; certification by a qualified professional engineer that flood proofing measures are reasonably adequate to protect against major flood damage; or a hydrologic study documenting probable effect on upstream or downstream property owners. The requirements of this section are applicable, except to the extent that this section includes a permit requirement. The adequacy of information provided and the need for additional information will be evaluated in the context of this FS, remedy selection and remedy implementation in accordance with CERCLA.

2. Streambeds and Stream Protection

Because the Flue Dust Operable Unit is bounded by Mill Creek, and Mill Creek is impacted by the release of hazardous or deleterious substances, activities within the operable unit are subject to location-specific requirements for stream and streambed protection. These protective provisions are set out in the Natural Streambed and Land Preservation Act of 1975 and implementing regulations and the Stream Protection Act.

Section 75-7-102. It is the policy of the State of Montana that its "natural rivers and streams and the lands and property immediately adjacent to them within the state are to be protected and preserved to be available in their natural or existing state and to prohibit unauthorized projects and in so doing to keep soil erosion and sedimentation to a minimum, except as may be necessary and appropriate after due consideration of all factors involved." This policy is applicable to Mill Creek and lands immediately adjacent to it. The policy should be implemented by compliance with the preservation standards set out below, to minimize soil

erosion and sedimentation during remedial activities and after Flue dust cleanup work has been completed.

APPLICABLE

Minimum Standards and Guidelines for Natural Streambed and Land Preservation Act of 1975

Section 36.2.404. Proposed projects are to be evaluated by the appropriate conservation district based on the following criteria: (1) the purpose of the project; (2) the necessity and justification for the proposed project; (3) whether the proposed project is a reasonable means of accomplishing the purpose; (4) whether there are modifications or alternative solutions which are reasonably possible and which would reduce the disturbance to the stream channel and its environment and accomplish the purposes of the proposed project; (5) whether the project will pass anticipated sediment loads without creating harmful flooding or erosion problems upstream or downstream; (6) whether the project will minimize the amount of stream channel alteration; (7) whether the project will be as permanent a solution as possible and whether the method used will create a reasonably permanent and stable situation; (8) whether the project will minimize effects on fish and aquatic habitat; (9) whether the project will minimize turbidity or other water pollution problems; and (10) whether the project will minimize adverse effects on the natural beauty of the area. These criteria are appropriate for consideration in the detailed analysis of alternatives and in the remedy selection and implementation pursuant to CERCLA. However, this provision is identified as relevant and appropriate because it would require the criteria to be evaluated in a permit context, whereas for a Superfund site remedy that includes project activities addressed by this regulation, a permit to construct such project is not required.

RELEVANT AND APPROPRIATE

Stream Protection Act

Section 87-5-501. It is the applicable policy of the State of Montana that "its fish and wildlife resources and particularly the fishing waters within the state are to be protected and preserved to the end that they be available for all time, without change, in their natural existing state except as may be necessary and appropriate after due consideration of all factors involved."

APPLICABLE

3. Major Facility Siting Act

The State of Montana has developed criteria which must be taken into account when siting an energy related facility. No energy related facility as defined by the law (MCA 75-20-104(10)) is anticipated for the Flue Dust Operable Unit. However, the siting

criteria are relevant and appropriate.

Section 36.7.2502 specifies preferred site criteria which include geologically stable areas in flat or rolling terrain and areas where atmospheric conditions and topography are favorable for dispersion of airborne pollutants.

Section 36.7.2503. No facilities can be located in the following areas:

(1) National wilderness areas.
(2) National primitive areas.
(3) National parks.
(4) Rivers in the national wild and scenic river system.
(5) National wildlife refuges and ranges.

Section 36.7.2504-2505 identify sensitive areas and areas of concern which should not be used unless a demonstration of no significant adverse impact can be made, or that mitigation of significant adverse impacts is possible. Sensitive areas and areas of concern include:

(1) State game ranges and game management areas.
(2) State parks and national and state monuments.
(3) National and state recreation areas.
(4) Rivers under active study for inclusion in the national wild and scenic river system.
(5) Roadless areas of 5,000 acres or more managed by federal or state agencies to retain their roadless character.
(6) Areas designated Class I under prevention of significant deterioration provisions or areas under active consideration for such designation.
(7) Areas designated as "non-attainment" under the Montana Clean Air Act.
(8) Designated critical habitat for state or federally listed threatened or endangered species.
(9) National historic landmarks and national register historic districts and sites.
(10) Land areas covered by conservation easements where the presence of the facility would be incompatible.
(11) Unique habitats and natural areas designated by the National Park Service, the USDA Forest Service, the Bureau of Land Management or the State as national natural landmarks, natural areas, research natural areas, areas of critical environmental concern, special interest areas, research botanical areas or outstanding natural areas.
(12) National trails.
(13) Municipal watersheds.
(14) Streams and rivers designated Class I or II by the Montana Dept. of Fish, Wildlife and Parks.
(15) State or federal waterfowl production areas.
(16) Specially managed buffer areas surrounding areas excluded under 36.7.2503.

(17) Active faults showing evidence of post-miocene movement.
(18) Wintering areas of elk, deer and pronghorn as designated by the Montana Dept. of Fish, Wildlife and Parks.
(19) Major elk summering areas which are forested and greater than 1/2 mile in radius, more than 1/2 mile from an existing road and designated by the Montana Dept. of Fish, Wildlife and Parks, the Bureau of Land Management or USDA Forest Service.
(20) Seasonal habitat of mountain sheep as designated by the Montana Dept. of Fish, Wildlife and Parks.
(21) Any undeveloped areas of land or water that contain known natural features of unusual scientific or educational significance, and any undeveloped areas of land or water that contain known natural features of unusual recreational significance that have public access provided.
(22) Areas with geologic formations that show a high probability of including significant paleontological resources.
(23) Sites with evidence of contemporary use that have religious or heritage significance and value to Indians.
(24) Proposed national natural landmarks under active study.
(25) Riparian forests defined as a stand of mature cottonwood or mixed cottonwood-conifer forests greater than 100 meters long where average canopy height is 50 feet or more and average density of mature trees is greater than 20 stems per acre.
(26) Nesting or mating areas of white pelicans, great blue herons, double-crested cormorants, gulls or terns.
(27) Sage grouse and sharp-tailed grouse breeding areas and wintering areas as designated by the Montana Dept. of Fish, Wildlife and Parks.
(28) Habitats occupied at least seasonally and critical to species listed as "species of special interest or concern" by the Montana Dept. of Fish, Wildlife and Parks or the U.S. Fish and Wildlife Service.

**ACTION-SPECIFIC ARARS**

1. Montana Reclamation Requirements

The State of Montana has developed extensive statutory and regulatory requirements for reclamation in connection with strip and underground mining, coal and uranium mining, metal mining, and open cut mining. These provisions are relevant and appropriate for Flue dust remediation, but are not directly applicable for two reasons. First, though the contamination and hazardous substance releases at the Flue Dust Operable Unit result from mining activities, the reclamation activities contemplated to be performed at the site will be performed in conjunction with remedial action, rather than mining. Second, many of the statutory programs governing reclamation at different types of mine sites contain "grandfather" provisions which exclude older mining operations from reclamation requirements. Nevertheless, to the extent that

particular reclamation provisions were designed to address conditions or activities similar to the conditions found at the site or activities to be performed in conjunction with site remediation, such reclamation provisions are relevant and appropriate. The Strip and Underground Mine Reclamation Act are particularly well suited for remedial activities at the Flue Dust Operable Unit because they were developed to address conditions, such as those found at this operable unit, caused by earth moving and other disturbances on the ground surface.

The Montana Strip and Underground Mine Reclamation Act

Section 82-4-202. It is the declared policy of the State of Montana and its people to: "(a) maintain and improve the state's clean and healthful environment for present and future generations; (b) protect its environmental life-support system from degradation; (c) prevent unreasonable degradation of its natural resources; (d) restore, enhance, and preserve its scenic, historic, archaeologic, scientific, cultural, and recreational sites; [and] (e) demand effective reclamation of all lands disturbed by the taking of natural resources."

RELEVANT AND APPROPRIATE

Section 82-4-231. As rapidly, completely and effectively as the most modern technology and the most advanced state of the art will allow, each operator shall reclaim and revegetate the land affected by his operation. This section requires reclamation activities such as grading, backfilling, subsidence stabilization, water control, topsoiling and other measures necessary to eliminate damage to landowners and members of the public, their real and personal property, public roads, streams, and all other public property from soil erosion, subsidence, landslides, water pollution, and hazards dangerous to life and property. Additionally, this section requires that the owner: (1) impound, drain or treat all runoff or underground mine water so as to reduce soil erosion, damage to grazing and agricultural lands, and pollution of surface and subsurface water; (2) to the extent possible using the best technology currently available, minimize disturbances and adverse impacts of the operation on fish, wildlife, and related environmental values and achieve enhancement of such resources where practicable; (3) avoid acid or other toxic mine drainage; (4) prevent, to the extent possible using the best technology currently available, additional contributions of suspended solids to streamflow or runoff; and (5) stabilize and protect all surface areas, including spoil piles, to effectively control air pollution.

RELEVANT AND APPROPRIATE

Section 82-4-233. This section requires that after the operation has been backfilled, graded, topsoiled and approved, the operator "shall prepare the soil and plant such legumes, grasses, shrubs, and trees as are necessary to establish on the regraded areas and

all other lands affected a diverse, effective and permanent vegetative cover of the same seasonal variety native to the area of land to be affected and capable of self-regeneration and plant succession at least equal in extent of cover to the natural vegetation of the area." The vegetative cover must be capable of feeding and withstanding grazing pressure from wildlife and livestock regenerating under natural conditions prevailing at the site and preventing soil erosion.

RELEVANT AND APPROPRIATE

Strip and Underground Mine Reclamation Permit Application Regulations

Section 26.4.311. This section requires development of an air pollution control plan that includes an air quality monitoring program and a plan for fugitive dust control.

RELEVANT AND APPROPRIATE

Section 26.4.312. In accordance with this provision, a plan for minimization for impacts on fish and wildlife must be submitted and must include a description of how disturbances and adverse impacts on fish, wildlife and related environmental values will be minimized and how enhancement of these resources will be achieved and must address compliance with the Endangered Species Act.

RELEVANT AND APPROPRIATE

Section 26.4.313. This section establishes reclamation plan requirements including: a timetable for estimated completion; a detailed cost estimate of reclamation that will be covered by performance bonds; a plan for backfilling, stabilization, ~~compacting and grading~~; a map showing the final topography; and a narrative of the method for revegetation, including but not limited to -- schedule, species and amounts per acre of seeds and seedlings to be used, introduced species to be used, if any, planting and seeding methods, approximate planting dates, mulching techniques, soil tillage and amendments, vegetation monitoring requirements, and measures to be used to determine the success of revegetation.

