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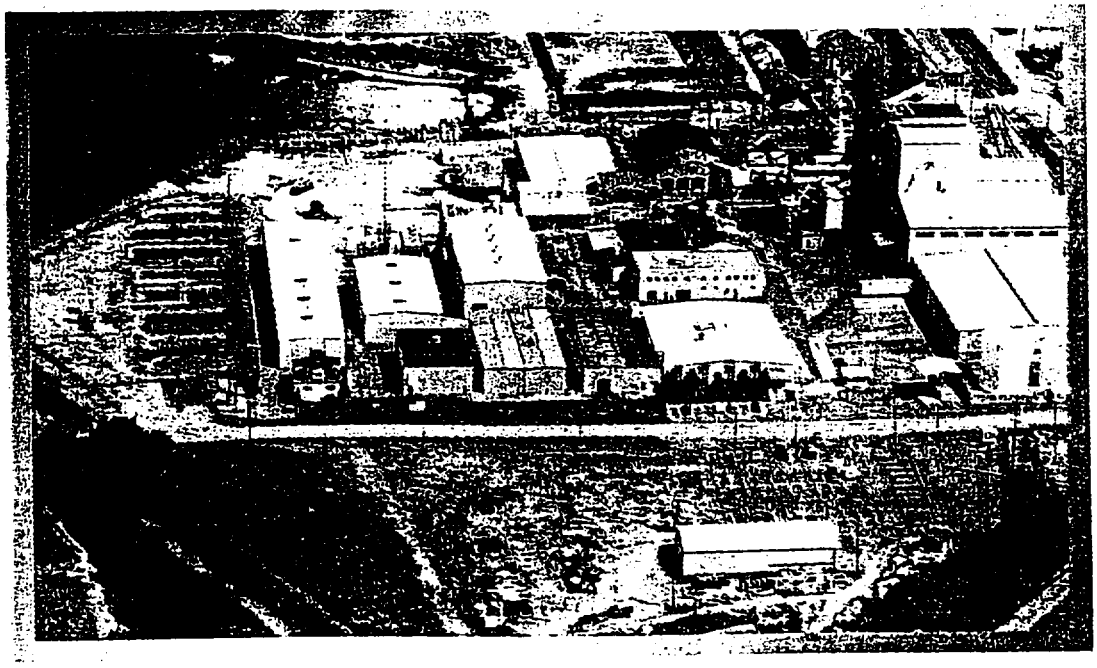
MOLYCORP, Inc.
A UNOCAL 76 COMPANY



Decommissioning Plan
for the
Washington, PA Facility

July 1995

FOSTER WHEELER ENVIRONMENTAL CORPORATION

TABLE OF CONTENTS

DECOMMISSIONING PLAN FOR MOLYCORP, INC.
WASHINGTON, PENNSYLVANIA

TABLE OF CONTENTS

LIST OF TABLES AND FIGURES iii

1.0 GENERAL INFORMATION 1-1

1.1 Purpose 1-1
1.2 License Information 1-1
1.3 Facility Description 1-1

2.0 DESCRIPTION OF PLANNED DECOMMISSIONING ACTIVITIES 2-1

2.1 Decommissioning Objectives, Tasks and Schedules 2-1
2.1.1 Decommissioning Objectives 2-1
2.1.2 Decommissioning Tasks 2-1
2.1.3 Decommissioning Procedures 2-8
2.1.4 Decommissioning Schedule 2-10
2.2 Decommissioning Organization and Responsibilities 2-10
2.2.1 Molycorp Project Manager 2-10
2.2.2 Contractor Project Manager 2-10
2.2.3 Radiological Engineer 2-14
2.2.4 Site Manager 2-15
2.2.5 Site Health and Safety/Radiation Safety Officer 2-16
2.3 Training 2-17
2.4 Contractor Assistance 2-17

3.0 DESCRIPTION OF METHODS USED FOR PROTECTION OF OCCUPATIONAL AND PUBLIC HEALTH AND SAFETY 3-1

3.1 Facility Radiological History Information 3-1
3.1.1 Physical Site Development and Processes 3-1
3.1.2 Historical Perspective on Site Contamination 3-2
3.2 Ensuring That Occupational Radiation Exposures Are As Low As Is Reasonably Achievable 3-5
3.2.1 Corporate Health Physicist 3-5
3.2.2 Contractor Project Manager 3-7
3.2.3 Radiological Engineer 3-7
3.2.4 Site Health and Safety/Radiation Safety Officer 3-7
3.2.5 Individual Employees 3-8
3.3 Health Physics Program 3-8
3.3.1 Administrative Occupational Exposure Limits 3-8
3.3.2 Dosimetry 3-8
3.3.3 Radiation Work Permits 3-9

3.3.4 Controlled Access Area Entry Requirements 3-10
3.3.5 Clean Area Requirements 3-10
3.3.6 Airborne Monitoring 3-11
3.3.7 Respiratory Protection Program 3-12
3.3.8 Personal Protective Clothing Requirements 3-13
3.3.9 Quality Assurance 3-13
3.4 Contractor Personnel and Site Health & Safety Plan 3-14
3.5 Radioactive Waste Management 3-15

4.0 FINAL RADIOLOGICAL STATUS SURVEYS 4-1

4.1 Background Determinations 4-2
4.2 Area Classification 4-2
4.3 Reference Grid System 4-2
4.4 Surface Scans 4-3
4.5 Surface Activity Measurements 4-3
4.5.1 Direct Measurements 4-3
4.5.2 Removable Surface Activity Measurements 4-4
4.6 Exposure Rate Measurements 4-4
4.7 Soil Sampling 4-5
4.7.1 Sampling of Surface Soil 4-5
4.7.2 Sampling of Subsurface Soil 4-5
4.8 Other Measurements and Samples 4-5
4.8.1 Building Interiors 4-5
4.8.2 Building Exteriors 4-5
4.9 Sample Analyses 4-6
4.10 Data Interpretation 4-6
4.11 Final Radiological Status Survey Report 4-6

5.0 FUNDING 5-1

6.0 PHYSICAL SECURITY PLAN AND MATERIAL CONTROL AND ACCOUNTING PLAN PROVISIONS IN PLACE DURING DECOMMISSIONING 6-1

7.0 RECORDS/REPORTS/NOTIFICATIONS 7-1

REFERENCES R-1

LIST OF TABLES

2-1 Potential Materials to be Excavated 2-3
2-2 Anticipated Labor and Equipment Requirements 2-11

LIST OF FIGURES

1-1 Site Map 1-3
2-1 Soil Areas with Greater than 30 pCi/g Thorium-232 2-2
2-1A Soil Areas and Boring Locations with Greater Than 30 pCi/g Thorium-232 ..... (rear pocket)
2-2 Major Construction Tasks & Sequence 2-9
2-3 Construction Schedule 2-12
2-4 Decommissioning Project Safety Organization Chart 2-13
3-1 Active Plant Site and South Property with Locations of Elevated Contact Radiation Levels, 1985 3-4
3-2 Generalized Areas of Significant Impact to Soils and Water 3-6
3-3 Conceptual Road Layout 3-16
3-4 Disposal Cell Plan View 3-18
3-5 Disposal Cell Cross-Section 3-19
3-6 Disposal Cell Profile 3-20

SECTION 1.0

1.0 GENERAL INFORMATION

The Molycorp, Inc. Washington Site Decommissioning Plan (Decommissioning Plan) presents the results of a decommissioning study incorporating an analysis of the Site Characterization Report (SCR) (submitted to United States Nuclear Regulatory Commission (NRC) January, 1995) and a review of disposal alternatives for the waste expected from the decommissioning of the facility. This Decommissioning Plan is submitted in accordance with the guidance provided in the NRC Regulatory Guide 3.65, "Standard Format and Content of Decommissioning Plans for Licensees under 10 CFR Parts 30, 40 and 70."

1.1 PURPOSE

The purpose of this Decommissioning Plan is to present a description of the expected decommissioning activities and the methods to be used to protect workers and the public. This description includes the structure of the safety organization and the responsibilities of members of that organization.

1.2 LICENSE INFORMATION

Molycorp, Inc.'s Washington, Pennsylvania facility produced a ferrocolumbium alloy from Brazilian ore (pyrochlore) between 1964 and 1970. While the use of pyrochlore was commonplace by that time, this particular ore contained thorium as an accessory metal. The thorium was also in concentrations which required Molycorp, Inc. to acquire a Source Materials License (December 19, 1963). The current Source Materials License is SMB-1393 (Docket 40-08778). The operation resulted in the production of a thorium-bearing slag, some of which was used as fill material over portions of the site.

Currently, much of the slag produced from this operation is relocated in a stabilized, soil capped pile on the southern portion of the site. There is also a smaller pile in the northern portion of the site. Ferrocolumbium slag is also mixed with soils at various locations on the site.

Importantly, the slag material does not represent a threat to the public health and safety or to the environment. Additionally, while low concentrations of thorium are present in the slag mixed with site soils, there is no evidence that any of the thorium is migrating off the site.

1.3 FACILITY DESCRIPTION

The Molycorp, Inc. Washington Facility is situated on the outskirts of the City of Washington, PA at 300 Caldwell Avenue in Canton Township. The active site consists of approximately 20 acres that are fenced. The main process buildings are located on the north side of Caldwell Avenue, while employee vehicle parking, equipment and miscellaneous storage areas are located on the south side.

Molybdenum oxide manufacturing was begun in the 1920s, but processing of this material was idled in 1991. The plant also produced ferrocolumbium, as well as other ferroalloys, e.g., molybdenum. Currently, the site is in an extended standby mode with a small active area leased to a vendor. Purchasing and reselling alloys, maintenance and decommissioning are the principal current site activities. See Figure 1-1 for a site map of the facility today.

THIS PAGE IS AN OVERSIZED DRAWING OR FIGURE,

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FIGURE 2-1A:
SOIL AREAS AND BORING LOCATIONS

WITHIN THIS PACKAGE...OR, BY SEARCHING USING THE DRAWING NUMBER:
FIGURE 2-1A

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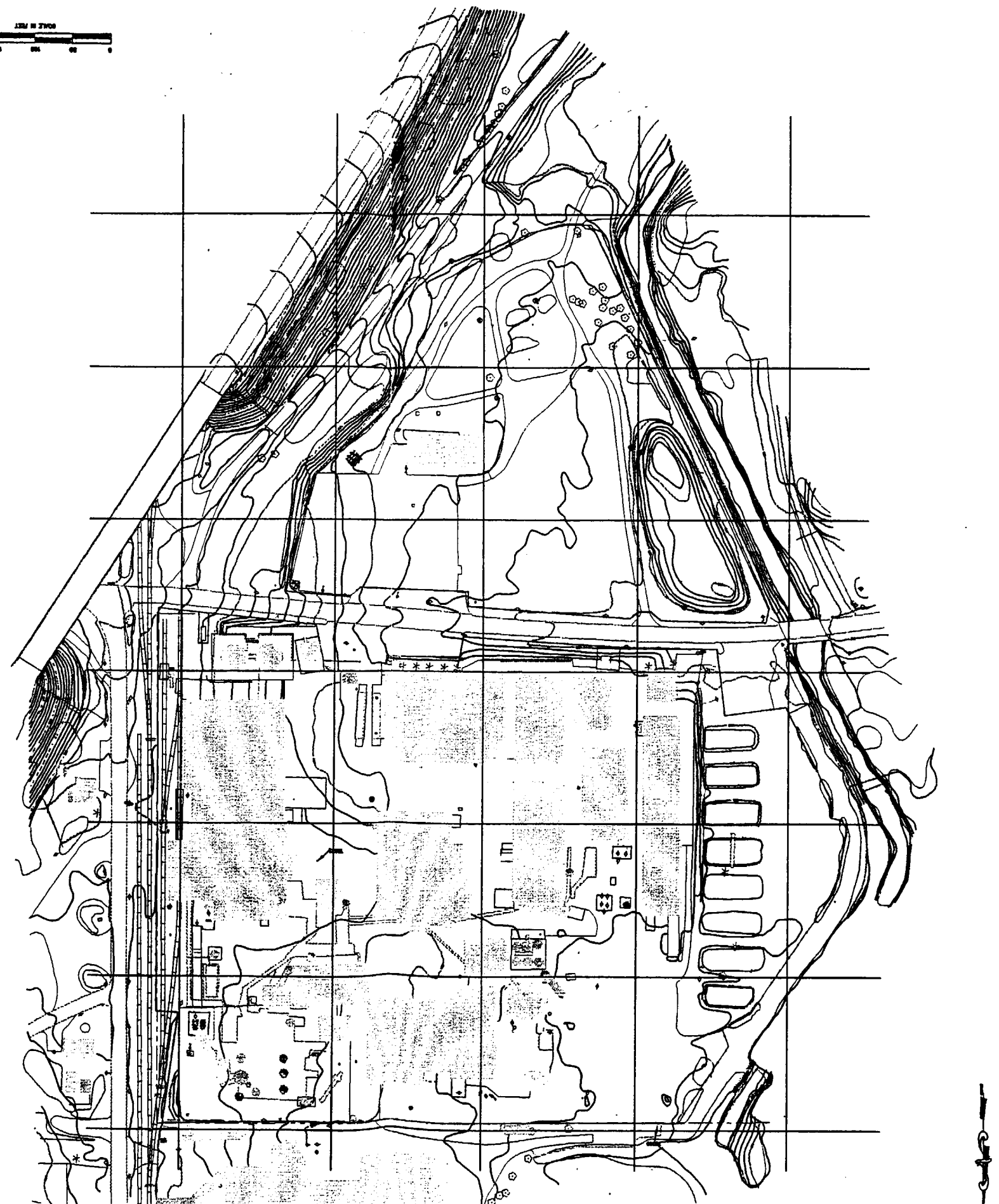

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FORMER EMERGENCY, EMERGENCY, CONFIGURATION

NORTHROP, INC.
WASHINGTON, PA.