RELEVANT AND APPROPRIATE

Section 26.4.314. In accordance with this provision, a detailed description supported by maps and appropriate data of measures to be taken during and after operations to minimize disturbance of the hydrologic balance on and off-site must be provided.

RELEVANT AND APPROPRIATE

Section 26.4.315. Before remedy implementation, this section requires a general plan for each proposed sedimentation pond and water impoundment including such information as preliminary hydrologic and geologic information required to assess the

hydrologic impact of the structure; a description, map and cross-section of each structure and its location; a schedule, a detailed design plan; any geotechnical investigation, design and construction requirements for each structure; and a description of the operation and maintenance requirements.

RELEVANT AND APPROPRIATE

Strip and Underground Mine Reclamation Act Backfilling and Grading Regulations

Section 26.4.501. This provision requires backfilling and grading to the approximate original contour of the land. Backfill material must be placed to minimize adverse effects on groundwater, on and off-site.

RELEVANT AND APPROPRIATE

Section 26.4.501(A). All final grading on the area of land affected must be to the approximate original contour of the land, per this section. No final graded soils may be steeper than 5 horizontal to 1 vertical, with limited exceptions. Moreover, the disturbed area must be blended with surrounding undisturbed ground to provide a smooth transition with the existing topography.

RELEVANT AND APPROPRIATE

Section 26.4.505. In accordance with this section, acid-forming, toxic-forming, combustible or any other waste materials identified by the Department that are exposed, used, or produced during mining shall be covered with the best available non-toxic and noncombustible material. If necessary, these materials must be tested to neutralize toxicity in order to prevent water pollution and sustained combustion and to minimize adverse effects on plant growth and land uses. "If necessary to protect against upward migration of salts or exposure by erosion, to provide an adequate depth for plant growth or to otherwise meet local conditions, . . thicker amounts of cover using noncombustible and nontoxic material or the use of special compaction and isolation techniques to prevent contact of these materials with groundwater" may be required. Acid-forming or toxic-forming materials shall not cause or pose a threat of water pollution. This section is relevant and appropriate for all portions of the site where exposed tailings or contaminated soils are to be consolidated and capped or capped in place.

RELEVANT AND APPROPRIATE

Section 26.4.520. Spoil materials, tailings and contaminated soils may be disposed of on-site in accordance with the requirements of this section. Leachate and surface runoff from the fill must not degrade surface or groundwater or exceed effluent limitations. The disposal area must not contain springs, natural watercourses, or wet weather seeps unless lateral drains are constructed from the

wet areas to prevent water infiltration. Underdrains must consist of durable rock or pipe and be designed and constructed consistent with current, prudent engineering practices. Slope protection must be provided to minimize surface erosion. the material must be transported and placed in a controlled manner, in horizontal lifts not exceeding 4 feet in thickness, concurrently compacted as necessary to ensure mass stability and prevent mass movement, covered and graded to allow surface and subsurface drainage compatible with the natural surroundings and to ensure a long-term static safety factor of 1.5. Inspection for stability is required quarterly. Color photographs of the underdrain must be taken as the underdrain system is being formed. An earthquake safety factor of at least 1.1 must be used. Surface water runoff from areas adjacent to and above the fill must not be allowed to flow into the fill and must be diverted into stabilized diversion channels designed to safely pass the runoff from a 100-year, 24-hour precipitation event. All disturbed areas, including diversion ditches that are not riprapped, must be vegetated upon completion of construction.

RELEVANT AND APPROPRIATE

Strip and Underground Mine Reclamation Hydrology Regulations

Section 26.4.631. In accordance with this section, reclamation operations must be planned and conducted to minimize disturbance to the prevailing hydrologic balance and to prevent material damage to the prevailing hydrologic balance outside the operable unit. Thus, changes in water quality and quantity must be minimized and reclamation practices that will prevent or minimize water pollution should be emphasized. Proper pollution control and minimization practices include but are not limited to stabilizing disturbed areas, diverting runoff, regulating channel velocity of water, achieving quickly germinating and growing stands of temporary vegetation, lining drainage channels with proper vegetation, and mulching.

RELEVANT AND APPROPRIATE

Section 26.4.633. This section specifies that "all surface draining from the disturbed area, including disturbed areas that have been graded, seeded, or planted, must be treated by the best technology currently available." Sediment control must be maintained until the disturbed area has been restored and revegetation requirements have been met.

RELEVANT AND APPROPRIATE

Section 26.4.634. Design of reclaimed drainages must emphasize channel and floodplain dimensions that will blend with the undisturbed drainage above and below the area to be reclaimed. Further, this section requires that reclamation establish or restore the channel to its natural habitat or characteristic pattern with a geomorphically acceptable gradient. The drainage

must safely pass through a 24-hour precipitation event with a 100-year recurrence interval or larger event as determined by the agency. In addition, reclamation must provide for long-term stability of the landscape, establishment or restoration of the stream to include a diversity of aquatic habitats (generally a series of riffles and pools) and restoration, enhancements or maintenance of natural riparian vegetation.

RELEVANT AND APPROPRIATE

Section 26.4.636. Some remedial activities at the site may include temporary diversion structures. If so, this section requires that temporary diversions be constructed to safely pass the peak runoff from a precipitation event with a 10-year, 24-hour recurrence interval. Channel lining must be designed using standard engineering practices, such as riprap, to safety pass designed velocity. Free board must be no less than 0.3 feet. Energy dissipators must be installed in streams where existing velocity of the diversion is greater than the receiving water.

RELEVANT AND APPROPRIATE

Section 26.4.638. This section specifies sediment control measures and requires that such measures be designed, constructed, and maintained using the best technology currently available to prevent additional contributions of sediment to stream flow or runoff, to meet the most stringent applicable state or federal effluent limitations, and to minimize erosion to the extent possible.

RELEVANT AND APPROPRIATE

Section 26.4.639. This section specifies in greater detail the requirements for sedimentation ponds. Sedimentation ponds must provide the required detention time adequate to meet effluent limitations for the water inflow or runoff entering the pond from a 10-year, 24-hour precipitation event (design event), plus the average underground inflow applicable. The water storage resulting from inflow must be removed by a non-clogging dewatering device or a conduit spillway and must have a discharge rate to achieve and maintain the required theoretical detention time. The dewatering device must not be located at a lower elevation than the maximum elevation of the sediment storage volume. The design must prevent short-circuiting to the extent possible. There must not be out-flow through the emergency spillway during the passage of the runoff resulting from the 10-year, 24-hour precipitation event or lesser events through the sedimentation pond. Sediment must be removed from the ponds when the volume of sediment accumulates to 60% of the design sediment storage volume. An appropriate combination of principal and emergency spillways must be provided to safely discharge the runoff from a 24-year, 24-hour precipitation event.

The minimum elevation at the top of the settled embankment must be 1 foot above the water surface in the pond with the emergency

spillway flowing at designed depths; the construction height of the dam must be increased a minimum of 5% over the design height to allow for settlement. The minimum top width of the embankment must be less than the quotient of (H + 35)/5, where H is the height, in feet, of the embankment as measured from the upstream toe of the embankment. The combined upstream and downstream side slopes of the settlement embankment must not be less than 5h:1v, with neither slope steeper than 2h:1v. If the sedimentation pond has an embankment that is more than 20 feet in height or has a storage volume of 20-acre feet or more, an appropriate combination of principal and emergency spillways that will discharge safely the runoff resulting from a 100-year, 24-hour precipitation event must be provided. The embankment must be designed and constructed with a static safety factor of at least 1.5, and a seismic safety factor of at least 1.2. The entire embankment, including the surrounding areas disturbed by construction, must be stabilized with a vegetative cover or other means immediately after the embankment is completed in order to protect against erosion and sudden drawdown. The active upstream face may be riprapped or otherwise stabilized. Areas in which vegetation is not successful or where rills and gullies develop must be repaired and revegetated.

RELEVANT AND APPROPRIATE

Section 26.4.640. This section describes control requirements for discharges from sedimentation ponds, permanent and temporary impoundments and diversions. Such discharges must be controlled by energy dissipators, riprapped channels or other devices to reduce erosion, to prevent deepening or enlargement of stream channels and to minimize disturbance of the hydrologic balance.
RELEVANT AND APPROPRIATE

Section 26.4.641. This section requires that drainage from acid- and toxic-forming spoil into ground and surface water must be avoided and, further, specifies the methodology for avoiding such drainage, including preventing water from coming into contact with spoil material and storing spoil on impermeable material, protected from erosion and contact with surface water.

RELEVANT AND APPROPRIATE

Section 26.4.642. This section prohibits permanent impoundments unless they can be constructed and operated in compliance with the following requirements: discharge of water from the impoundment will not degrade the quality of receiving water; the level of water will be sufficiently stable to support the intended use, water impoundments will not result in the diminution of the quality or quantity of water used by adjacent or surrounding landowners; design, construction and maintenance will achieve the minimum design requirements applicable to structures constructed and maintained under the Watershed Protection and Flood Prevention Act (16 U.S.C. § 1006), the impoundment will have a minimum static safety factor of 1.5 with steady seepage saturation conditions and a seismic safety factor of at least 1.2; slope protection to

minimize surface erosion at the site and sediment control measures must be provided for all embankments; the surrounding areas and diversion ditches disturbed or created by construction must be graded, fertilized, seeded and mulched immediately after the embankment is completed; and embankments must be routinely inspected and maintained.

RELEVANT AND APPROPRIATE

Section 26.4.648. In accordance with this section, the permittee must "replace the water supply of any owner of interest in real property who obtains all or part of his supply of water for domestic, agricultural, industrial or other legitimate use from surface or underground source where such supply has been affected by contamination, diminution or interruption proximately resulting from strip or underground mine operation by the permittee."

RELEVANT AND APPROPRIATE

Strip and Underground Mine Reclamation Act Top Soiling, Revegetation, and Protection of Wildlife and air Resources Regulations

Section 26.4.703. Materials other than, or along with, soil for final surfacing of disturbances may be allowed if the resulting medium is at least as capable as soil of supporting the approved vegetation and post-remedial activity land use. Moreover, the medium must be the best available within the area to support vegetation.

RELEVANT AND APPROPRIATE

Section 26.4.711. In accordance with this section, "a diverse, effective, and permanent vegetative cover of the same seasonal variety native to the area . . . affected and capable of meeting the criteria set forth in 82-4-233 shall be established on all areas of land affected except water areas and surface areas of roads . . ."

RELEVANT AND APPROPRIATE

Section 26.4.713. This section specifies that seeding and planting of disturbed areas must be conducted during the "first normal period for favorable planting and final preparation" but in no case more than ninety days after top soil has been replaced.

RELEVANT AND APPROPRIATE

Section 26.4.714. Pursuant to this section, as soon as practicable, a mulch or cover crop of small grains, grasses or legumes or both must be used on all regraded and resoiled areas to control erosion, promote germination of seeds and increase the moisture retention of the soil until adequate permanent cover is established.

RELEVANT AND APPROPRIATE

Section 26.4.716. Revegetation must encourage a prompt vegetative cover and recovery of productivity levels. A permanent diverse vegetative cover shall be established by drill or broadcast seeding or planting, by seedling transplant, by establishing sod plugs or by other methods. Revegetation must be capable of self-regeneration. Seed and seedlings genotypically adapted to the area must be used when available. Seed mixes free of weedy or other undesirable species shall be used.

RELEVANT AND APPROPRIATE

Section 26.4.717. Whenever tree species are necessary, trees adapted for local site conditions and climate shall be used.

RELEVANT AND APPROPRIATE

Section 26.4.718. Soil amendments must be used as necessary to aid in the establishment of permanent vegetative cover. Irrigation, management, fencing or other measures may also be used after review and approval by the agencies.

RELEVANT AND APPROPRIATE

Section 26.4.719. Livestock grazing on reclaimed land is prohibited until revegetation is established to sustain managed grazing.

RELEVANT AND APPROPRIATE

Section 26.4.721. In accordance with this section, rills and gullies must be filled, graded or otherwise stabilized and the area reseeded.

RELEVANT AND APPROPRIATE

Section 26.4.724. Success of revegetation shall be measured on the basis of unmined reference areas approved by the agencies. At least one reference area shall be established for each native community if found within the area.

RELEVANT AND APPROPRIATE

Section 26.4.725. This section establishes that the period of responsibility under the performance bond begins when the canopy cover of seeded species is comparable to the approved standard after the last year of seeding, fertilizing, irrigating or other work. Then, the revegetated area and respective reference areas will be evaluated for at least two consecutive years prior to application for bond release.

RELEVANT AND APPROPRIATE

Section 26.4.726. Annual production shall be measured by clipping each morphological class on the revegetated area and the reference area. This section then specifies how weighted productivity shall be established for reference areas for comparison to the revegetation area.

RELEVANT AND APPROPRIATE

Section 26.4.727. This section requires that the canopy cover be measured for each species in the revegetated area and the reference areas. It then establishes how weighted canopy cover shall be established for the reference areas for comparison purposes.

RELEVANT AND APPROPRIATE

Section 26.4.728. Permanence of vegetation in the revegetated areas must be established by showing that the revegetated area is composed of at least 51% native species and introduced species are present in a minority.

RELEVANT AND APPROPRIATE

Section 26.4.729. This section requires that the number of species occupying 1% or more of the ground cover in the revegetated area shall be equal to or greater than the number of species occupying 1% or more of the canopy cover in the reference area. It then specifies how the weighted diversity is to be calculated.

RELEVANT AND APPROPRIATE

Section 26.4.730. The revegetated area must furnish palatable forage in comparable quantity and quality during the same grazing period as the reference areas.

RELEVANT AND APPROPRIATE

Section 26.4.751. Pursuant to this section, required site activities must be conducted so as to avoid or minimize impacts to important fish and wildlife species, including critical habitat and any threatened or endangered species identified at the site. Proper mitigation measures may include fencing, cover or other appropriate methods to exclude wildlife from ponds that contain hazardous concentrations of toxic-forming material. Reclamation must provide for habitat needs for various wildlife species in an equal or greater capacity than was provided prior to mining. Plant groupings and water sources must be distributed to fulfill the requirements of fish and wildlife. Wetlands and other habitats of unusually high value for fish and wildlife must not be disturbed and where practicable, shall be enhanced. Natural riparian vegetation shall not be disturbed and, where practicable, shall be enhanced. Stream channels must be restored.

RELEVANT AND APPROPRIATE

Section 26.4.761. This section requires fugitive dust control measures and specifies a variety of options for such measures, including: watering of unpaved roads, chemical stabilization, paving roads, prompt removal of dust-forming debris, restricting vehicle speed, revegetating, mulching or otherwise stabilizing the surface of all areas adjoining roads that are the sources of fugitive dust, restricting travel of unauthorized vehicles, enclosing, covering, watering or otherwise treating loaded haul trucks, substituting conveyer systems for haul trucks and covering conveyer systems when conveyed loads are subject to wind erosion, minimizing the area of disturbed lands, prompt revegetation of regraded lands, planting of special windbreak vegetation at critical points, restricting activities causing fugitive dust during periods of air stagnation, reducing the period of time between initially disturbing the soil and revegetating. Air monitoring equipment must be installed and monitoring must be conducted.

RELEVANT AND APPROPRIATE

3. Surface Water

In addition to the chemical-specific requirements of the Montana Water Quality Act and implementing regulations and the Public Waters Supply Act and implementing regulations, both of these statutory and regulatory programs contain action-specific requirements pertinent to remedial alternatives for the Flue Dust Operable Unit being evaluated in this feasibility study. Those provisions are discussed in greater detail below.

Montana Water Quality Act

Section 75-5-101. This section establishes applicable public policy of Montana to "conserve water by protecting, maintaining, and improving the quality and potability of water for public water supplies, wildlife, fish and aquatic life, agriculture, industry, recreation, and other beneficial uses." Compliance with this section can be achieved by meeting the numeric standards set out in the discussion of chemical-specific ARARs and by complying with the requirements identified in Section 3.2.1 below.

APPLICABLE

Section 75-5-605. Pursuant to this section it is unlawful to cause pollution of any state waters, to place or cause to be placed any wastes in a location where they are likely to cause pollution of any state waters, to violate any permit provision, to violate any provision of the Montana Water Quality Act, to construct, modify, or operate a system for disposing of wastes (including sediment, solid waste and other substances that may pollute state waters) which discharges into any state waters without a permit or to discharge wastes into any state waters. Discharges or other activities affecting state waters conducted wholly within the operable unit are not subject to permit requirements.

APPLICABLE

Montana Surface Water Quality Regulations

Section 16.20.633. This provision requires that state surface waters be free from substances that will, inter alia, create concentrations or combinations of materials which are toxic or harmful to human, animal, plant or aquatic life. Moreover, no waste may be discharged and no activities conducted such that the waste or activities, either alone or in combination with other wastes or activities, will violate, or can reasonably be expected to violate, any of the standards. Paragraph 4 of this section specifically provides that "tailings ponds, or water, waste, or product holding facilities must be located, constructed, operated and maintained in such a manner and of such material so as to prevent the discharge, seepage, drainage, infiltration, or flow which may result in the pollution of surface waters." Installation and operation of a monitoring system may also be required.

APPLICABLE

Public Water Supplies Act

Section 75-6-112. Pursuant to this provision it is illegal for a person to (1) discharge drainage or other wastes that will cause pollution of state waters used for domestic use or as a source for a public water supply; and (2) discharge drainage or other waste into any state waters, on the banks of any state waters or into any abandoned or operating water well unless such waste is properly treated.

APPLICABLE

4. Groundwater

General Discussion

The Montana Groundwater Act and implementing regulations include several action-specific requirements in addition to the chemical-specific requirements identified in the first section of this appendix. The Montana Hazardous Waste Management Regulations impose, by reference to federal regulations, groundwater monitoring requirements. These requirements are discussed in detail below.

Section 16.20.916. Prohibits all disposal of pollutants into wells that affect state waters.

Montana Groundwater Pollution Control System (MGWPCS) Regulations

Section 16.20.1016. This section establishes special MGWPCS permit conditions that are relevant and appropriate for discharges to groundwater from within the Flue Dust Operable Unit. These conditions include: discharge limitations, monitoring

requirements, and procedures to be used to alleviate groundwater pollution.

RELEVANT AND APPROPRIATE

Groundwater Protection Regulations

Section 16.44.702. This section incorporates, by reference to federal regulations 40 CFR Part 264, certain standards for owners and operators of hazardous waste treatment, storage and disposal facilities, including the groundwater protection regulations of 40 CFR Part 264, Subpart F. Because most of the remedial alternatives include repository disposal of wastes from the Hill and all alternatives envision some hazardous or deleterious substances being left in place, the groundwater protection requirements of 40 CFR Part 264, Subpart F are relevant and appropriate. Subpart F includes, inter alia, groundwater monitoring program, monitor well installation, sampling, sample analysis, reporting and corrective action requirements.

RELEVANT AND APPROPRIATE

5. Montana Hazardous Waste Management Requirements

General Discussion

The Flue Dust Operable Unit currently contains discrete waste management units, including the flue dust storage areas and beryllium vaults. These are similar to waste piles regulated pursuant to Montana hazardous waste management statutory and regulatory requirements. Additionally, certain of the cleanup alternatives contemplate disposal of contaminated soils and tailings materials on-site. The disposal cell or repository would resemble a landfill unit regulated by Montana hazardous waste management requirements. Accordingly, certain landfill, waste pile, groundwater monitoring, maintenance, closure, post-closure and related hazardous waste management requirements are relevant and appropriate for purposes of site cleanup.

The Montana Hazardous Waste Act

Section 75-10-402. It is the policy of the state "to protect the public health and safety, the health of living organisms, and the environment from the effects of the improper, inadequate or unsound management of hazardous wastes" by establishing a regulatory program to assure the safe and adequate management of such waste.

APPLICABLE

Hazardous Waste Management Regulations

Section 16.44.701 - 16.44.703. By reference to federal regulatory requirements, these sections establish the standards for all permitted hazardous waste management facilities. Remedial

alternatives that contemplate storage of contaminated soils or tailings in an on-site facility are sufficiently similar to the hazardous waste management units regulated pursuant to these sections that those regulatory provisions applicable to waste piles and landfill units are relevant and appropriate. Pertinent provisions include (by reference to the federal regulations as incorporated in the Montana regulations): groundwater protection requirements in 40 CFR § 264.91 through 264.101 (discussed in greater detail in the action-specific ARARs, Section 4.3, above), closure and post-closure obligations set out in 40 CFR § 264.111 through 120, waste pile provisions set out in 40 CFR § 264.250, 251, 254, and 258, and landfill requirements set out in 40 CFR § 264.303, 309 and 310. Of particular concern are RCRA landfill closure requirements. Specifically, the following requirements are relevant and appropriate.