FIGURE 1-1
SITE MAP

SCALE IN FEET

SECTION 2.0

2.0 DESCRIPTION OF PLANNED DECOMMISSIONING ACTIVITIES

2.1 DECOMMISSIONING OBJECTIVES, ACTIVITIES, TASKS AND SCHEDULES

2.1.1 Decommissioning Objectives

The decommissioning objectives for the Washington, PA site are:

1. To analyze the gamma-log data from soil borings completed on site to determine the depths to and thicknesses of soils with thorium-232 concentrations exceeding 30 pCi/g. These are summarized in Table 2-1. Areas exhibiting these exceedances are highlighted on Figure 2-1. Figure 2-1A provides zones of exceedance and thicknesses of these zones at each location and the boundaries of these areas (see pocket in rear of plan).

2. To delineate the areas to be excavated. The areas, derived from Table 2-1 and depicted in Figure 2-1, are targeted for excavation in order for the site to achieve restricted-use decommissioned status. Note that about 60 percent of the remaining thorium concentrations in the borings are less than 20 pCi/g (Table 2-1).

3. To formulate a cost-effective ALARA excavation plan. A cost-effective methodology will be determined for each section of the site requiring excavation.
   - Areas where clean overburden can be included in the excavated waste will be identified.
   - Areas where clean overburden can be stockpiled for use in encapsulation and/or grading will be determined.

4. To transport the excavated material to an elevated area near the southwest corner of the Molycorp, Inc. 55-acre property. A road with stream crossing, as needed, will be designed and constructed to the top of the hill containing residual coal tar waste and foundation. The coal tar waste and foundation will be remediated prior to transport of thorium-232 contaminated soils. All required permits will be obtained.

5. To encapsulate thorium-232 contaminated soil in a disposal cell. The disposal cell will be constructed on the former coal tar site and encapsulated with clean overburden, artificial liners, and other protective layers, (e.g., Claymax).

2.1.2 Decommissioning Tasks

The decommissioning tasks include removal of slag material, slag/soil and other material with concentrations of thorium-232 greater than or equal to 30 pCi/g from the active site (affected areas). The material removed will be encapsulated on site in an engineered disposal cell.

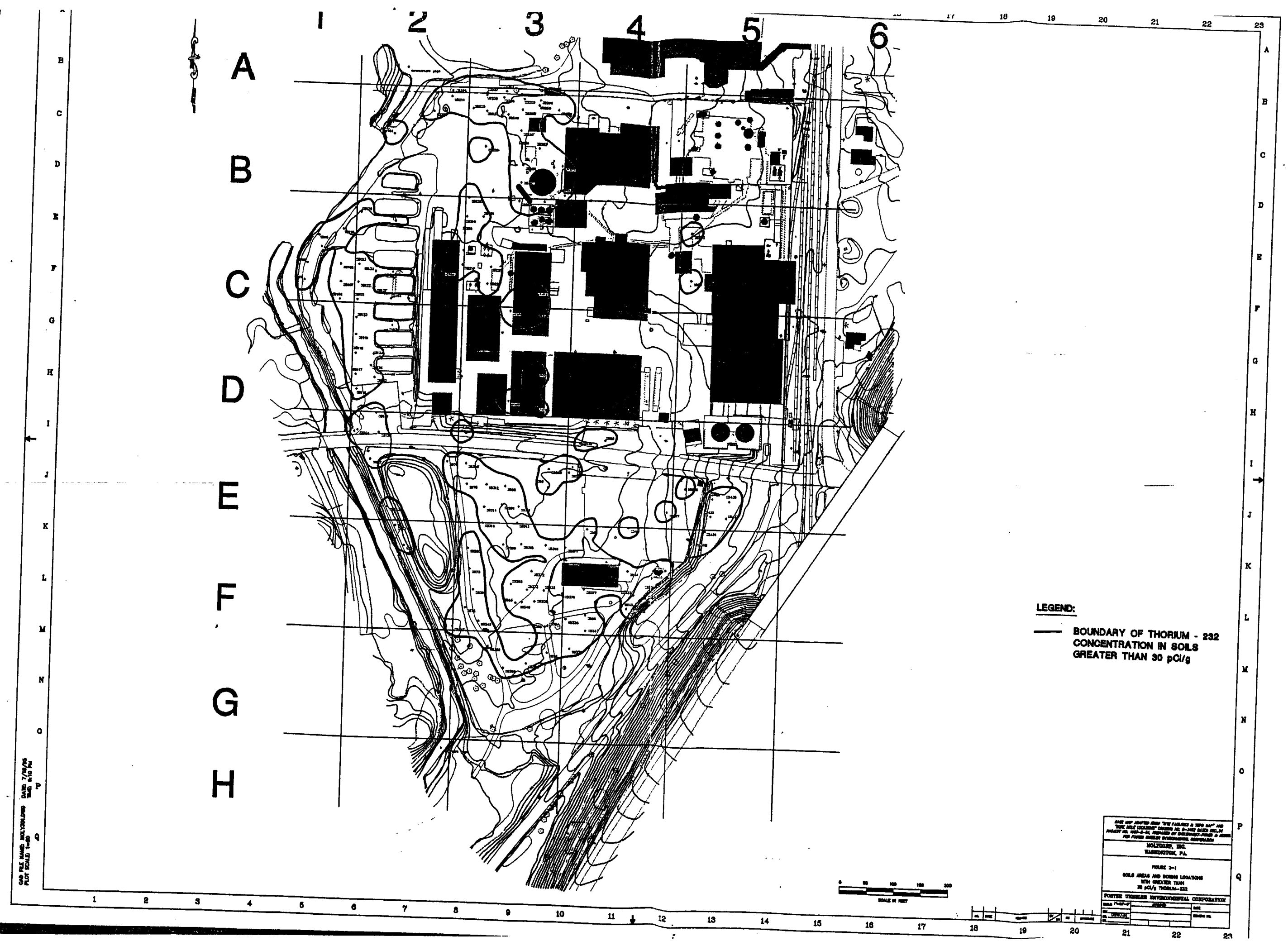

LEGEND:
BOUNDARY OF THORIUM - 232 CONCENTRATION IN SOILS GREATER THAN 30 pCi/g
SCALE IN FEET
MOLYCORP, INC.
WASHINGTON, PA.
FIGURE 2-1
SOILS AREAS AND BORING LOCATIONS WITH GREATER THAN 30 pCi/g THORIUM-232
FOSTER WHEELER ENVIRONMENTAL CORPORATION

TABLE 2-1

POTENTIAL MATERIALS TO BE EXCAVATED

Soil Boring #	Clean Overburden Thickness (feet)	Maximum Thorium-232 Concentration (pCi/g)	Thickness of Contaminated Zone (feet)	Remaining Thorium-232 Concentration (pCi/g)
14	2	79	1½	12
25	2	39	1	15
33	1½	48	1	28
36	5½	72	2	27
40	0	45	1	19
43	1	190	8	1
44	½	134	7½	2
45	5	43	1	23
50	4	266	6	2
51	4	32	1½	28
55	4	33	½	17
56	5½	343	3½	16
56A	4	32	½	13
59	3	39	½	12
65	3	481	4½	16
68	2	378	5	27
72	2	169	3	8
73	6½	39	½	15
75	1	39	1	18
78	½	253	4½	8
80	0	60	½	18
82	4½	47	½	7
87*	5½	32	½	24
	9½	37	½	Bedrock
88	0	213	6	23
90	2½	32	½	15
97	0	128	2	5
106	0	35	½	10
107	2	43	1	28
108	4½	43	1	13
110	½	49	4½	27
114	1	55	½	5
116	3	113	2	17
117	2½	89	2	7

*Boring with two layers of contamination.

TABLE 2-1

POTENTIAL MATERIALS TO BE EXCAVATED

Soil Boring #	Clean Overburden Thickness (feet)	Maximum Thorium-232 Concentration (pCi/g)	Thickness of Contaminated Zone (feet)	Remaining Thorium-232 Concentration (pCi/g)
118	2½	35	2½	19
119	2	80	5½	15
120	2½	135	4½	28
121	2½	84	4½	16
122	2½	76	4½	22
123	2½	82	3½	16
126	4	40	1	15
130	½	92	½	28
131	3	56	½	4
133	1½	90	4	14
134*	1½	314	4½	27
	7½	44	4½	26
137	2½	216	4	16
139	2½	815	5	26
153	4½	39	2½	23
154	2	488	5½	26
156	3	44	½	19
157	1½	44	3	3
164	8	34	½	3
173	2½	33	½	15
204	8	83	3½	19
214	9½	42	1½	8
217	4½	32	1	2
216	2½	44	1½	14
218	½	34	½	19
219	2	46	1	21
220	1	38	½	11
225	1½	42	4	25
227*	4	37	½	25
	4	142	2½	19
228	0	93	3	22
231	5	41	1	23
235	4½	82	1	7
237	0	117	3½	2

**Boring with two layers of contamination.*

TABLE 2-1

POTENTIAL MATERIALS TO BE EXCAVATED

Soil Boring #	Clean Overburden Thickness (feet)	Maximum Thorium-232 Concentration (pCi/g)	Thickness of Contaminated Zone (feet)	Remaining Thorium-232 Concentration (pCi/g)
238	0	62	2½	26
248	5½	37	½	13
249	0	176	4	21
250	1	168	3½	21
253	0	95	5½	26
254	1½	112	4½	25
255*	0	57	½	23
	2½	113	3½	28
256	4½	167	1½	19
257	½	37	½	17
258	1	168	3½	21
259	0	168	2½	24
260	½	396	10½	Bedrock
263	5½	59	1	25
265	0	568	19	Bedrock
266	0	43	2½	
267	5½	60	1	27
268	1	57	½	21
271	0	187	2	10
273	0	276	2	25
275	9	44	1½	27
276	2	147	4½	23
278	½	51	½	27
279	1½	33	½	16
280	1½	38	½	3
282	4½	95	2	4
288	4½	148	2½	22
289	1	146	4½	29
290	6	33	1	22
291*	0	56	½	10
	4	96	2½	27
292	7	57	½	16
293	1½	91	1½	23
297	1½	67	1	4

*Boring with two layers of contamination.