(1) 40 CFR § 264.111 (incorporated by reference in ARM § 16.44.720) establishes that hazardous waste management facilities must be closed in such a manner as to minimize the need for further maintenance and to control, minimize or eliminate, to the extent necessary to protect public health and the environment, post-closure escape of hazardous wastes, hazardous constituents, leachate, contaminated runoff or hazardous waste decomposition products to the ground or surface waters or to the atmosphere.

(2) 40 CFR § 264.228(a) (incorporated by reference by ARM § 16.44.702) requires that at closure, free liquids must be removed or solidified, the wastes stabilized and the waste management unit covered.

(3) 40 CFR §§ 264.228 and 264.310 (incorporated by reference by ARM § 16.44.702) require that surface impoundment and landfill caps must: (a) provide long-term minimization of migration of liquids through the unit; (b) function with minimum maintenance; (c) promote drainage and minimize erosion or abrasion of the final cover; (d) accommodate settling and subsidence; and (e) have a permeability less than or equal to the permeability of the natural subsoils present.

(4) 40 CFR § 264.228 and 264.310 (incorporated by reference by ARM § 16.44.702) also require post-closure care, including maintenance and monitoring, to ensure cap integrity.

(5) 40 CFR §§ 264.116 and 264.119 (incorporated by reference by ARM § 16.44.702) require, <u>inter alia</u>, that the owner or operator submit to the local land use or zoning authority a survey plat indicating the location and dimensions of waste disposal units, together with the types and amounts of waste disposed of in each unit. Additionally, the owner must record a deed restriction, in accordance with state law, that will in perpetuity notify potential purchasers that the property has been used for waste disposal and that its use is restricted.

RELEVANT AND APPROPRIATE

6. Solid Waste

All non-liquid waste materials within the Flue Dust Operable Unit that are not regulated under or subject to the preceding hazardous waste management requirements are subject to Montana solid waste management requirements.

The Montana Solid Waste Management Act

Section 75-10-202. The Montana Legislature has found that the "health and welfare of Montana citizens are being endangered by improperly operated solid waste management systems and by the improper and unregulated disposal of wastes." Therefore, Montana has declared that it is the state's public policy to "control solid waste management systems to protect the public health and safety and to conserve natural resources whenever possible."

APPLICABLE

Section 75-10-212. This section makes it unlawful to dispose of solid waste except as prescribed by the Montana Solid Waste Management Act. Such disposal is also prohibited on privately owned property where hunting, fishing or other recreation is permitted, with certain exceptions.

APPLICABLE

Section 75-10-214. A property owner may, however, dispose of solid waste on his or her own property unless such disposal creates a nuisance or public health hazard.

APPLICABLE

Solid Waste Management Regulations

Section 16.14.505. The standards for solid waste disposal are set forth in this provision and include: preclusion against location of solid waste disposal sites in a 100-year floodplain, a requirement that sites be located only in areas that will prevent the pollution of ground and surface waters and public and private water supplies, a requirement for drainage structures to be installed where necessary to prevent surface runoff from entering disposal areas and a requirement that sites be located to allow for reclamation and reuse of the land.

APPLICABLE

Section 16.14.520. General operational and maintenance requirements for solid waste management systems are established pursuant to this section. This section requires that solid waste disposal be confined to areas within the disposal site that can be

effectively maintained and operated.

APPLICABLE

Section 16.14.523. Solid waste must be transported in such a manner as to prevent its discharge, dumping, spilling or leaking from the transport vehicle.

APPLICABLE

Section 16.40.1103. Requires all ponds from mining, milling or manufacturing operations to be drained and covered with clean material or provided with vegetative cover that will prevent erosion. Also any piles shall be leveled so that no low places that may collect water exist. Side slopes are to be stabilized. Any pile edges abutting a water course must be diked and riprapped to prevent erosion. Access to any stabilized pile area must be controlled.

APPLICABLE

7. Air Quality

The Clean Air Act of Montana and implementing regulations include certain action-specific requirements to ensure that the chemical-specific standards set forth in the first part of this Appendix are met. These ARARs are discussed in detail below.

The Clean Air Act of Montana

Section 75-2-102. Montana has declared it to be state policy to "achieve and maintain such levels of air quality as will protect human health and safety and, to the greatest degree practicable, prevent injury to plant and animal life and property, foster the comfort and convenience of the people, promote the economic and social development of the state, and facilitate the enjoyment of the natural attractions of this state." Compliance with this policy will be achieved by meeting the air quality standards described in this analysis.

APPLICABLE

Air Quality Regulations

Section 16.8.1103. This section requires, for any new or altered source, emission controls with the maximum air pollution control capability which is technically practicable and economically feasible.

APPLICABLE

Section 16.8.1401. "No person shall cause or authorize the production, handling, transportation or storage of any material unless reasonable precautions to control emissions of airborne

particulate matter are taken." Moreover, "no person shall cause or authorize the use of any street, road or parking lot without taking reasonable precautions to control emissions of airborne particulate matter."

APPLICABLE

Section 16.8.1424. Adopts by reference the NESHAPs found in 40 CFR Part 261. The standards for arsenic emissions contain both numerical standards, found in the contaminant specific section, and narrative requirements which govern the action. Any action undertaken must result in cleanup and proper disposal, wet-down or chemical stabilization of any dry, dusty material having an inorganic arsenic concentration greater than 2%. In addition, emissions of inorganic arsenic must be minimized during any construction activity. All control equipment must be inspected once per shift. Also, a plan must be prepared for stopping operations if any increase of inorganic arsenic concentrations is detected. A continuous monitoring system is required for the measurement of the opacity of each arsenic trioxide and metallic arsenic process emission stream.

APPLICABLE

Section 16.8.1427. This section prohibits any person from operating any business or using any machine, equipment, device or facility in such a manner as to create a public nuisance.

APPLICABLE

8. Occupational Safety

The State of Montana requires that precautions and safeguards be taken to render the work place safe. Certain of those requirements have already been set forth in the form of numeric exposure values for worker health protection against noise and air emission exposures in part 1 of this Appendix. Additional safety requirements are established in the Montana Safety Act and the Employee and Community Hazardous Chemical Information Act. Those requirements are discussed in greater detail below.

The Montana Safety Act

Section 50-71-201. This section requires that every employer furnish a safe place of employment, provide safety devices and safeguards and use practices, operations and processes as are reasonably adequate to render the place of employment safe. The employer must also do every other thing reasonably necessary to protect the life and safety of its employees.

APPLICABLE

The Employee and Community Hazardous Chemical Information Act

Section 50-78-202. This section requires that each employer

compile and maintain a work place chemical list which contains the chemical name of each hazardous chemical in the work place, cross-referenced to generally used common names. This list must indicate the work area in which each such hazardous chemical is stored or used.

APPLICABLE

Section 50-78-203. Every employer must maintain the most current material safety data sheets for each hazardous chemical in the work place.

APPLICABLE

Section 50-78-204. This section requires that an employee who may be exposed to hazardous chemicals must be informed of potential or actual exposure and provided access to the work place chemical list and the material safety data sheets for each hazardous chemical.

APPLICABLE

Section 50-78-307. This section requires that every employer provide, at least annually, an education and training program for all employees using or handling hazardous chemicals.

APPLICABLE

9. Water Resources

The State of Montana has promulgated a variety of statutes and regulations governing the use, diversion and appropriation of both surface and groundwater, primarily to address water quality issues. Though these requirements may not be strictly environmental limitations, they do impact environmental quality. Therefore, the State of Montana has identified pertinent provisions of the Montana Water Development Program Act, the Natural Streambed and Land Preservation Act of 1975, the Stream Protection Act, Water Reservation Regulations, Water Well Construction Regulations, and Water Quality Regulations as ARARs.

The Montana Water Development Program Act

Section 85-1-601. It is applicable policy in the State of Montana that "water is one of the most valuable and important renewable resources in Montana."

APPLICABLE

Section 85-2-101. The state's water conservation policy is designed to "encourage the wise use of the state's water resources . . . and to provide for the wise utilization, development, and conservation of the waters of the state for the maximum benefit of its people with the least possible degradation of the natural aquatic ecosystems."

APPLICABLE

Section 85-2-412. Where a person has diverted all of the water of a stream by virtue of prior appropriation and there is a surplus of water so diverted, such surplus must be returned to the stream.
APPLICABLE

The Natural Streambed and Land Preservation Act of 1975

Section 75-7-104. This section provides that streambed protection requirements shall not impair, diminish, divest, or control any existing or vested water rights.

APPLICABLE

The Streambed Protection Act

Section 87-5-506. Similarly, this section states that stream protection for fish and wildlife purposes shall not operate or be construed as to impair, diminish, divest or control any existing or vested water rights.

APPLICABLE

APPENDIX B

STATE OF MONTANA TBCs IDENTIFIED
TO EPA
DECEMBER 1989

| Metal | TLV | 1-hour | 24-hour | Annual Average |
|---|---|---|---|---|
| Aluminum | 2,000 | 47.62 | 15.71 | 2.62 |
| Arsenic | 50 | 1.19 | 0.39 | 0.07 |
| Cadmium | 50 | 1.19 | 0.39 | 0.07 |
| Copper | 200 | 4.76 | 1.57 | 0.26 |
| Iron | 1,000 | 23.81 | 7.86 | 1.31 |
| Lead | 150 | 3.57 | 1.19 | 0.20 |
| Manganese | 1,000 | 23.81 | 7.86 | 1.31 |
| Selenium | 200 | 4.76 | 1.57 | 0.26 |
| Silica | 3,000 | 71.43 | 23.57 | 3.93 |
| Silver | 10 | 0.24 | 0.08 | 0.01 |
| Zinc | 5,000 | 119.05 | 39.29 | 6.55 |

STATE OF MONTANA
NONCOMPREHENSIVE LIST OF REQUIREMENTS FOR
REMEDIAL DESIGN, IMPLEMENTATION, OPERATION
AND MAINTENANCE

Superfund defines as ARARs only federal environmental laws and state environmental or facility siting laws. Remedial design, implementation, operation and maintenance must nevertheless comply with all other applicable laws, both state and federal. Many such laws, while not strictly environmental or facility siting laws, have environmental impacts. The State of Montana has identified, below, a non-comprehensive list of state law requirements to be incorporated in the record of decision, during remedial design, or for remedy implementation, operation or maintenance.