TABLE 2-1

POTENTIAL MATERIALS TO BE EXCAVATED

Soil Boring #	Clean Overburden Thickness (feet)	Maximum Thorium-232 Concentration (pCi/g)	Thickness of Contaminated Zone (feet)	Remaining Thorium-232 Concentration (pCi/g)
311	8	48	1½	22
312	8½	189	2	24
313	8	52	1	4
314	11	52	1	28
315	3½	66	1½	22
316	4½	49	1	16
319	2½	62	4½	4
324	0	124	3	24
325	0	136	4½	2
328	1	146	2½	5
333	0	72	2	23
335	3½	391	4½	3
337	0	196	7	3
338	6½	346	3½	12
339	5	518	3	5
340	0	666	8½	25
342	0	35	2	24
343	1½	67	3	30
347	2½	221	5	12
350	0	54	1	19
352	1½	225	4	8
355	2	58	1	15
356	3	34	½	14
362	0	157	1	16
363	0	42	½	7
365	0	78	2	15
366	2½	63	2	24
367	1½	100	3	8
371	7	56	½	22
372	6½	98	2	16
373	4	178	5	16
376	7½	36	½	26
377	5½	40	2	30
378	½	36	1	18

*Boring with two layers of contamination.

TABLE 2-1

POTENTIAL MATERIALS TO BE EXCAVATED

Soil Boring #	Clean Overburden Thickness (feet)	Maximum Thorium-232 Concentration (pCi/g)	Thickness of Contaminated Zone (feet)	Remaining Thorium-232 Concentration (pCi/g)
380	1½	89	5	30
385	0	33	½	18
387	0	38	2	4
388	0	37	1	18
417	0	39	1	22
424	0	113	1½	16
429	½	42	½	18
430	0	88	1½	3
431	0	96	1	27
432	0	47	½	2
437	½	63	2	8
438	½	44	½	14

**Boring with two layers of contamination.*

The residual soil on site will have concentrations less than 30 pCi/g, which is a modified Option 2 cleanup level of SECY 81-576. The reduction from 50 pCi/g as originally stated in this option (giving 170 mrem/yr under a defined scenario) is in keeping with the reduction in potential exposure to less than 100 mrem/yr under the SECY scenario. This dose is expected to be less for the actual decommissioned site and will be calculated.

The major construction tasks and their sequence are depicted in Figure 2-2. An overview is as follows:

- Survey and stake out the excavation areas, disposal area, and access road;
- Construct the access road to the disposal area;
- Prepare the disposal area, clear and grub, establish berms and the base;
- Excavate and stockpile material greater than 30 pCi/g;
- Dispose of the greater than 30 pCi/g material in the disposal area;
- Encapsulate the disposal area;
- Confirm the residual soil meets the concentration objective (less than or equal to 30 pCi/g);
- Backfill the excavated areas; and
- Perform final decontamination of site, road, and disposal area.

It should be noted that radiological contamination of buildings where ferrocolumbium was produced is not expected. Surfaces, however, will be scanned (Section 4.4) and should areas be above the Regulatory Guide 1.86 Guidelines, they will be decontaminated. The resulting volume will be insignificant.

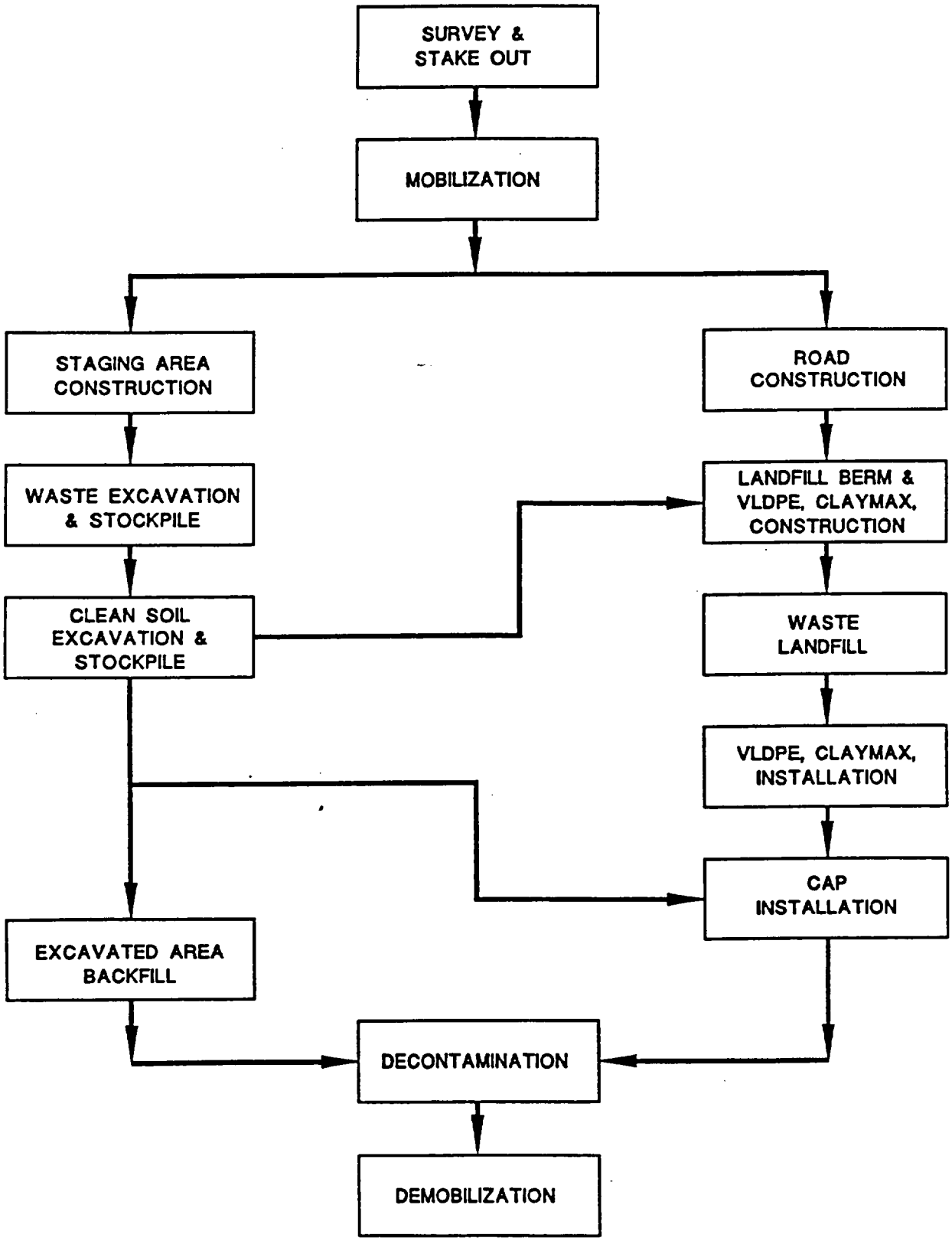
2.1.3 Decommissioning Procedures

The prior section's overview is presented in Figure 2-2 as a series of sequential construction tasks. As depicted, concurrent tasks will be executed by two crews (crew A and crew B). The tasks for each crew are described below.

Crew A will initiate construction of the various staging areas for temporary stockpiling of soil and slag material. Crew A will proceed to excavate the waste material from this area and, where required, the overburden. Various stockpiles will be established.

FIGURE 2-2

MAJOR CONSTRUCTION TASKS & SEQUENCE
MOLYCORP, INC.
WASHINGTON, PA.



Concurrently, crew B will begin construction of the road and preparation of the disposal area. Upon completion of the disposal area, both crews will be mobilized to relocate the waste material to the disposal area. Crew A will proceed to backfill the exposed areas, while crew B will be completing the encapsulation. Confirmation of the excavated area is a separate non-construction task.

Table 2-2 presents a list of the equipment required for execution of these tasks along with the estimated manpower to staff these crews.

2.1.4 Decommissioning Schedule

Figure 2-3 presents a tentative schedule for the decommissioning of the Washington site. It assumes two crews and a duration of approximately one and one-half years.

2.2 DECOMMISSIONING ORGANIZATION AND RESPONSIBILITIES

Figure 2-4 presents the Decommissioning Project Safety Organization. The following sections detail the safety related responsibilities of these personnel. Due to the limited size of this project, the duties of certain personnel may be combined.

2.2.1 Molycorp Project Manager

The Molycorp Project Manager will function as the Molycorp, Inc. representative for the decommissioning project and will provide oversight for all project activities. The Molycorp Project Manager will coordinate cost and schedule reporting requirements with the Contractor Project Manager (Project Manager).

2.2.2 Contractor Project Manager

The Contractor Project Manager will maintain overall responsibility for the performance of project operations for the duration of the project. The Contractor Project Manager will report to the designated Molycorp Project Manager for all project related activities and any liaison with their Corporate Office for project oversight, management direction, and resolution of company related issues. The Contractor Project Manager will control all on-site professional, technical, and labor forces to ensure the adequate and timely completion of planned project tasks. With the assistance of the assigned on-site and off-site personnel, the Contractor Project Manager will ensure the following:

- Maintenance of a single point of contact for Molycorp, Inc. representatives on all project related schedule, cost, safety and technical matters, including the coordination of any required communications, meetings or updates;

TABLE 2-2

ANTICIPATED LABOR AND EQUIPMENT REQUIREMENTS

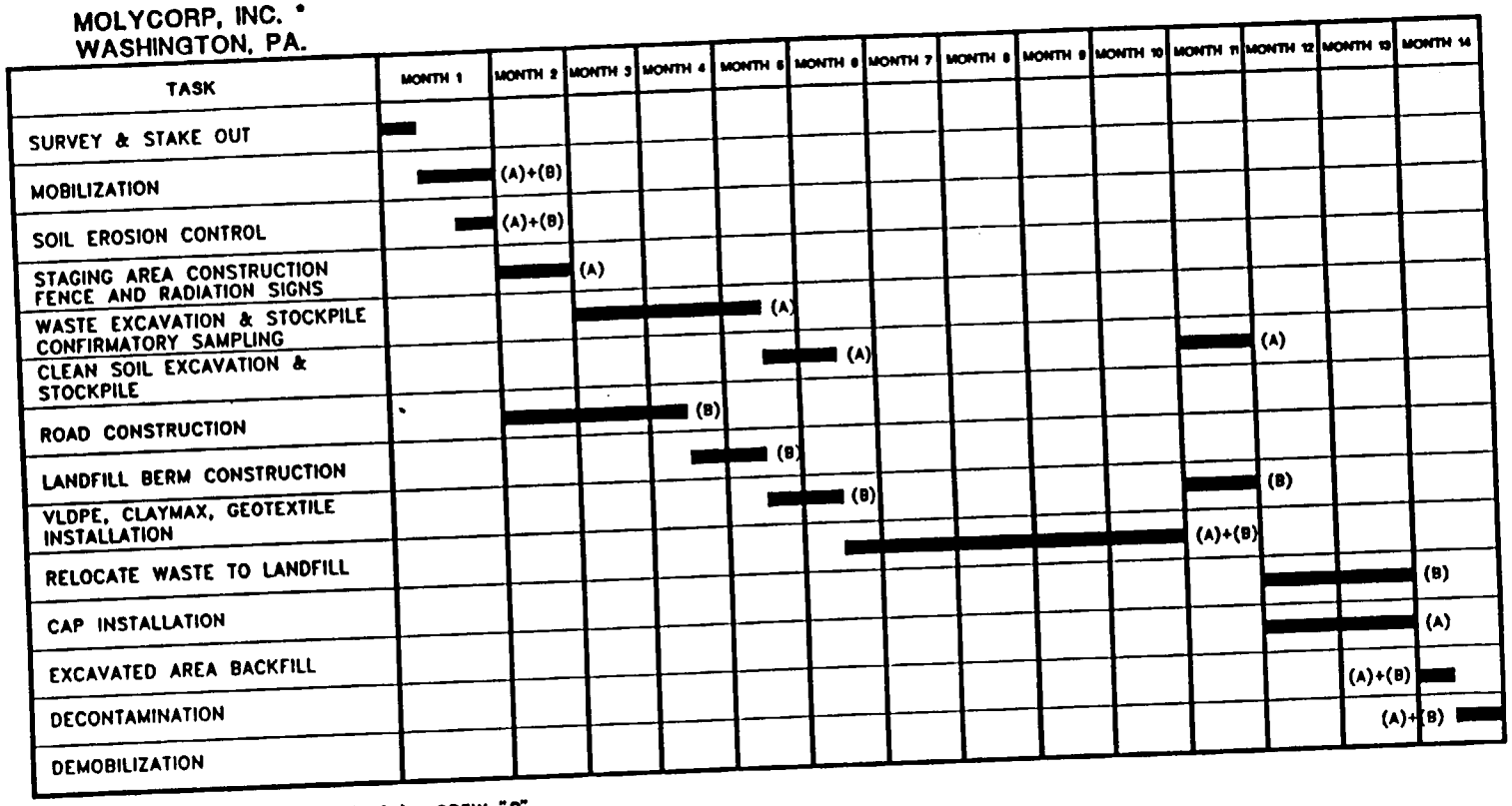
Labor Teamster	No.	Description
	1	Foreman
	1	Water Wagon
Total Teamsters	2	
Equipment Operators	**No.**	**Description**
	5	Type A Rate
	5	Type B Rate
	1	Foreman
Total Operators	11	
Laborers	**No.**	**Description**
	5	Laborers
Total Laborers	5	
TOTAL CRAFT	18	
Equipment	**No.**	**Description**
	2	450 Excavators
	8	Dump Trucks*
	1	Water Wagon
	2	Loaders
	4	Rollers
	2	Dozers
	1	Load All
	3	Pickups
Total Equipment	23	
TOTAL EQUIPMENT	23	