1.0 Montana Reclamation Requirements

Section 82-4-222. This section imposes requirements for a detailed plan for reclamation, revegetation, and rehabilitation of the land or water affected by the operation. The plan must include, but is not limited to: (1) the location and area of land affected; (2) the annual rainfall and the direction and average velocity of prevailing winds in the area; (3) the results of any test borings or core sampling, including the nature and depth of various strata or overburden and top soil; (4) a determination of the probable hydrologic consequences of reclamation operations, with respect to the quantity and quality of water, including the dissolved and suspended solids under seasonal flow conditions; (5) a listing of plant varieties encountered in the area to be affected and their relative dominance in the area together with an enumeration of tree varieties and the approximate number of each variety occurring per acre; (6) the estimate cost for backfilling, subsidence stabilization, water control, grading work, topsoiling, planting, revegetating, and reclamation plan.

Section 82-4-223. This section requires that a bond payable to the State of Montana with surety satisfactory to the State be posted in the minimum amount of $10,000.

Section 82-4-237. In accordance with this section, the operator must file an annual report with the Department of State Lands. This section is relevant and appropriate and, for Superfund site reclamation purposes, would be applied to require submittal of the annual report to the State and U.S. EPA including such information as the progress of all reclamation work, including the type of planting or seeding, mixture and amount of seed, date of planting or seeding, and area of land planted.

Section 26.4.305. This section requires that various maps be provided to the State, including: (1) the owners of record of the land surface to be affected by operation; (2) the location and boundaries of any proposed reference areas for determining the success of revegetation; (3) the boundaries of any public park and locations of any cultural or historical resources; (4) elevations and locations of monitoring stations used to gather data for water quality and quantity, fish and wildlife, and air quality; (5) each water diversion, collection, conveyance, treatment, storage, and discharge facility to be used; (6) each air pollution collection and control facility; (7) the location of proposed revegetation communities and fish,

wildlife and related environmental enhancement features; (8) the location of each sedimentation pond and fill area; (9) the final surface drainage plan; and (10) the location of test boring holes.

Section 26.4.317. This section requires that stream channel diversions be described, with maps and cross-sections.

Section 26.4.320. In accordance with this section, a description, including maps and cross-section drawings of proposed disposal sites and spoil disposal structures is required. Compliance with the requirements of this section will be required for on-site disposal of tailings and contaminated soils.

Section 26.4.519. The operator may be required to monitor settling of regraded areas in accordance with this section.

Section 26.4.645. Pursuant to this section groundwater levels, infiltration rates, subsurface flow, storage characteristics and the quality of groundwater must be monitored to determine the effects of mining operations.

Section 26.4.646. In addition, surface water monitoring must be conducted in a manner which is adequate to measure accurately and record water quantity and quality of all discharges from the permit area.

Section 26.4.723. This section requires periodic monitoring of vegetation, soils and wildlife, together with submittal of data obtained by such monitoring.

Section 26.4.731. Where toxicity to animal consumers is suspected due to the effects of mining, comparative chemical analysis of the vegetation in the revegetated area and the reference area may be required.

4.0 Reclamation Bonding, Insurance, Reporting and Special Areas Regulations

Section 26.4.1102 through 26.4.1119. These provisions establish bond amount requirements (26.4.1102); the period of bond liability (26.4.1103); the proper bond form (26.4.1105); bond terms and conditions (26.4.1106); other bond forms including certificates of deposit (26.4.1108) or letters of credit (26.4.1109); replacement bond requirements (26.4.1110); bond release application content requirements (26.4.1111); requirements for advertising of such application for bond release (26.4.1112); inspection requirements prior to bond release (26.4.1113); bond release criteria (26.4.1116); bond forfeiture procedures (26.4.1117); bond forfeiture effects (26.4.1118); and bond forfeiture criteria (26.4.1119).

Section 26.4.1125. This provision specifies liability insurance requirements and requires a minimum of $300,000 bodily injury coverage for each occurrence and $500,000 in the aggregate and $300,000 property damage for each occurrence and $500,000 in the aggregate.

Section 26.4.1129. This section requires the operator to submit an annual report concerning reclamation activities.

## 5.0 Surface Water Quality Requirements

Section 75-5-602. DHES may require the owner or operator of any point source to install, use and maintain monitoring equipment, including biological monitoring, to sample effluents, to make reports and provide such other information as may be reasonably required.

Section 16.20.635. This section identifies acceptable methods of sample collection, preservation and analysis to determine compliance with surface water quality standards.

Section 16.20.642. This provision requires that bioassay tolerance concentrations be determined and specifies the manner for such determination.

Section 75-6-105. Logs from any water wells drilled to furnish water for public consumption must record the depth, thickness, and character of different strata and other related information and be furnished to MDHES.

Section 16.20.211. Pursuant to this section water must be analyzed for the following inorganic chemicals every three years for community groundwater supplies and annually for community surface water supplies: arsenic, cadmium, lead, mercury, nitrate (as N), selenium and silver.

Section 16.20.212 - 16.20.219. These provisions establish sampling and testing requirements.

## 6.0 Groundwater Quality Requirements

Section 85-2-516. Within sixty days after any well is completed, a well log report must be filed by the driller with the DNRC.

Section 16.20.1013. This section requires that any existing source or any proposed source which discharges or may discharge pollutants into State groundwater must obtain a Montana groundwater pollution control system ("MGWPCS") permit. Though no permit will be required for Superfund remedial activities conducted wholly on-site, the information required by this section must be provided. Pertinent information requirements include: location of adjacent State surface waters, list of surface owners and lessees of land within one mile of the proposed source, information describing existing groundwater quality and uses within one mile of the site, soil conditions, geological conditions, groundwater characteristics, local hydrogeology, and proposed measures to be taken to provide alternative water supplies in the event any domestic, municipal, agricultural or commercial or industrial well is adversely affected by the operation of the source.

Section 16.20.1025. Pursuant to this section the owner, operator or person responsible for a spill or unanticipated discharge of any toxic substances that may lower the quality of groundwater below groundwater quality standards must notify the State as soon as possible of such discharge.

## 7.0 Hazardous Waste Management Requirements

Section 75-10-406. This section precludes the construction or operation of a hazardous waste management facility without review and approval from

DHES for such facility. Though no permit is required for Superfund remedial activities conducted wholly on-site, the information required by this section, including an operation and maintenance plan, must be provided.

Section 75-10-409. The facility owner or operator may be required to install monitoring equipment, collect and analyze samples, maintain records and demonstrate compliance with Montana hazardous waste management requirements.

Section 16.44.109 and 16.44.110. These provisions establish monitoring, recordkeeping, and reporting requirements and the option for DHES to establish additional permit conditions on a case-by-case basis.

Section 16.44.120. This section establishes Part B permit application requirements. The permit, itself, will not be required for remedial activity conducted wholly on-site. However, the information required by this section will be required and should be incorporated, at a minimum, during the design phase. Pertinent information requirements include: relationship to adjacent groundwater, security procedures, plans for spill prevention and containment, proximity to fault zones, plans for closure and post-closure care and associated cost estimates, insurance and financial guarantees, and a description of the nature, design, operation and maintenance of hazardous waste management facilities which store, treat or dispose of hazardous waste in surface impoundments, waste piles or landfills.

Section 16.44.804 - 16.44.823. These sections establish closure and post-closure financial assurance requirements for hazardous waste management facilities and are relevant and appropriate for Smelter Hill.

8.0 Solid Waste Management Requirements

Section 75-10-221. Except as provided in MCA § 75-10-214, no person may dispose of solid waste or operate a solid waste management system without a license from DHES. Though a license would not be required for Superfund remedial activity conducted wholly on-site, the operation and maintenance information is pertinent and will be required.

9.0 Air Quality Requirements

Section 75-2-211. This section requires construction and operation permits for any machine, equipment, device or facility which may directly or indirectly cause or contribute to air pollution. Though construction and operation permits will not be required for Superfund remedial activity conducted wholly within the Smelter Hill operable unit, the emissions evaluation process contemplated by this section is required.

Section 16.8.809. Sampling, data collection, recording and data analysis must be performed as specified in this section.

Section 16.8.927. This provision describes how air emission concentrations are to be determined.

10.0 Water Use Restrictions

Section 85-2-301. A person may only appropriate water for a beneficial use.

Section 85-2-302. Pursuant to this provision a person may not appropriate water or commence construction of diversion, impoundment, withdrawal, or distribution works therefore except by applying for and receiving a permit from the DNRC. Though permit requirements are not applicable to Superfund remedial activities conducted wholly on-site, the information required for such permit must be provided.

Section 85-2-306. Appropriation of groundwater may also require a permit and, at a minimum, requires notice of completion and appropriation within sixty days of well completion.

Section 85-2-311. This section specifies the criteria which must be met in order to receive a permit for appropriation of waters and includes requirements that: (1) there are unappropriated waters in the source of supply; (2) the proposed use of water is a beneficial use; and (3) the proposed use will not interfere unreasonably with other planned uses or developments.

Section 85-2-402. An appropriator may not change an appropriational right except as provided in this section and with the approval of the Department of Natural Resources and Conservation.

Sections 36.16.104 through 36.16.106. These sections establish water reservation application and application content requirements. Though the permit application requirements are not applicable, the information required by these sections must be provided.

11.0 Water Well Construction Regulations

Section 36.21.402, 36.21.403, 36.21.405, 36.21.406 and 31.21.411. These provisions establish that water well contractors and drillers must be licensed and set forth license content and licensure bonding requirements.

Section 36.21.701 and 36.21.703. Pursuant to these sections monitoring well constructors must also be licensed and must verify their experience.

Section 16.20.405. Any person or firm drilling or causing any water well to be drilled within the State of Montana for use in furnishing water directly or indirectly for public consumption or use must register with DHES.

DEPARTMENT OF
HEALTH AND ENVIRONMENTAL SCIENCES

both files

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Bureau of Solid and Hazardous Waste
Superfund Program
Telephone: (406)444-2821

December 13, 1989

Mike Bishop
US EPA
301 S. Park
Drawer 10096
Helena, MT. 59101

Dear Mike,

Enclosed is the State's TBCs to be included in the requirements for both the Flue Dust operable unit and the Smelter Hill RI/FS. I have not forwarded a copy to Rex, and I will rely on you to do that.

If either you or Rex have any questions, feel free to call.

Sincerely,

Tom

Thomas L. Eggert
Special Assistant Attorney General
Superfund Program

"AN EQUAL OPPORTUNITY EMPLOYER"

STATE OF MONTANA
IDENTIFICATION OF OTHER GUIDANCE
TO BE CONSIDERED ("TBCs")

In addition to considering ARARs, a feasibility study must also identify and incorporate other federal and state "criteria, advisories and guidance" (known as "TBCs") that ensure protection of human health and the environment and are appropriate for the circumstances at the site. In that category Montana has identified certain proposed maximum contaminant level goals ("MCLGs") and ambient air guidelines for non-criteria air pollutants, as more specifically described below.

Superfund Section 121(d), 42 U.S.C. § 9621(d), provides that maximum contaminant level goals ("MCLGs") established under the federal Safe Drinking Water Act are properly considered for remedy selection purposes. Maximum Contaminant Level Goals are the maximum level of a contaminant in drinking water at which no known or anticipated adverse effect on the health of persons would occur and which allow an adequate margin of safety. While there are no MCLGs yet established for the metal contaminants of concern at Smelter Hill, MCLGs have been proposed for several of these metals. (54 Fed. Reg. 22,062, May 22, 1989). Because the values have not been "duly promulgated", Montana has identified them as standards to be considered, consistent with the NCP, 40 C.F.R. § 300.68(i)(4).

| Constituent | Concentration (mg/l) |
|---|---|
| Cadmium | 0.005 |
| Beryllium | - 0 - |
| Arsenic | - 0 - |
| Mercury | 0.002 |
| Selenium | 0.05 |

Lastly, the State of Montana has developed Ambient Air Guidelines for Non-Criteria Air Pollutants. These Guidelines incorporate threshold limit values ("TLVs"), representing conditions under which it is believed that nearly all workers may be repeatedly exposed, day after day, without adverse effect. the TLVs are derived from the best available information from industrial experience, experimental human studies, experimental animal studies or a combination of all three. However, rarely are the values based on comprehensive analysis of human exposures (such studies present a tremendous risk) and, therefore, the TLVs may not be fully protective of all exposed populations. The Guidelines calculate and present 1-hour, 24-hour and annual average exposure concentrations believed to be safe. The following Guidelines are not "duly promulgated" regulations, but should be considered in selecting the cleanup for the Smelter Hill operable unit.

# APPENDIX C

**Cost Estimate Backup Analysis**

Table C-2.1
Alternative No. 2
Item 1 Backup

EXCAVATE/TRANSPORT UNTREATED FLUE DUST/PLACE IN REPOSITORY

| SITE LOCATION | HOURS | QUANTITY | UNIT | UNIT PRICE | TOTAL |
|---|---|---|---|---|---|
| 1.AREA CUT | 6 | 3,882 | CY | $2.24 | $8,702 |
| 2.BRADLEY PONDS | 278 | 99,215 | CY | $4.80 | $476,708 |
| 3.COAL PILE TRACKS | 136 | 42,477 | CY | $3.48 | $147,616 |
| 4.FDS FACILITY | 207 | 64,633 | CY | $3.81 | $246,329 |
| 5.IRON PONDS | 215 | 74,360 | CY | $4.03 | $300,034 |
| 6.MAIN FLUE | 106 | 36,700 | CY | $4.03 | $148,080 |
| 7.MISC PILES | 23 | 7,147 | CY | $3.48 | $24,837 |
| 8.SWITCH BACK | 14 | 4,394 | CY | $4.48 | $19,699 |
| 9.THICKENER | 23 | 6,500 | CY | $4.53 | $29,429 |
| SUB TOTAL | 1008 | 339,308 | | | $1,401,434 |
| WHEEL WASHES | | 7 | EA | $13,600.00 | $95,200 |
| CONSTRUCTION WATER | | 10,784 | CF | $0.33 | $3,591 |
| WATER LINE ABOVE GROUND | | 14,000 | LF | $4.16 | $58,240 |
| ABOVE GROUND WATER TANK | | 1 | LS | $22,000.00 | $22,000 |
| HAUL ROADS | | 1 | LS | $17,560.00 | $17,560 |
| HEALTH & SAFETY (INCLUDES 40 HR CLASS,MEDICAL EXAMS & EQUIP) | | 22 | EA | $6,376.00 | $140,272 |
| TOTALS | | | | $5.12 | $1,738,297 |

ASSUMPTION FOR CALCULATIONS ARE BASED ON USING CAT 235 EXCAVATOR, CAT 769 OFF ROAD 35 TON DUMP TRUCKS, CAT 14G ROAD GRADER, CAT D8 DOZER WITH RIPPER, ONE 4,000 GALLON WATER TRUCK FOR ROADBED DUST CONTROL, ONE 4,000 GALLON WATER TRUCK WITH WATER CANNON FOR FLUE DUST CONTROL. EQUIPMENT AND LABOR PRICES ARE BASED ON HOURLY RATES BY WASHINGTON CONSTRUCTION. CUBIC YARD TOTALS FOR THE NINE AREAS INCLUDES REMOVING ADDITIONAL 6 INCHES OF MATERIAL BELOW EXISTING PILES. TOTAL AMOUNT OF FLUE DUST IS BASED ON 316,500 CUBIC YARDS. CONCRETE WALLS AND BOTTOM OF THE THICKENER WILL REMAIN IN PLACE. FLUE DUST FROM THE MAIN FLUE WILL BE STOCKPILED AT THE BOTTOM (NORTH END) OF THE MAIN FLUE SYSTEM BY OTHERS. MOBILIZATION FOR EQUIPMENT IS NOT INCLUDED. PRICES ARE BASED ON 1990 QUOTES WITHOUT ESCALATION.

Table C-2.2
Alternative No. 2
Item 2 Backup

CONSTRUCT RCRA REPOSITORY

| ITEM | QUANTITY | UNIT | UNIT PRICE | TOTAL |
|---|---|---|---|---|
| CUT/STOCKPILE | 239,040 | CY | $2.50 | $597,600 |
| CLAY LINER | 61,923 | CY | $10.50 | $650,192 |
| 60 MIL HDPE LINER | 1,227,777 | SF | $0.70 | $859,444 |
| CONSTRUCTION WATER | 9,587 | CF | $0.33 | $3,192 |
| GEO-NET | 611,389 | SF | $0.48 | $293,467 |
| GRAVEL 2' BOTTOM | 8,110 | CY | $13.50 | $109,485 |
| PLACE FROM STOCKPILE TO BOTTOM | 26,750 | CY | $1.50 | $40,125 |
| PLACE FROM STOCKPILE TO SIDES | 35,595 | TN | $2.00 | $71,190 |
| 30 MIL PVC LINER | 608,450 | SF | $0.35 | $212,958 |
| GRAVEL 6" DRAINAGE LAYER | 9,437 | CY | $14.50 | $136,837 |
| PLACE FROM STOCKPILE TO CAP | 176,541 | CY | $1.50 | $264,812 |
| GEOTEXTILE NON WOVEN FABRIC | 1,953,027 | SF | $0.22 | $429,666 |
| 4" PVC COLLECTION PIPE | 4,029 | LF | $7.00 | $28,203 |
| 6" PVC PERF COLLECTION PIPE | 2,489 | LF | $9.00 | $22,401 |
| MANHOLE | 100 | LF | $65.00 | $6,500 |
| 6" PVC OBSERVATION PIPE | 100 | LF | $9.00 | $900 |
| SUMP PUMPS | 4 | EA | $2,200.00 | $8,800 |
| FENCE | 5,214 | LF | $6.00 | $31,284 |
| SEEDING | 21 | AC | $1,500.00 | $31,500 |
| FIELD & LAB TESTING FOR RCRA | 1 | LS | $57,000.00 | $57,000 |
| HEALTH & SAFETY (INCLUDES 40 HR CLASS, MEDICAL EXAMS & EQUIPMENT | 18 | EA | $6,376.00 | $114,768 |
| TOTALS | | | | $3,970,322 |

ASSUMPTION FOR CALCULATIONS BASED ON USING CAT 637 SCRAPERS, CAT 14G ROAD GRADER, CAT 815 COMPACTOR, CAT D6 DOZER, WATER TRUCKS. EQUIPMENT AND LABOR PRICES ARE BASED ON HOURLY RATES BY WASHINGTON CONSTRUCTION. LINERS ARE BASED ON QUOTES FROM PREVIOUS DAMES & MOORE CONTRACTS. COST FOR RCRA REPOSITORY INCLUDES ONLY CONSTRUCTION, DOES NOT INCLUDE LONG-TERM MAINTENANCE AND MONITORING. PRICES ARE BASED ON 1990 QUOTES WITHOUT ESCALATION. MOBILIZATION FOR EQUIPMENT IS NOT INCLUDED.

Table C-4.1
Alternative No. 4
Item 1 Backup

EXCAVATE/PLACE FLUE DUST IN STOCKPILE FOR CRUSHER

| SITE LOCATION | HOURS | QUANTITY | UNIT | UNIT PRICE | TOTAL |
|---|---|---|---|---|---|
| 1.AREA CUT | 24 | 4,689 | CY | $3.14 | $14,700 |
| 2.BRADLEY PONDS | 500 | 100,022 | CY | $3.14 | $313,569 |
| 3.COAL PILE TRACKS | 217 | 43,284 | CY | $3.14 | $135,695 |
| 4.FDS FACILITY | 327 | 65,440 | CY | $3.13 | $205,154 |
| 5.IRON PONDS | 376 | 75,167 | CY | $3.14 | $235,649 |
| 6.MAIN FLUE | 188 | 37,507 | CY | $1.95 | $72,951 |
| 7.MISC PILES | 40 | 7,954 | CY | $3.14 | $24,936 |
| 8.SWITCH BACK | 26 | 5,201 | CY | $3.13 | $16,305 |
| 9.THICKENER | 37 | 7,307 | CY | $3.71 | $27,109 |
| SUB TOTAL | 1735 | 346,571 | CY | | $1,046,068 |
| CONSTRUCTION WATER | | 11,017 | CF | $0.33 | $3,669 |
| HEALTH & SAFETY (INCLUDES 40 HR CLASS, MEDICAL EXAMS & EQUIP) | | 8 | EA | $6,376.00 | $51,008 |
| TOTALS | | | | $3.18 | $1,100,745 |

ASSUMPTION FOR CALCULATIONS ARE BASED ON USING CAT 235 EXCAVATOR, CAT 769 OFF ROAD 35 TON DUMP TRUCKS, CAT 14G ROAD GRADER, CAT D8 DOZER WITH RIPPER, ONE 4,000 GALLON WATER TRUCK FOR ROADBED DUST CONTROL, ONE 4,000 GALLON WATER TRUCK WITH WATER CANNON FOR FLUE DUST CONTROL. EQUIPMENT AND LABOR PRICES ARE BASED ON HOURLY RATES BY WASHINGTON CONSTRUCTION. CUBIC YARD TOTALS FOR THE NINE AREAS INCLUDES REMOVING ADDITIONAL 6 INCHES OF MATERIAL BELOW EXISTING PILES, AND AN ADDITIONAL 6 INCHES OF MATERIAL IN AREA WHERE BATCH PLANT AND CRUSHER ARE PLACED. TOTAL AMOUNT OF FLUE DUST IS BASED ON 316,500 CUBIC YARDS. CONCRETE WALLS AND BOTTOM OF THE THICKENER WILL REMAIN IN PLACE. FLUE DUST FROM THE MAIN FLUE SYSTEM WILL BE STOCKPILED AT THE BOTTOM (NORTH END) OF THE MAIN FLUE SYSTEM BY OTHERS. MOBILIZATION FOR EQUIPMENT IS NOT INCLUDED. PRICES ARE BASED ON 1990 QUOTES WITHOUT ESCALATION.