*Assume with drivers

FIGURE 2-3

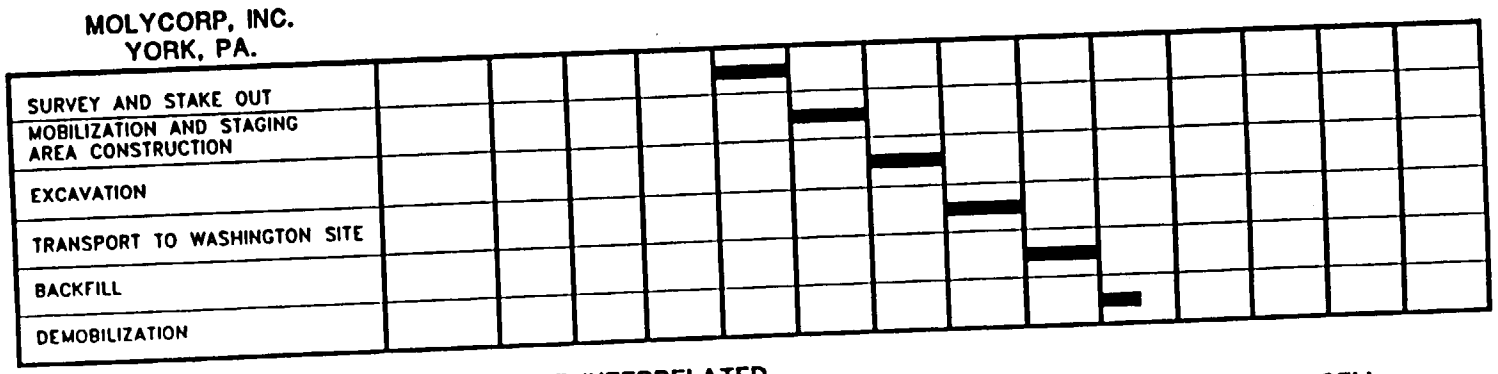
CONSTRUCTION SCHEDULE

MOLYCORP, INC. *
WASHINGTON, PA.



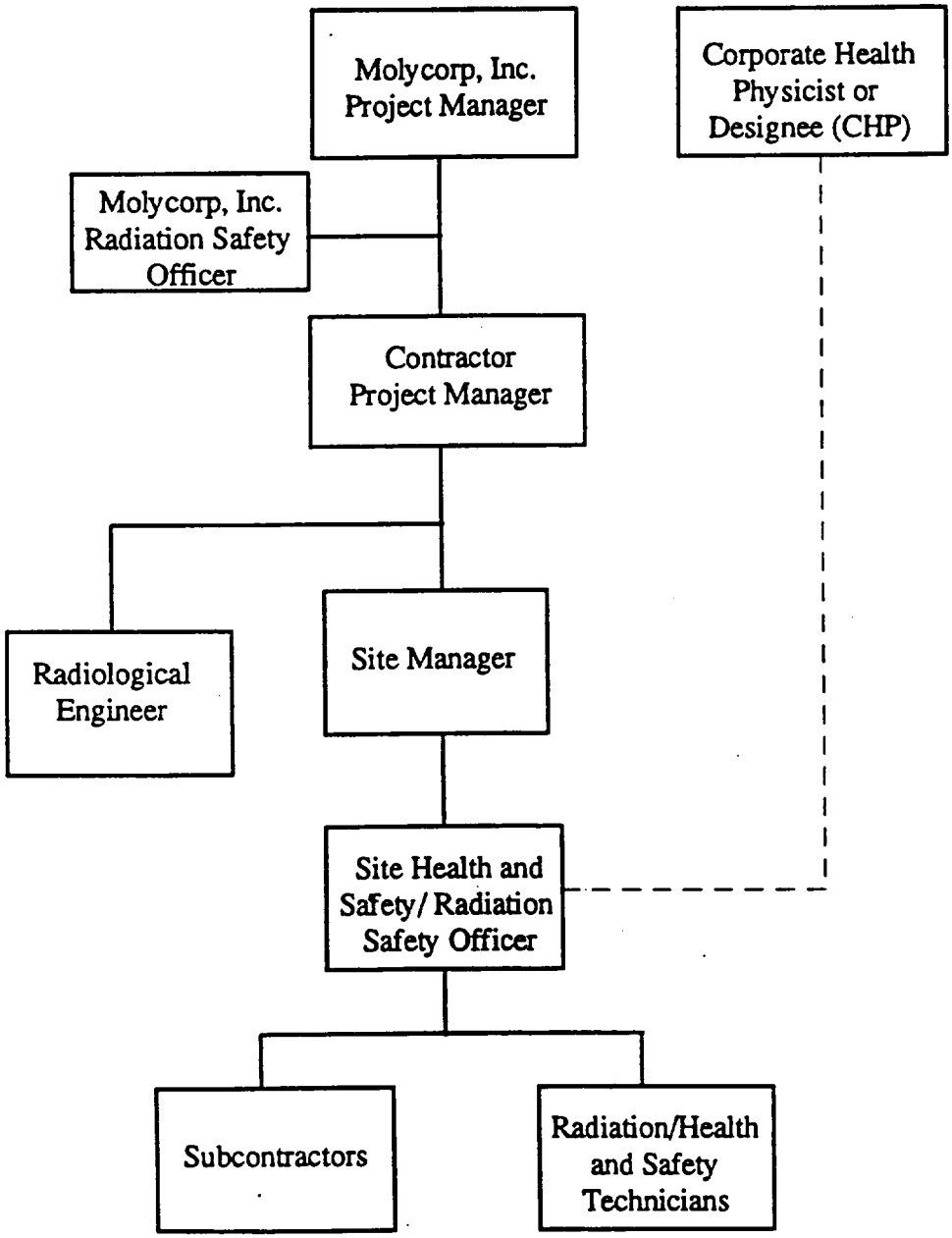
NOTE : (A)= CREW "A", (B)= CREW "B"

MOLYCORP, INC.
YORK, PA.



* NOTE THAT THESE SCHEDULES ARE INTERRELATED.
WASTE MATERIAL FROM YORK, PA WILL BE TRANSPORTED TO WASHINGTON, PA. DISPOSAL CELL.

Figure 2-4
Washington Site
Decommissioning Project Safety Organization Chart



moly.ppt

- Coordination of the project staff to assure that adequate safety and radiological controls, plans and procedures are enforced and that project operations are conducted efficiently and in compliance with all appropriate regulatory requirements;
- Provision of sufficient staffing to support the scheduled completion of project tasks;
- Coordination of appropriate procurement and subcontract activities in support of project goals and schedules;
- Continuous monitoring of project status and performance and the initiation of any required corrective actions or reassignment of project personnel;
- Accurate reporting to Molycorp, Inc. representatives of actual and projected project costs and up-to-date scheduled status;
- Resolution of any cost or schedule related discrepancies or questions;
- Compliance with all required procedures, operating requirements, permits or restrictions; and
- Maintenance of all appropriate project data, documents, and records and the compilation of a final report that accurately reflects the work performed.

The minimum qualifications for the Contractor Project Manager position consist of one of the following:

- B.S. degree in physical sciences, chemistry, biology, mathematics, or engineering and two years of experience in managing nuclear or hazardous waste decontamination and remediation projects;
- Four years of experience in managing nuclear or hazardous waste decontamination and remediation projects or equivalent experience.

2.2.3 Radiological Engineer

The Radiological Engineer will participate in project planning and final reporting activities to ensure regulatory compliance, the adequacy of plans and procedures and the appropriate development of project specific plans and work instructions. The Radiological Engineer will also be responsible for assuring radiological safety in the execution of decommissioning activities. The Radiological Engineer will be responsible for ensuring that radiation exposure to personnel and the environment are maintained As Low As Reasonably Achievable (ALARA) and are at all times within regulatory and administrative limits. The Radiological Engineer will report administratively to the Project Manager and will perform the following duties:

- Manage the radiological information obtained from the Site Characterization Report and Final Radiological Status Surveys, including performing all calculations to show compliance with project objectives;
- Prepare the Final Radiological Status Survey Report;
- Oversee the bioassay program to ensure proper monitoring of internal and external exposures, and assist in the training of individuals in the biological effects of radiation, as needed;
- Prepare and/or review project specific plans, procedures, and work instructions to ensure compliance with applicable guidelines, regulations, and ALARA policies;

- Assist the Site Health and Safety, Radiation Safety Officer and Radiation Health and Safety Technicians in the performance of the field effort; and
- Provide radiological calculations for dose assessment, ALARA, and safety considerations.

The minimum qualifications for the Radiological Engineer consist of one of the following:

- M.S. degree in radiological health, nuclear physics, or health physics and two years of experience as a health physicist or radiological engineer at nuclear facilities or in nuclear decontamination and remediation projects; or
- M.S. degree in physical sciences, chemistry, biology, mathematics, or engineering and three years of experience as a health physicist or radiological engineer at nuclear facilities in nuclear decontamination and remediation projects; or
- B.S. degree in radiological health, nuclear physics, or health physics and four years of experience as a health physicist or radiological engineer at nuclear facilities in nuclear decontamination and remediation projects; or
- B.S. degree in physical sciences, chemistry, biology, mathematics or engineering and six years of experience as a health physicist or radiological engineer at nuclear facilities or in nuclear decontamination and remediation projects.

2.2.4 Site Manager

The Site Manager will report directly to the Contractor Project Manager and will be responsible for the day-to-day activities on the project. The Site Manager will also be responsible for ensuring that personnel are provided the correct health and safety resources as required. The Site Manager will also be responsible for the coordination of daily activities with the Site Health and Safety/Radiation Safety Officer to ensure proper planning, organizing, directing, and controlling of project activities in a manner that does not conflict with the safety and health of employees performing the work activities. Specifically, the Site Manager will ensure the safety and health of employees during all project activities and will allocate the necessary resources to ensure that required safety and health activities are carried out. The Site Manager will be responsible for enforcing all applicable plans, procedures, and instructions affecting safety and health. The Site Manager is further responsible for the day-to-day oversight of all subcontractor activities to ensure that those activities are being performed in a manner consistent with all health and safety requirements.

The minimum qualifications for the Site Manager position consist of one of the following:

- B.S. degree in physical sciences, chemistry, biological sciences, mathematics, or engineering and two years of experience supervising personnel on nuclear or hazardous waste decontamination and remediation projects; or
- Four years of experience supervising personnel on nuclear or hazardous waste decontamination and remediation projects.

2.2.5 Site Health and Safety/Radiation Safety Officer

The Site Health and Safety/Radiation Safety Officer (RSO) will report directly to the Site Manager for the day-to-day performance of project radiological activities. The RSO will receive direction from the Corporate Health Physicist or Designee (who will be a Certified Health Physicist), in the administration of all project radiological controls programs, final release activities, appropriate documentation, and compliance with all appropriate plans, procedures, practices, and regulatory requirements. The RSO will be responsible for the following:

- Developing the Site Health and Safety Plan, implementing the specific provisions of that plan, and ensuring that all site employees, subcontractors, and visitors understand the requirements of the plan;
- Functioning as the Site Health and Safety Officer with responsibility for implementing the Site Health and Safety Plan;
- Assisting the Site Manager and other project personnel in the preparation of work plans and procedures;
- Conducting appropriate surveys and inspections while ensuring that radiological and industrial safety hazards are appropriately identified and that necessary precautions are in place prior to the initiation of work activities;
- Specifying appropriate safety and radiological controls precautions for work permits and work procedures;
- Directing the day-to-day activities of the Radiation Health and Safety Technicians in the performance of project operations and the selection of instrumentation and decontamination techniques appropriate for protecting personnel and reducing exposures;
- Monitoring work in progress to ensure compliance with project plans and procedures, regulatory requirements, and good radiological work practices;
- Preventing the performance of work activities that may jeopardize the safety of personnel, violate approved plans, procedures, or practices, or could result in the release of contamination;
- Reviewing and maintaining all appropriate project personnel and radiological records, including survey data, training documentation, certification and qualification records, release survey records, permits, licenses, and instrumentation records;
- Maintaining radiological supplies and instrument inventories; and
- Inspecting and assisting in the preparation of excavated materials for disposal, including appropriate radiological survey and assay activities.

The minimum qualifications for the RSO position consists of the following:

- Two years experience as a Radiation Safety Officer on nuclear decontamination and remediation projects on equivalent health physics experience; and
- Certification as an Occupational Health and Safety Technician.

2.3 TRAINING

The Training Program shall meet the following goals:

- Meet or exceed the applicable training requirements specified by the NRC, Occupational Safety and Health Administration (OSHA), and the Environmental Protection Agency;
- Ensure that all personnel are knowledgeable of requirements of their jobs and are competent in the operation of equipment they use, are safe in their work practices, and understand all risks associated with their work environment;
- Ensure that personnel will meet the requirements specified by Molycorp, Inc. to work at the Washington site;
- Ensure that personnel maintain a high level of competency in all qualified areas; and
- Indoctrinate new employees to ensure that they understand all requirements that they are expected to meet.

For this decommissioning project, all Contractor and subcontractor personnel working on site will be trained in accordance with the applicable requirements of 29 CFR 1910 for general industry and 29 CFR 1926 for construction before participating in the decommissioning activities. Radiation safety training will also be provided to all project personnel upon mobilization.

The RSO will maintain site-specific training records.

2.4 CONTRACTOR ASSISTANCE

The contractor may provide personnel required for excavation, road building, waste transportation and disposal cell cap construction by direct hiring and/or assisting subcontractors. Based on radiological considerations, these assisting subcontractors will perform their activities under the Molycorp, Inc. Source Materials License as well as applicable health and safety policies and procedures.

SECTION 3.0

3.0 DESCRIPTION OF METHODS USED FOR PROTECTION OF OCCUPATIONAL AND PUBLIC HEALTH AND SAFETY

3.1 FACILITY RADIOLOGICAL HISTORY INFORMATION

Molycorp, Inc., formerly the Molybdenum Corporation of America until 1974, has owned and operated a plant on the outskirts of Washington, Pennsylvania in Canton Township for over 70 years. The active site consists of approximately 20 acres, as shown previously on Figure 1-1. This section presents a summary of significant historical information about the facility and presents an historical perspective on the extent of site contamination and activities performed to address it. Site investigations that were conducted, incidents of release and inspections will also be discussed.

3.1.1 Physical Site Development and Processes

The Molybdenum Corporation of America was formed from the Electric Reduction Company in Washington, Pennsylvania on June 16, 1920. The facility was purchased to manufacture ferroalloys. Production continued into the 1940s and expanded. Interstate Route 70, adjacent to the site, was built later, in the 1960s and "isolates" the site on one side.

Molybdenum manufacturing was begun in the 1920s. Processing of this material was idled in 1991. Although primarily manufacturing molybdenum products, the plant also produced ferrocolumbium (FeCb, 1964 to 1971), as well as other ferroalloys. Waste slags from the ferro-alloy operations, some of which contained natural thorium, were retained on the plant site, along with the larger quantity of ferromolybdenum slags that were normally used as landfill on the plant property. In 1972 some of the thoriated material from the site was disposed of at the West Valley, New York, burial site. Additionally, Molycorp, Inc. performed cleanup operations to segregate and stabilize some of the thoriated slag and soil located at the Washington site. The segregated material was placed in a capped pile containing about 10,000 cubic yards of slag on the south property. An 8-foot steel security fence surrounds the area south of Caldwell Avenue which contains the pile. Appropriate warning signs are posted on the fence by the pile and on the pile.

New additions to the facility, built in the 1960s, are the eight surface impoundments and a large thickener. In 1978 one of two molybdenum roasting furnaces was shut down as part of a consent decree with the Pennsylvania Department of Environmental Resources (PADER) Air Quality Agency due to exceedances of SO_2 standards. All remaining processing continued. Ferrocolumbium slag cleanup at the site occurred, primarily, in the early to mid-1970s time frame. Numerous investigations, studies and surveys were undertaken from 1970 to today to comply with regulatory requirements of the NRC.

3.1.2 Historical Perspective on Site Contamination

This section reviews the activities that have occurred in addressing contamination from the ferro-columbium process at the site. Field investigations and long-term monitoring have been conducted over time, and are summarized below. Additional detail is presented in the SCR.

In parallel with the changing physical site development, various investigations were undertaken to address changing United States Atomic Energy Commission (USAEC or AEC) requirements almost immediately upon Molycorp, Inc. receiving a Source Materials License in late 1963 (December 19, 1963). The processing of certain types of ore concentrates for ferrocolumbium (FeCb) necessitated a Source Materials License, i.e., ore concentrates or materials containing 0.05 percent (or greater) by weight of uranium, thorium or a combination of both. Most of this material was a pyrochlore which originated from the Companhia Brasileira de Metalugia e Mineracao's Araxa mine whose ore contained thorium as an accessory mineral above the 0.05 percent limit. The slag which resulted from the aluminothermic production of ferrocolumbium alloys was in a refractory glass/ceramic form containing an average of 1.2 percent thorium. This slag, initially segregated and retained on site, continued to be generated through 1970.

In 1966, Molybdenum Corporation of America (Molycorp, Inc.'s predecessor) initiated several meetings with the Pennsylvania Department of Health's Industrial Wastes Section and AEC personnel in pursuit of an on-site burial permit. A formal application was submitted in 1967. About this time period, Molycorp, Inc.'s consultant, Applied Health Physics, Inc., conducted a series of leaching studies on the FeCb slags (1970). These studies indicated that the radioactive materials were fixed and would not leach into the groundwater in excess of prescribed limits. Nonetheless no action was taken by the state or the AEC on the request for an on-site burial permit.

In June of 1971, an AEC compliance inspection revealed that thorium-bearing slags had been inadvertently buried on-site in violation of the terms and conditions of their license and AEC regulations. It was speculated that the burial occurred during a large scale clean-out of settling basins and regrading of the plant site by a private contractor who was totally unaware of the restrictions on landfilling FeCb slags.

The AEC issued a Notice of Violation and requested remedial action be taken by Molycorp, Inc. to excavate these materials and dispose of them in accordance with AEC regulations and guidance documents. Molycorp, Inc. contracted with Applied Health Physics, Inc. to perform a thorough radiological survey of the site and to provide health physics and waste disposal services necessary to comply with AEC's requests. Levels to 1.2 mR/hr were reported in some areas.

In 1972, Molycorp, Inc. authorized these materials to be excavated, sampled, concentrated as much as possible, and shipped in bulk form to an AEC-licensed waste disposal facility operated by Nuclear Fuel Services, Inc. in West Valley, New York. Disposal was terminated when New York State officials determined the slag was "of insignificant contamination and too large a volume to

bury and waste valuable burial area" (Applied Health Physics, 1975). The solution implemented in 1973 was consolidating and placing the thorium slag source material into a pile covered with vegetation at the south end of the site, which was in compliance with Federal and state regulations as well as Molycorp, Inc.'s Source Material License SMB-1393. The 1975 Applied Health Physics, Inc. report and analysis of activity by gamma spectrometry indicated that the average concentration of Th-232 in the slag contained in the pile was 1,250 pCi/g, with exposures within the 0.2 mR/hr NRC (note in 1974 AEC was reorganized to the NRC and ERDA-Energy Research and Development Authority) maximum level allowed at that time.

An NRC contractor, Oak Ridge Associated Universities, conducted a radiological survey of the site in 1985, which identified elevated (twice background or greater) levels of thorium in the dikes which separated the surface impoundments, and indicated the potential of subsurface thoriated slags in the western and southern portions of the site. Figure 3-1 shows the areas on-site found to have elevated contact radiation levels at the time of that study.

In 1990, Radiation Surveillance Associates, Inc. (RSA, Inc.) conducted a sub-surface survey for Molycorp, Inc. to characterize the thorium contamination across the western portion of the site (i.e., the impoundment area), and the area immediately to the north, west, and northwest. Thirty-two holes were drilled on the site and radiation measurements were logged at every six inches of depth from the surface down to bedrock, both above and below the water table. Radiation levels were also logged in monitoring wells previously drilled on the site. In addition to the subsurface measurements, RSA, Inc. conducted a scintillometer survey of the radiation exposure rates inside the study area. The surface study consisted of approximately 400 measurements of the gamma radiation field at a height of one meter above ground level. Findings revealed that, in general, the subsurface concentrations of thorium were above those in the surface soils in almost every hole drilled. A general pattern was that the underground radiation levels decreased to background at a depth of about ten feet. While a majority of the holes exhibited concentrations of greater than 0.01 percent thorium, in only a few holes did the thorium content exceed an average of 0.05 percent thorium at some point below the surface of the ground (Wrenn, Appendix I, 1990, page 6).

In October 1992, Molycorp, Inc.'s license (SMB 1393) was renewed. This license renewal included an amendment incorporating a schedule for decommissioning the site. In November 1992, Molycorp, Inc. submitted a Site Characterization Plan (SCP) to the NRC for approval.

The Molycorp, Inc. site was investigated during the spring, summer and fall of 1994 by Foster Wheeler Environmental Corporation and samples were taken from surface water, groundwater, and soils to assess the level and type of contamination that may exist. A Site Characterization Report (SCR) for License Termination was subsequently submitted to the U.S. NRC in January 1995. The level of field effort involved soil sampling from 418 borings (12,499 soil samples) and on-site analysis for a significant portion for thorium-232 by NaI-based gamma spectroscopy using a downhole probe and/or sample analysis. In addition, selected soil samples were analyzed for a select portion of the Total Analyte List (TAL) metals and radionuclides at IEA Labs, Cary,