Table C-4.2
Alternative No. 4
Item 2 Backup

PLACE MATERIAL FROM NINE AREAS INTO CRUSHER AND STOCKPILE FOR BATCH PLANT

| ITEM | QUANTITY | UNIT | UNIT PRICE | TOTAL |
|---|---|---|---|---|
| CRUSHER | 346,571 | CY | $3.65 | $1,264,984 |
| MOBILIZATION | 3 | EA | $35,000.00 | $105,000 |
| BERMS FOR EROSION CONTROL | 1 | EA | $9,120.00 | $9,120 |
| MOBILIZATION TO EACH SITE | 8 | EA | $6,560.00 | $52,480 |
| HEALTH & SAFETY (INCLUDES 40 HR) CLASS, MEDICAL EXAMS AND EQUIPMENT) | 5 | EA | $6,376.00 | $31,880 |
| TOTALS | | | $4.22 | $1,463,464 |

PRICES ARE BASED ON QUOTE FROM PEBBLE HAULERS BASED ON THREE MOBILIZATIONS. INCLUDES LABOR AND EQUIPMENT. RECYCLE CRUSHER HANDLES CONCRETE, STEEL AND REBAR, WILL CRUSH TO 1 1/2" MINUS. CRUSHER WILL HANDLE 350 TONS PER HOUR. PRICES ARE BASED ON 1990 QUOTES WITHOUT ESCALATION.

Table C-4.3
Alternative No. 4
Item 3 Backup

PLACE STOCKPILED MATERIAL INTO BATCH PLANT AND PROCESS

| ITEM | QUANTITY | UNIT | UNIT PRICE | TOTAL |
|---|---|---|---|---|
| STOCKPILE/INTO PUGMILL | 488,308 | TN | $3.45 | $1,684,663 |
| | (361,710 | CY) | | |
| MOBILIZATION | 3 | EA | $35,000.00 | $105,000 |
| CONSTRUCTION WATER | 7,181 | CF | $0.33 | $2,391 |
| WATER FOR DUST CONTROL | 15,668 | CF | $0.33 | $5,217 |
| WATER LINE ABOVE GROUND | 14,000 | LF | $4.16 | $58,240 |
| ABOVE GROUND WATER TANK | 1 | EA | $22,000.00 | $22,000 |
| PORTLAND CEMENT | 90,428 | TN | $75.00 | $6,782,100 |
| HYDRATED LIME | 36,171 | TN | $100.00 | $3,617,100 |
| HEALTH & SAFETY (INCLUDES 40 HR) | | | | |
| CLASS, MEDICAL EXAMS & EQUIPMENT) | 14 | EA | $6,376.00 | $89,264 |
| TCLP TESTS (CLP METHODS) | 488 | EA | $795.00 | $387,960 |
| LAB TECHNICIAN | 366 | DA | $84.00 | $30,744 |
| TOTALS | | | $26.18 | $12,784,679 |

PRICES ARE BASED ON QUOTE FROM PEBBLE HAULERS BASED ON THREE MOBILIZATIONS. PORTLAND CEMENT USAGE IS BASED ON USING 25% OF TOTAL TONS OF DRY FLUE DUST, HYDRATED LIME USAGE IS BASED ON USING 10% OF TOTAL TONS OF DRY FLUE DUST. LABORATORY TESTS ARE BASED ON USING TWO DAY TURN AROUND TIME PER SAMPLE FOR CLP METHODOLOGY. TECHNICIANS ARE BASED ON 5 DAYS PER WEEK. PRICES ARE BASED ON 1990 QUOTES WITHOUT ESCALATION.

Table C-4.4
Alternative No. 4
Item 4 Backup

LOAD TREATED MATERIAL/HAUL TO REPOSITORY AND PLACE

| SITE LOCATION | HOURS | QUANTITY | UNIT | UNIT PRICE | TOTAL |
|---|---|---|---|---|---|
| 1.AREA CUT | 42 | 7,065 | TN | $4.13 | $29,207 |
| 2.BRADLEY PONDS | 736 | 139,436 | TN | $5.30 | $739,167 |
| 3.COAL PILE TRACKS | 366 | 60,988 | TN | $4.13 | $252,124 |
| 4.FDS FACILITY | 239 | 93,906 | TN | $4.69 | $439,968 |
| 5.IRON PONDS | 645 | 105,233 | TN | $4.87 | $512,471 |
| 6.MAIN FLUE | 314 | 51,179 | TN | $4.87 | $249,235 |
| 7.MISC PILES | 74 | 12,260 | TN | $4.13 | $50,683 |
| 8.SWITCH BACK | 52 | 7,832 | TN | $5.29 | $41,457 |
| 9.THICKENER | 62 | 10,409 | TN | $4.13 | $43,031 |
| SUB TOTAL | 2930 | 488,308 | TN | | $2,357,343 |
| | | (361,710 | CY) | | |
| CONSTRUCTION WATER | | 15,668 | CF | $0.33 | $5,217 |
| WHEEL WASHES | | 7 | EA | $13,600.00 | $95,200 |
| HAUL ROADS | | 1 | LS | $17,560.00 | $17,560 |
| HEALTH & SAFETY, INCLUDES 40 HR) CLASS,MEDICAL EXAMS & EQUIP) | | 8 | EA | $6,376.00 | $51,008 |
| TOTALS | | | | $6.98 | $2,526,329 |

ASSUMPTION FOR CALCULATIONS ARE BASED ON USING CAT 235 EXCAVATOR, CAT 769 OFF ROAD 35 TON DUMP TRUCKS, CAT 14G ROAD GRADER, CAT D8 DOZER WITH RIPPER, ONE 4,000 GALLON WATER TRUCK FOR ROADBED DUST CONTROL, ONE 4,000 GALLON WATER TRUCK WAITH WATER CANNON FOR FLUE DUST CONTROL. EQUIPMENT AND LABOR PRICES ARE BASED ON HOURLY RATES BY WASHINGTON CONSTRUCTION. CUBIC YARD TOTALS FOR THE NINE AREAS INCLUDES REMOVING ADDITIONAL 6 INCHES OF MATERIAL BELOW EXISTING PILES, AN ADDITIONAL 6 INCHES OF MATERIAL BELOW THE CRUSHER/BATCH PLANT AREA, AND THE ADDITION OF PORTLAND CEMENT AND HYDRATED LIME. TOTAL AMOUNT OF FLUE DUST IS BASED ON 316,500 CUBIC YARDS. CONCRETE WALLS & BOTTOM OF THE THICKENER WILL REMAIN IN PLACE. FLUE DUST FROM THE MAIN FLUE SYSTEM WILL BE STOCKPILED AT THE BOTTOM (NORTH END) OF THE MAIN FLUE SYSTEM BY OTHERS. MOBILIZATION FOR EQUIPMENT IS NOT INCLUDED. PRICES ARE BASED ON 1990 QUOTES WITHOUT ESCALATION.

Table C-4.5B
Alternative No. 4
Capital Item 5 Backup

CONSTRUCT REPOSITORY

| ITEM | QUANTITY | UNIT | UNIT PRICE | TOTAL |
|---|---|---|---|---|
| CUT/STOCKPILE | 222,076 | CY | $2.50 | $555,190 |
| 80 MIL HDPE LINER | 652,664 | SF | $0.90 | $587,398 |
| CONSTRUCTION WATER | 9,260 | CF | $0.33 | $3,084 |
| PLACE FROM STOCKPILE TO BOTTOM | 43,706 | CY | $1.50 | $65,559 |
| PLACE FROM STOCKPILE TO SIDES | 37,998 | CY | $2.00 | $75,996 |
| GRAVEL 6" DRAINAGE LAYER | 10,120 | CY | $14.50 | $146,740 |
| PLACE FROM STOCKPILE TO CAP | 140,373 | CY | $1.50 | $210,560 |
| 4" PVC COLLECTION PIPE | 4,301 | LF | $7.00 | $30,107 |
| 6" PVC PERF COLLECTION PIPE | 2,657 | LF | $9.00 | $23,913 |
| MANHOLE | 106 | LF | $65.00 | $6,890 |
| 6" PVC OBSERVATION PIPE | 106 | LF | $9.00 | $954 |
| SUMP PUMPS | 4 | EA | $2,200.00 | $8,800 |
| FENCE | 5,786 | LF | $6.00 | $34,716 |
| SEEDING | 23 | AC | $1,500.00 | $34,500 |
| FIELD & LAB TESTING FOR RCRA | 1 | LS | $34,200.00 | $34,200 |
| HEALTH & SAFETY, (INCLUDES 40 HR CLASS, MEDICAL EXAMS AND EQUIPMENT) | 18 | EA | $6,376.00 | $114,768 |
| TOTALS | | | | $1,933,374 |

ASSUMPTION FOR CALCULATIONS ARE BASED ON USING CAT 637 SCRAPERS, CAT 14G ROAD GRADER, CAT 815 COMPACTOR, CAT D6 DOZER, WATER TRUCKS. EQUIPMENT AND LABOR PRICES ARE BASED ON HOURLY RATES BY WASHINGTON CONSTRUCTION. LINERS ARE BASED ON QUOTES FROM PREVIOUS DAMES & MOORE CONTRACTS. COST FOR NON-RCRA 2 REPOSITORY INCLUDES ONLY CONSTRUCTION DOES NOT INCLUDE LONG-TERM MAINTENANCE AND MONITORING. PRICES ARE BASED ON 1990 QUOTES WITHOUT ESCALATION. MOBILIZATION FOR EQUIPMENT IS NOT INCLUDED. QUANTITIES BASED ON RCRA REPOSITORY MINUS 15%.