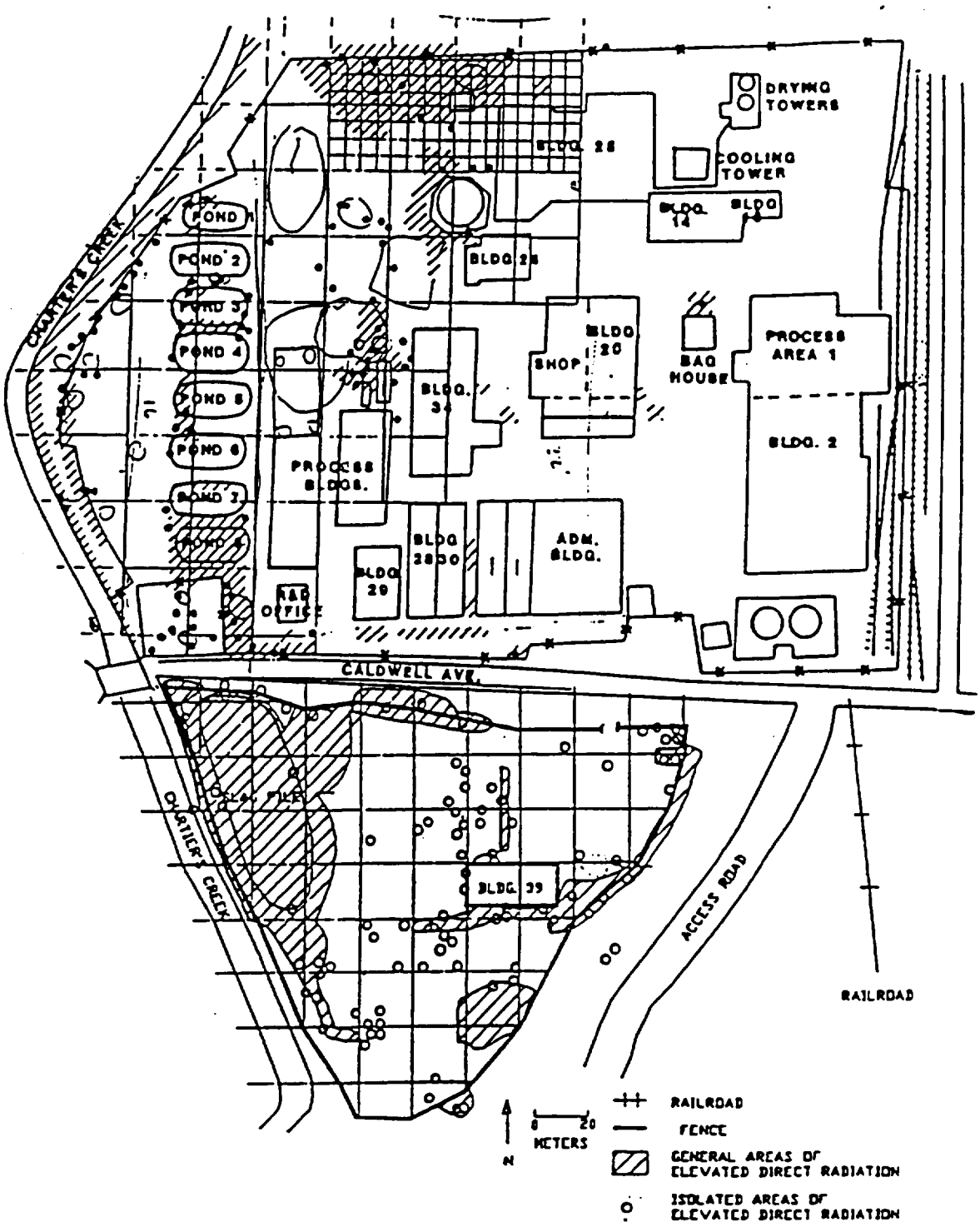


Figure 3-1 Active Plant Site and South Property with Locations of Elevated Contact Radiation Levels, 1985.

Source: Oak Ridge Associated Universities, Radiological Survey of Molybdenum Corporation of America, Washington, PA 1985.

North Carolina. Several stream sediment samples from Chartiers Creek and adjacent soil samples were analyzed for radionuclides and geotechnical parameters, respectively. Two rounds of approximately 30 groundwater samples and four Chartiers Creek water samples were analyzed for TAL metals and radionuclides.

Radium (Ra-228) was detected in measurable quantities, although considerably below the prevailing NRC standards. Thorium-232, the radionuclide of primary concern, does not exceed 5 pCi/l in either ground or surface water. Figure 3-2 shows the locations of potential elevated thorium concentrations, based on the analytical program to date.

Analyses of soils by both downhole and sample specific gamma spectroscopy indicated elevated Thorium-232 concentrations exceeding 30 pCi/g in areas generally in the surficial soil. These areas include the impound area, the northwest portion of the site around the thickener, the thorium pile and the center of Unit 2 (south of Caldwell Avenue).

Detailed analyses of the extent and concentration of contamination including: characterization of the source; thoriated slag/soil survey results; surface water; sediments and storm sewer sampling; groundwater; buildings and equipment; and air sampling, can be found in Section 5.0 of the Foster Wheeler Environmental Corporation SCR for the Washington, PA facility. (January 1995).

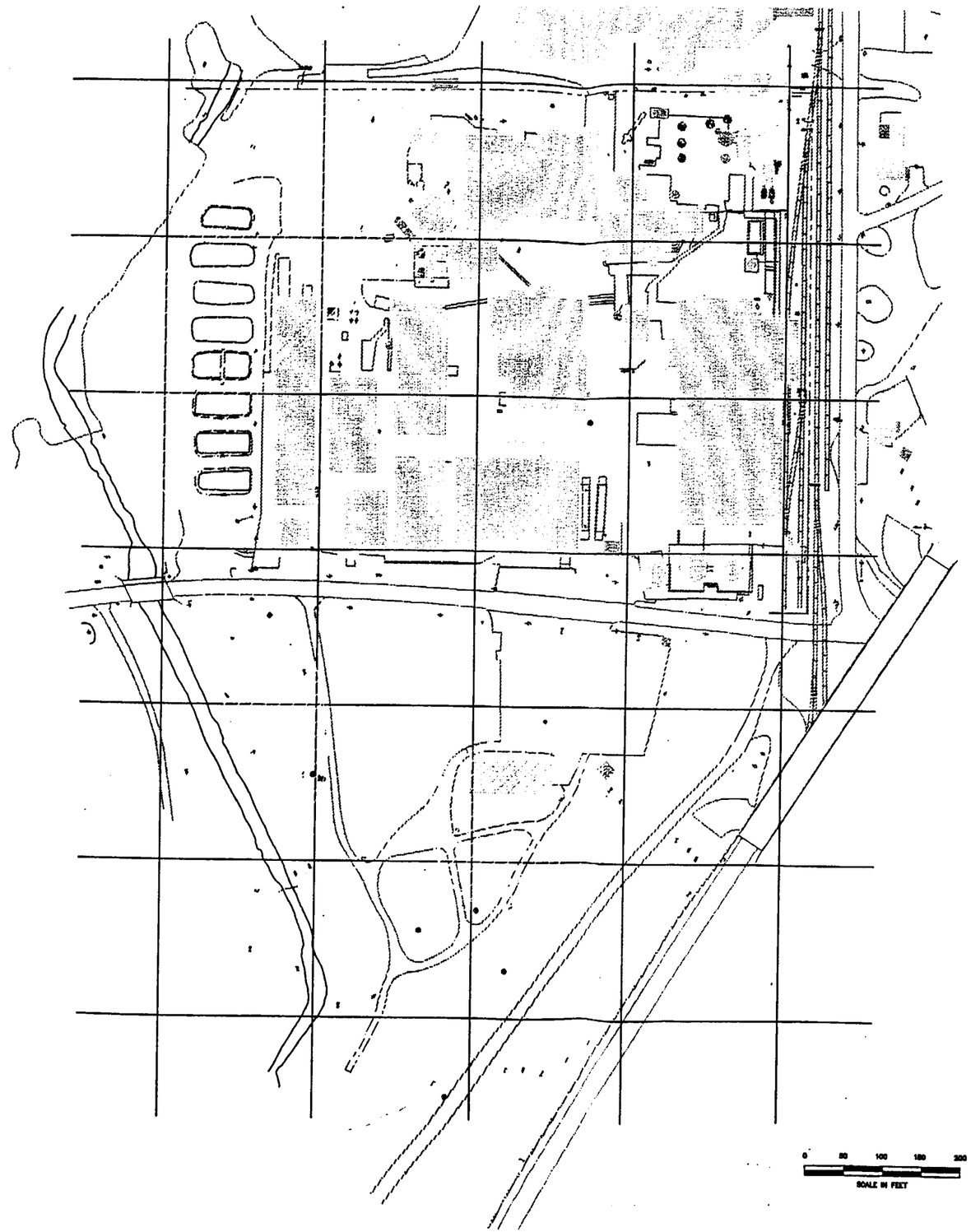
3.2 ENSURING THAT OCCUPATIONAL RADIATION EXPOSURES ARE AS LOW AS IS REASONABLY ACHIEVABLE

Every reasonable effort to maintain radiation exposures As Low As Is Reasonably Achievable (ALARA) will be made during the decommissioning project. The implementation of the Contractor ALARA policy is the responsibility of the Contractor's Decommissioning Project Safety Organization (see Figure 2-4). These personnel along with Molycorp, Inc.'s Health and Safety Staff, will be required to review procedures, plans, or work instructions involving radiation safety. Designs or design changes for facilities, equipment, excavation or disposal that may cause radiation exposure will also be reviewed by Decommissioning Project Safety Organization personnel prior to implementation. These personnel are further responsible for reviewing radiation protection programs developed for implementation at the Washington site.

3.2.1 Corporate Health Physicist

The Corporate Health Physicist's or Designee's (a Certified Health Physicist) responsibilities in regard to ALARA include:

- Directing an annual appraisal of the radiation protection and exposure control programs applicable to Contractor employees; and
- Overseeing and coordinating the development of exposure goals, plans, procedures, and methods for maintaining radiation exposures ALARA for all Contractor employees, subcontractors, and project visitors.



LEGEND:

GENERALIZED AREAS OF SIGNIFICANT IMPACT TO SOILS AND WATER

0 50 100 150 200
SCALE IN FEET

MOLYCORP, INC.
WASHINGTON, PA.

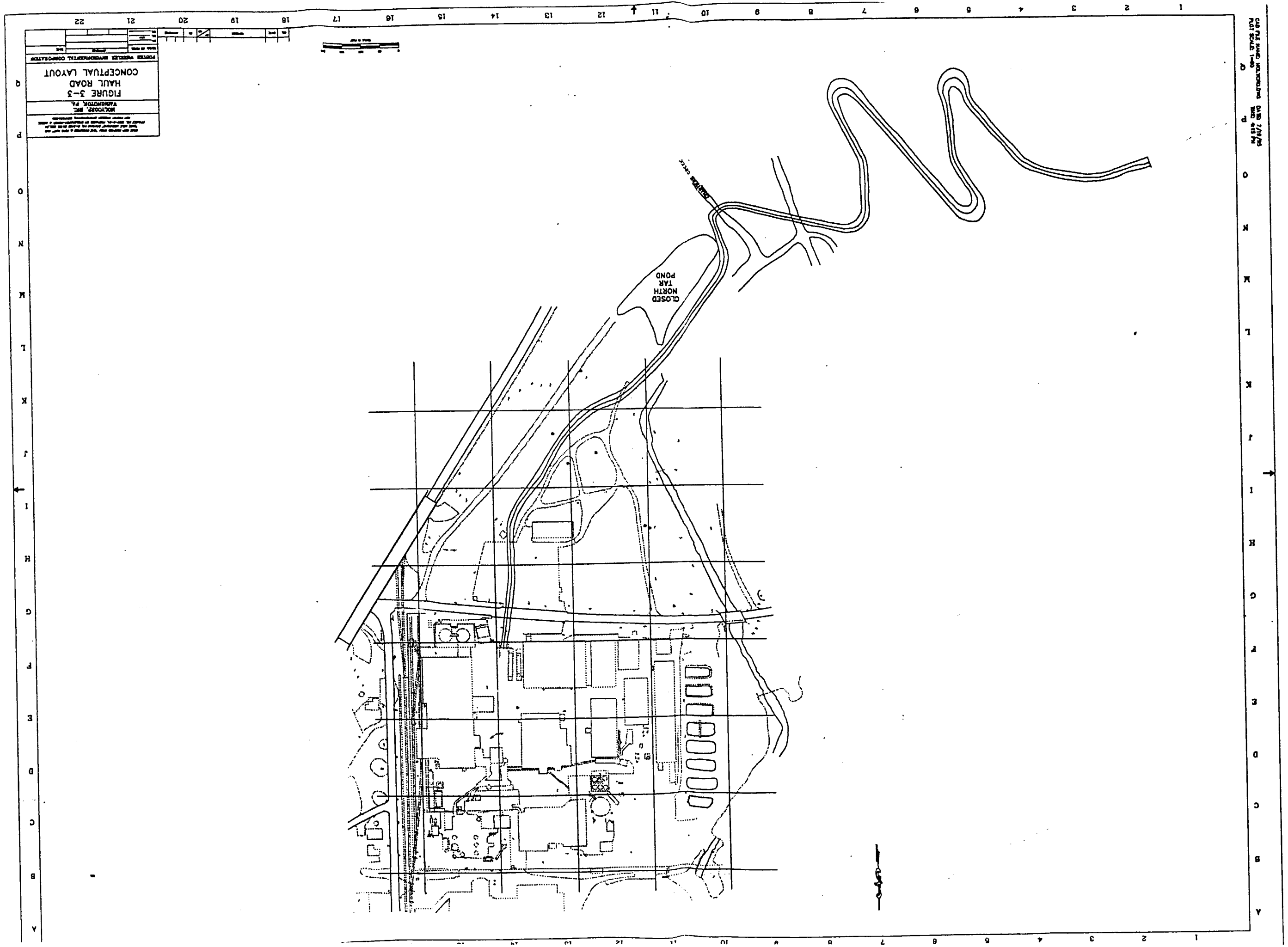
FIGURE 3-2

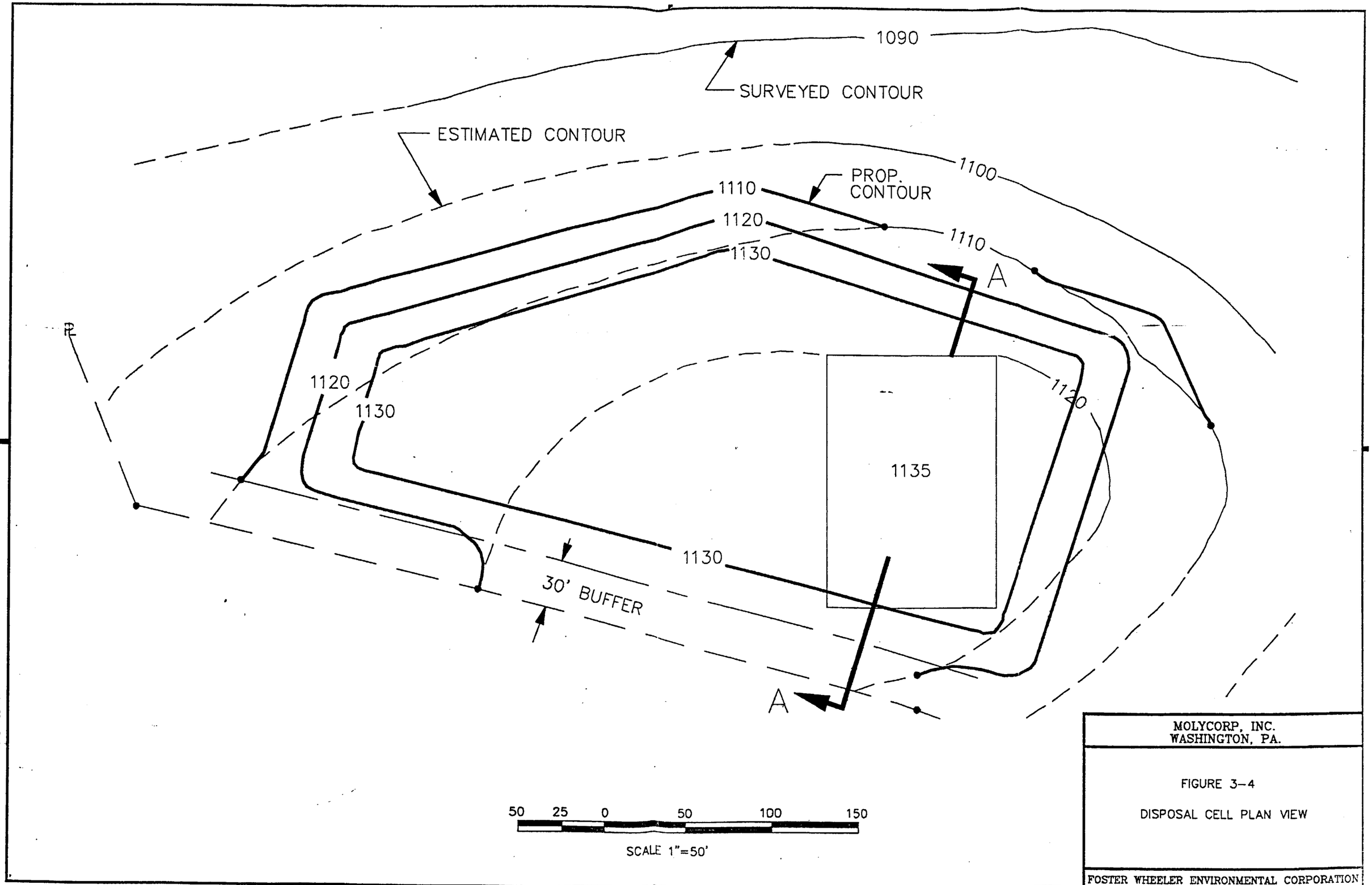
GENERALIZED AREAS OF IMPACT TO SOILS AND WATER

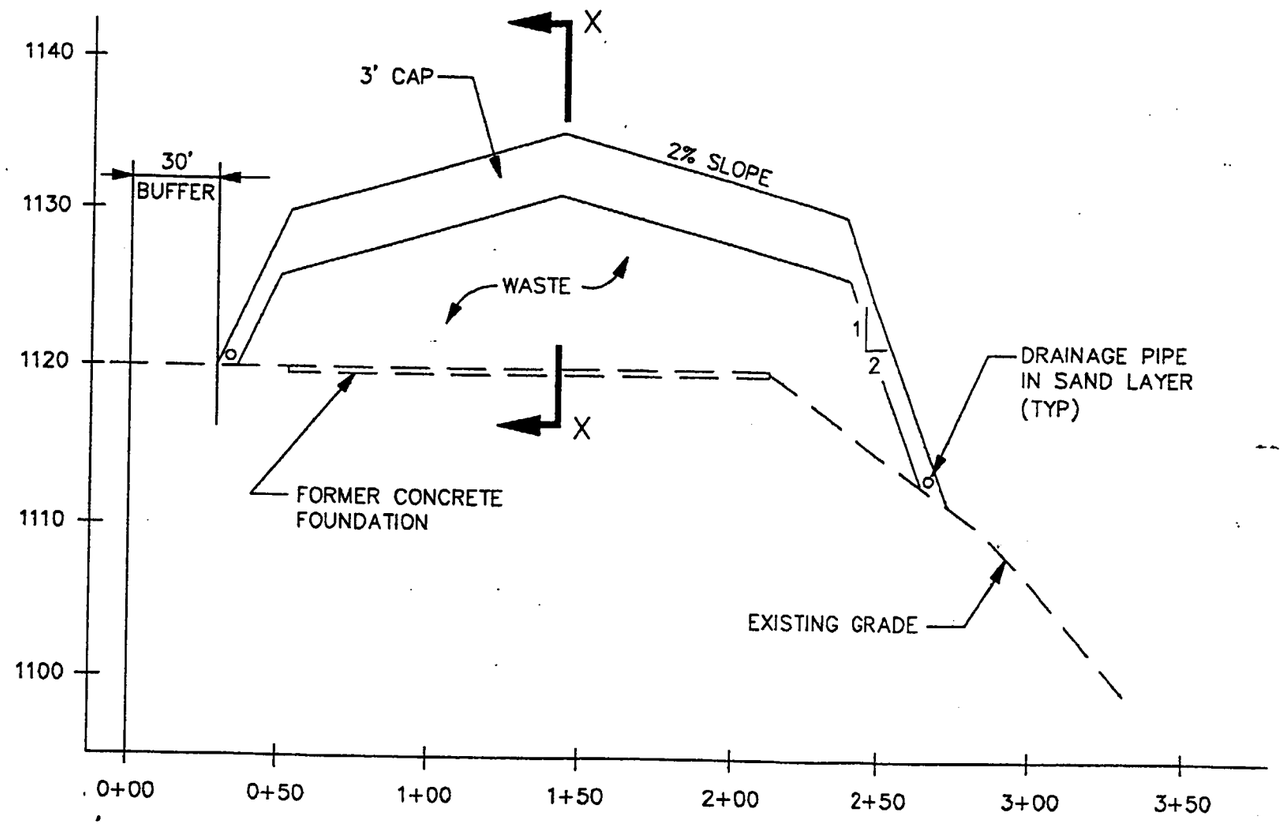
FOSTER WHEELER ENVIRONMENTAL CORPORATION

MOL8

CAD FILE NAME: MOL8-1.DWG
PLOT SCALE: 1=100 (1in27)
DATE: 7/23/96
TIME: 6:00 PM


CLOSED
NORTH
TAR
POND
FIGURE 3-3
HAUL ROAD
CONCEPTUAL LAYOUT
POTTER MEDICAL ENVIRONMENTAL CONSULTANTS
MOLYCORP, INC.
WASHINGTON, PA.


1090
SURVEYED CONTOUR
ESTIMATED CONTOUR
1100
PROP. CONTOUR
1110
1120
1130
1110
A
1120
1130
1120
1135
1130
30' BUFFER
A
50 25 0 50 100 150
SCALE 1"=50'
MOLYCORP, INC.
WASHINGTON, PA.
FIGURE 3-4
DISPOSAL CELL PLAN VIEW
FOSTER WHEELER ENVIRONMENTAL CORPORATION
CAD FILE NAME:MOLYSITE.DWG DATE: 7/19/95
PLOT SCALE:1=1 TIME: 4:16 PM



SECT "A–A"

HOR. 1" = 50'
VER. 1" = 10'

MOLYCORP, INC.
WASHINGTON, PA.

FIGURE 3–5

DISPOSAL CELL CROSS–SECTION

FOSTER WHEELER ENVIRONMENTAL CORPORATION

3.2.2 Contractor Project Manager

The Contractor Project Manager is responsible for ensuring that criteria affecting potential radiation exposure and contamination are considered in the design, operation and construction facilities and equipment. Other Contractor Project Manager responsibilities in regard to ALARA include:

- Ensuring adherence to the radiation protection program by all personnel assigned to the project; and
- Ensuring that ALARA reviews are performed for procedures, programs, policies, or facility design and equipment changes.

3.2.3 Radiological Engineer

The Radiological Engineer is responsible for the following:

- Participating in design reviews for procedures, facilities, and equipment that can affect potential radiation exposures;
- Prescribing goals and objectives to be achieved in the area of radiological protection;
- Reviewing data and information obtained from radiological surveys and monitoring activities to determine compliance with ALARA policy;
- Developing methods, plans, procedures, and work instructions to keep occupational exposures ALARA;
- Reviewing training programs related to work in radiologically contaminated areas or involving radioactive materials;
- Reviewing exposure records to develop methods to reduce exposures; and
- Reviewing the supervision, training and qualifications of the radiological controls staff in all Contractor operations.

3.2.4 Site Health and Safety/Radiation Safety Officer

The Site Health and Safety/Radiation Safety Officer (RSO) is responsible for implementation of the radiation protection program for the Washington decommissioning. The radiation protection program includes all radiological standard operating procedures and those procedures written specifically for the excavation and transport of contaminated materials and associated radiological requirements. The responsibilities of the RSO in regard to ALARA include:

- Ensuring adequate radiation protection coverage for all personnel, including visitors;
- Supervising, training and documenting the training of the radiation protection staff;
- Identifying sources or operations having the potential for causing above background exposures to radiation;
- Implementing the radiation protection and exposure control programs;
- Reviewing draft procedures and proposed changes in design specifications to ensure that provisions are included for maintaining exposures ALARA;

- Overseeing the collection, analysis, and evaluation of data and information obtained from radiological surveys or radiological monitoring activities used in determining hazards to occupational or public health; and
- As directed, provide a report to the Corporate Health Physicist concerning the status of radiation protection and exposure control programs in effect at the site to which the RSO is assigned.

3.2.5 Individual Employees

Each individual, who performs a work assignment for the Contractor and all Contractor subcontractors, becomes subject to the ALARA and Health Physics Policies and is responsible for complying with the Contractor and Molycorp, Inc. policy as set forth in administrative and radiological protection procedures.

3.3 HEALTH PHYSICS PROGRAM

3.3.1 Administrative Occupational Exposure Limits

Occupational exposures to ionizing radiation for Contractor personnel will be administratively limited to below regulatory limits to control personnel exposures resulting from operations with radioactive materials. To ensure compliance with established regulatory guidelines, Foster Wheeler Environmental's internal Administrative Controls (AC's) have been established below regulatory standards.

3.3.2 Dosimetry

Dosimetry methods will be applied by the RSO to all project personnel who require access to Radiologically Controlled Areas (RCAs).