CONFIDENTIAL BUSINESS INFORMATION

Table C-5A.1
Alternative No. 5
Capital Item 1 Backup

CONFIDENTIAL BUSINESS INFORMATION

Table C-5A.3B
Alternative No. 5
Capital Item 2 Backup

CONFIDENTIAL BUSINESS INFORMATION

Table C-5A.4
Alternative No. 5
Capital Item 3, O&M Item 2 Backup*

CONFIDENTIAL BUSINESS INFORMATION

Table C-5A.2
Alternative No. 5
O&M Item 3 Backup

Table C-5B.1
Alternative No. 6
Capital Item 1 Backup

EXCAVATE/TRANSPORT UNTREATED FLUE DUST TO CENTRAL STOCKPILE

| SITE LOCATION | HOURS | QUANTITY | UNIT | UNIT PRICE | TOTAL |
|---|---|---|---|---|---|
| 1.AREA CUT | 6 | 3,882 | CY | $1.69 | $6,565 |
| 2.BRADLEY PONDS | 278 | 99,215 | CY | $3.84 | $381,144 |
| 3.COAL PILE TRACKS | 136 | 42,477 | CY | $2.37 | $100,857 |
| 4.FDS FACILITY | 207 | 64,633 | CY | $2.71 | $175,181 |
| 5.IRON PONDS | 215 | 74,360 | CY | $3.04 | $226,364 |
| 6.MAIN FLUE | 106 | 36,700 | CY | $3.04 | $111,721 |
| 7.MISC PILES | 23 | 7,147 | CY | $2.37 | $16,970 |
| 8.SWITCH BACK | 14 | 4,394 | CY | $3.38 | $14,862 |
| 9. THICKENER | 23 | 6,500 | CY | $3.33 | $21,677 |
| | | | CY | | |
| SUB TOTAL | 1008 | 339,308 | CY | | $1,055,342 |
| WHEEL WASHES | | 7 | EA | $13,600.00 | $95,200 |
| CONSTRUCTION WATER | | 10,784 | CF | $0.33 | $3,591 |
| WIDEN HAUL ROADS | | 1 | LS | $17,560.00 | $17,560 |
| HEALTH & SAFETY(INCLUDES 40 HR CLASS,MEDICAL EXAMS & EQUIPME | | 16 | EA | $6,376.00 | $102,016 |
| TOTALS | | | | $3.75 | $1,273,709 |

ASSUMPTION FOR CALCULATIONS ARE BASED ON USING CAT 235 EXCAVATOR, CAT 769 OFF ROAD 35 TON DUMP TRUCKS, CAT 14G ROAD GRADER, CAT D8 DOZER WITH WITH RIPPER, ONE 4,000 GALLON WATER TRUCK FOR ROADBED DUST CONTROL, ONE 4,000 GALLON WATER TRUCK WITH WATER CANNON FOR DUST CONTROL. EQUIPMENT AND LABOR PRICES ARE BASED ON QUOTES FROM WASHINGTON CONSTRUCTION. TOTAL CUBIC YARD ESTIMATES FOR THE NINE AREAS INCLUDES REMOVING ADDITIONAL 6 INCHES OF MATERIAL BELOW EXISTING PILES. TOTAL AMOUNT OF FLUE DUST IS BASED ON 316,500 CUBIC YARDS. CONCRETE WALL AND BOTTOM OF THICKENER WILL REMAIN IN PLACE. FLUE DUST FROM THE MAIN FLUE SYSTEM WILL BE STOCKPILED AT THE BOTTOM (NORTH END) OF THE MAIN FLUE SYSTEM BY OTHERS. MOBILIZATION AND DEMOBILIZATION FOR EQUIPMENT IS NOT INCLUDED. PRICES ARE BASED ON 1990 QUOTES WITHOUT ESCALATION.

Table C-5B.3B
Alternative No. 6
Capital Item 2 Backup

CONSTRUCT REPOSITORY

| ITEM | QUANTITY | UNIT | UNIT PRICE | TOTAL |
|---|---|---|---|---|
| CUT/STOCKPILE | 224,779 | CY | $2.50 | $561,948 |
| 80 MIL HDPE LINER | 660,608 | SF | $0.90 | $594,547 |
| CONSTRUCTION WATER | 9,016 | CF | $0.33 | $3,002 |
| PLACE FROM STOCKPILE TO BOTTOM | 44,238 | CY | $1.50 | $66,357 |
| PLACE FROM STOCKPILE TO SIDES | 38,461 | CY | $2.00 | $76,922 |
| GRAVEL 6" DRAINAGE LAYER | 10,196 | CY | $14.50 | $147,842 |
| PLACE FROM STOCKPILE TO CAP | 142,081 | CY | $1.50 | $213,122 |
| 4" PVC COLLECTION PIPE | 4,354 | LF | $7.00 | $30,478 |
| 6" PVC PERF COLLECTION PIPE | 2,689 | LF | $9.00 | $24,201 |
| MANHOLE | 108 | LF | $65.00 | $7,020 |
| 6" PVC OBSERVATION PIPE | 108 | LF | $9.00 | $972 |
| SUMP PUMPS | 4 | EA | $2,200.00 | $8,800 |
| FENCE | 5,634 | LF | $6.00 | $33,804 |
| SEEDING | 23 | AC | $1,500.00 | $34,500 |
| FIELD & LAB TESTING FOR RCRA | 1 | LS | $34,200.00 | $34,200 |
| HEALTH & SAFETY (INCLUDES 40 HR CLASS, MEDICAL EXAMS & EQUIPMENT | 18 | EA | $6,376.00 | $114,768 |
| TOTALS | | | | $1,952,483 |

ASSUMPTION FOR CALCULATIONS ARE BASED ON USING CAT 637 SCRAPERS, CAT 14G ROAD GRADER, CAT 815 COMPACTOR, CAT D6 DOZER, WATER TRUCKS. EQUIPMENT AND LABOR PRICES ARE BASED ON HOURLY RATES BY WASHINGTON CONSTRUCTION. LINERS ARE BASED ON QUOTES FROM PREVIOUS DAMES & MOORE CONTRACTS. COST FOR REPOSITORY INCLUDES ONLY CONSTRUCTION DOES NOT INCLUDE LONG-TERM MAINTENANCE AND MONITORING. PRICES ARE BASED ON 1990 QUOTES WITHOUT ESCALATION. MOBILIZATION FOR EQUIPMENT IS NOT INCLUDED. QUANTITIES ARE BASED ON CONSTRUCTING A RCRA REPOSITORY MINUS 15%.

Table B-5B.4
Alternative No. 6
Capital Item 3, O&M Item 2 Backup

| Item | Total Costs (1990 Dollars) |
|---|---|
| Capital | |
| Engineering | $1,145,000 |
| Construction Management | 714,200 |
| Equipment Rental | 401,850 |
| Small Tools | 50,000 |
| Field Office | 34,000 |
| Mobilization/Demobilization | 27,000 |
| Freight/Insurance | 255,400 |
| Initial Consumables | 300,500 |
| Initial Parts | 180,000 |
| General Process | 819,650 |
| Material Reciept | 300,150 |
| Leaching/Acid Kill | 749,150 |
| Filtration | 2,889,100 |
| Bleed Stream | 804,700 |
| Solvent Extraction | 732,400 |
| Reagents | 357,150 |
| Electrowinning | 2,816,400 |
| Buildings | 1,150,350 |
| Utilities | 320,000 |
| Maintenance/Office/Laboratory and Electrical Equipment | 672,400 |
| TOTAL CAPITAL COSTS | $14,719,400 |
| O&M | |
| Labor | $810,000 |
| Electrical/Natural Gas | 860,200 |
| Reagents | 933,600 |
| Grinding Media | 38,000 |
| Operating/Maintenance Supplies | 360,000 |
| General & Administrative Labor | 600,000 |
| General & Administrative Supplies | 67,000 |
| TOTAL O&M COSTS | $3,668,800 # |

* Cost Summary from "Feasibility Study, ARCO Coal, Flue Dust Processing Facility, Capitol and Operating Cost Estimate," KD Engineering, Inc. ,1990b.

\# O&M costs are for the five years of production beginning in year 3.

Table C-5B.2
Alternative No. 6
O&M Item 3 Backup

PROCESS ACID LEACH RESIDUE AND LIME PRECIPITATE THROUGH BATCH PLANT AND PLACE INTO REPOSITORY

| ITEM | QUANTITY | UNIT | UNIT PRICE | TOTAL |
|---|---|---|---|---|
| STOCKPILE/INTO PUGMILL | 494,653 | TN | $3.30 | $1,632,355 |
| EXCAVATE 6" BELOW CENTRAL STOCKPILE | 17,000 | CY | $2.50 | $42,500 |
| MOBILIZATION | 2 | EA | $30,000.00 | $60,000 |
| CONSTRUCTION WATER FOR PROCESS | 7,546 | CF | $0.33 | $2,513 |
| CONSTRUCTION WATER FOR DUST CONTROL | 13,037 | CF | $0.33 | $4,341 |
| WATER LINE ABOVE GROUND | 14,000 | LF | $4.16 | $58,240 |
| ABOVE GROUND WATER TANK (10,000 GAL | 1 | EA | $22,000.00 | $22,000 |
| PORTLAND CEMENT | 91,600 | TN | $75.00 | $6,870,000 |
| HYDRATED LIME | 36,600 | TN | $100.00 | $3,660,000 |
| HAUL/PLACE RCC IN RCRA | 494,653 | TN | $3.48 | $1,721,392 |
| | (366,400 | CY) | | |
| HEALTH & SAFETY (INCLUDES 40 HR CLASS, MEDICAL EXAMS & EQUIPMENT | 14 | EA | $6,376.00 | $89,264 |
| ANALYTICAL TCLP TESTS (CLP METHODS) | 508 | EA | $790.00 | $401,320 |
| LAB TECHNICIAN | 305 | DA | $84.00 | $25,620 |
| TOTALS | | | $39.82 | $14,589,545 |

PRICES ARE BASED ON QUOTE FROM PEBBLE HAULERS BASED ON TWO MOBILIZATIONS. PORTLAND CEMENT BASED ON USING 25% OF TOTAL TONS OF DRY FLUE DUST, HYDRATED LIME BASED ON USING 10% OF TOTAL TONS OF DRY FLUE DUST. LABORATORY TESTS ARE BASED ON USING TWO DAY TURN AROUND TIME PER SAMPLE FOR CLP TESTS, WITH ONE SAMPLE PER 1,000 TONS OF MATERIAL. TECHNICIANS ARE BASED ON 5 DAYS PER WEEK. ASSUME PROCESSED MATERIAL IS 100 LBS PER CUBIC FOOT. PRICES ARE BASED ON 1990 QUOTES WITHOUT ESCALATION.