As the licensee, Molycorp, Inc. will inform the Contractor Project Manager of all visitors to the Washington Decommissioning Project Site. In consultation with Molycorp's RSO, visitors to the site will be issued dosimetry as deemed appropriate by the Contractor RSO. This determination will be based on radiation and contamination levels to be encountered by the visitor, the duration of the visit, and the nature of the visit. A visitor may be exempted from the requirements of the dosimetry, bioassay, and training programs at the discretion of the RSO, and with the approval of the Molycorp RSO, provided that the visit is expected to be a one-time occurrence and the visitor is escorted by an individual who has proper dosimetry, has the required training for access to the site, and is familiar with site operations.

The primary dosimeter to be employed is the thermoluminescent dosimeter (TLD). The RSO may require the use of self-reading pocket dosimeters (SRDs) and additional dosimeters, such as extremity TLDs, when radiological conditions warrant such use. Dosimetry requirements for a given operation or activity will be specified by a Radiation Work Permit. TLDs will be processed

monthly. The RSO will maintain records of exposure to ionizing radiation for those individuals wearing dosimetry.

Urine bioassay samples will be collected from all personnel who participate in the project dosimetry program. A baseline sample will be collected from appropriate project personnel upon mobilization, and an exit sample will be collected upon demobilization. Other samples will be collected as deemed necessary by the Certified Health Physicist, the Radiological Engineer, and/or the RSO.

Urine bioassay samples will be analyzed by a Molycorp, Inc. and Contractor approved laboratory. It is the responsibility of the Radiological Engineer to interpret the bioassay data and perform any dosimetry calculations that may be necessary.

Whole-body counting is not expected to be routinely employed during the Washington site decommissioning for determining personnel uptake of radionuclides. Whole-body counting may be employed as prescribed by the Certified Health Physicist or Radiological Engineer for extenuating circumstances.

3.3.3 Radiation Work Permits

The RSO shall issue a Radiation Work Permit (RWP) for any work in a radiologically controlled area. In cases where no written procedures exist for an operation, an RWP may be issued with sufficient specific instructions to allow the RWP to take the place of written procedures. The RWP is a tool used to control personnel exposures to ionizing radiation and radioactive material by establishing minimum requirements for dosimetry, personnel protective equipment, etc., for work to be performed and by providing specific information about radiological and other hazards in the area to be accessed.

A RWP may be initiated by any individual responsible for a given operation or work to be performed. The RSO reviews RWPs, makes any necessary changes, then approves the RWP for use.

Personnel performing work covered by a RWP will participate in a pre-job briefing in which the requirements of the RWP are presented by a responsible individual and discussed by the work group. Personnel attending the briefing sign the RWP before entering the Radiologically Controlled Area to indicate that they understand the requirements of the RWP.

A RWP is terminated by the RSO when radiological conditions change, the scope of work changes, or a specified period of time has elapsed. Since RWPs are task-specific, it is likely that several RWPs will be in effect at any given time during the course of the Washington site decommissioning.

3.3.4 Controlled Access Area Entry Requirements

Controlled access areas are established for the purpose of controlling radiation exposures to site workers, visitors, and the general public, and to control the spread of contamination.

Signs at points of entry into the fenced area surrounding the Washington site will instruct visitors and other individuals unfamiliar with decommissioning operations at the site to register at the Molycorp, Inc. visitors office. Upon reporting to Contractor personnel, the individual can be escorted to any area to which he/she may need access. Subcontractors and other personnel who will perform work on the site will be given orientation and training that will make them aware of areas that they may access and the requirements for entering such areas.

RCAs include Controlled Surface Contamination Areas (CSCAs), Radiation Areas, Airborne Radioactivity Areas, and Radioactive Material Storage Areas. It is anticipated that there will be no High Radiation Areas nor Very High Radiation Areas posted during the course of the Washington site decommissioning. RCAs will be posted with radiation warning signs that will normally be suspended from yellow and magenta colored rope or ribbon or affixed to posts or doors. Some of the requirements for entering a RCA are listed on the posted radiological warning signs applicable to a given area. The remainder of the requirements for entering a given RCA will be contained in the active RWPs.

There will be no eating, drinking, smoking, chewing, or application of cosmetics within RCAs. The need for respiratory protection shall be evaluated and documented for all personnel entering an Airborne Radioactivity Area.

3.3.5 Clean Area Requirements

High traffic areas outside of RCAs, especially paths to and from RCA accesses, restrooms, break/lunch rooms, and field office spaces, will be frequently surveyed for radioactive surface contamination to ensure that these areas are maintained essentially free of radioactive contamination above background levels. The periodicity of these routine surveys will be determined by the RSO in consultation with the Certified Health Physicist and the Radiological Engineer. Clean areas shall be promptly decontaminated or controlled as RCAs if surface contamination levels are found to exceed guideline values.

The potential for an internal uptake of radioactive material remains relatively small based on a review of past radiological surveys and existing data. High Efficiency Particulate Air (HEPA) filtered exhaust ventilation shall be evaluated and used inside any buildings or containments in which airborne radionuclides may present a hazard. If air sampling indicates the need for respiratory protection, full-face negative pressure respirators with HEPA filters shall be the first choice. If air samples indicate airborne contamination levels are sufficiently high, air supplied respirators shall be used to work in the affected areas.

Except for sources that are permanently attached to detection instruments, radioactive check sources not in use will be stored in a locked cabinet designated by the RSO. The number of keys to the cabinet and the number of personnel having access to the keys will be kept to a minimum. Radioactive check sources stored on site will be inventoried at a frequency specified by the RSO, in consultation with the Molycorp RSO.

Radioactive waste will be stored in designated Radioactive Material Storage Areas after it is removed from an RCA. Radioactively contaminated tools, equipment, and other materials will be marked with yellow and magenta colored tape or equivalent and will be stored in RCAs until they are decontaminated or otherwise disposed of as radioactive waste. Radioactive materials transported through uncontrolled areas will be tarped or dust-suppressed as necessary to prevent the spread of contamination while transiting these uncontrolled areas.

Packaging, labeling, and on-site transportation of radioactive waste will be performed in accordance with all regulatory requirements.

Spread of contamination will be minimized by:

- Posting areas with removable contamination in excess of guideline values as CSCA;
- Requiring personnel who enter CSCAs to wear anti-contamination clothing specified by the applicable RWP;
- Ensuring that personnel remove contaminated clothing properly and place used anticontamination clothing in designated receptacles upon exiting a CSCA;
- Monitoring personnel, materials, and equipment for the presence of radioactive contamination upon exiting or removal from a CSCA, and decontaminating personnel or equipment, or controlling items as radioactive material, as appropriate;
- Performing contamination surveys frequently inside CSCAs, along the perimeters of CSCAs, and at the exits of CSCAs; and
- Wetting soils during excavation activities to prevent the spread of fugitive dust.

3.3.6 Airborne Monitoring

Airborne particulate monitoring is performed to:

- Demonstrate compliance with the intake limits for workers specified in 10 CFR 20;
- Meet the posting requirements for Airborne Radioactivity Areas;
- Determine whether precautionary measures such as process or engineering controls, increased surveillance, limitation of working times, provision of respiratory protective equipment, or other precautions should be considered; and
- Determine whether exposures to radioactive materials are being maintained ALARA.

The system used for monitoring airborne radioactivity shall have a Minimum Detectable Activity (MDA) not greater than 10 percent of the applicable Derived Air Concentration (DAC). Site specific MDA requirements shall be determined during the project ALARA briefing.

Airborne particulate surveys shall be performed with portable air samplers as follows:

- At least every four hours and when airborne radioactivity is expected to be maximized;
- In RCAs when radiological work is performed;
- During radiological work that has been known to cause or is expected to cause airborne radioactivity; and
- Whenever airborne radioactivity levels above the regulatory or administrative limits are suspected.

Personnel air samplers (lapel samplers) will be employed whenever general area air samples indicate levels greater than 0.1 DAC (or when breathing zone grab samples indicate levels greater than 0.1 DAC) to more accurately measure actual concentrations of airborne radioactivity in the breathing zones.

Portable air particulate sampling equipment will be immediately available during abnormal conditions. Site specific airborne particulate surveys will be performed as identified in the project ALARA briefing.

Continuous air monitors will be employed to sample airborne particulate radioactivity if low volume, portable air sampling is otherwise required but not performed.

3.3.7 Respiratory Protection Program

Respiratory protection requirements will be specified in the applicable RWP. The RSO will specify appropriate respiratory protective equipment based upon measurement of actual airborne radioactive contamination, suspicion/likelihood of airborne contamination in excess of applicable limits, and consultation with the Certified Health Physicist or Radiological Engineer.

Prior to using respiratory protective equipment, Contractor and subcontractor employees will provide certification that they have been physically examined to determine their fitness for using respiratory equipment and were fit tested to ensure that a proper seal can be obtained between the individual's face and the respirator selected. These physical examinations will be updated annually.

Personnel required to wear respiratory protective equipment will provide certification that they have been trained in the proper use and care of the respiratory protective equipment to be employed. This training will contain the following minimum elements:

- When and why respiratory protection is required;
- The operating principles of the selected respiratory protective equipment and its limitations;
- Procedures to ensure proper fit of the respirator;
- Proper care and maintenance of the selected respirator; and
- Emergency actions to be carried out by individuals who experience respirator failure or malfunction, physical or emotional distress, procedural or communication failure,

significant deterioration of operating conditions, and any other condition that might require relief

3.3.8 Personal Protective Clothing Requirements

The RSO will determine the appropriate requirements for personal protective clothing for a given operation or activity and will include these requirements on the applicable RWP.

When working in RCAs with low levels of removable contamination, an ensemble of personal protective clothing consisting of as few items as shoe covers and rubber gloves may be adequate to protect against contamination of personnel. In such cases, precautions should be observed to prevent contaminating personal clothing.

A full set of personal protective clothing will be worn when working in RCAs with high levels of removable contamination, such as >1,000 dpm/100 cm^2 alpha or beta/gamma.

It is anticipated that disposable personal protective clothing will be employed during the Washington site decommissioning. Soiled disposable clothing will be packaged into steel drums, or other appropriate containers, so that it can be efficiently volume-reduced.

The use of launderable anti-contamination clothing will also be considered. If selected, launderable anti-contamination clothing will either be laundered on-site or processed regularly by an off-site vendor.

3.3.9 Quality Assurance

During the course of the Washington site decommissioning project, one or more audits of project activities and records will be performed by qualified personnel from the Contractor Quality Assurance Department. Records and activities will be reviewed and compared to the requirements of Contractor procedures. Results of audit findings will be addressed by Contractor corporate management and the Contractor Project Manager and reviewed with Molycorp, Inc.

Calibration of all portable radiological instruments will be performed semi-annually, or more frequently if specified by the instrument operating manual, and after repairs or maintenance that could have invalidated the instrument's current calibration. The Certified Health Physicist, the Radiological Engineer, or the RSO will determine whether or not a given instrument requires calibration more frequently than semi-annually. Radiological field survey equipment and laboratory analysis equipment shall be calibrated by qualified personnel using standards traceable to the National Institute of Standards and Technology (NIST).

Portable survey instruments, self-reading pocket dosimeters, counter-scalers, and air sampling equipment will have a current calibration prior to use. The RSO is responsible for ensuring that all such equipment for the Washington site decommissioning maintains a current calibration label and that records of the current calibration are on file. In addition to records of calibration, the

RSO will maintain a copy of the operating manual provided by the manufacturer for each type of instrument in use at the project.

3.4 CONTRACTOR PERSONNEL AND SITE HEALTH & SAFETY PLAN

A Site Health and Safety Plan, similar to that prepared for the closure of the surface impoundments on the Washington site, will be prepared before mobilization of the Contractor project team. The purpose of the Site Health and Safety Plan is to establish methods of protecting employees and the public from hazards associated with the decontamination and decommissioning of the Washington site. The Site Health and Safety Plan will be prepared in accordance with the requirements of 29 CFR 1910.

One week after on-site work starts, the Site Health and Safety Plan will be reviewed and revised as necessary to contain provisions for protection against unanticipated project hazards. Other changes to the Site Health and Safety Plan will be made throughout the life of the project as circumstances dictate.

The Site Health and Safety Plan will identify the following elements:

- A safety and health risk or hazard analysis for each operation identified in this Decommissioning Plan;
- Employee training to ensure compliance with 29 CFR 1910 and any additional site requirements;
- Personal protective equipment to be used by employees for each operation;
- Medical surveillance requirements;
- Frequency and types of air monitoring, personnel monitoring, environmental sampling techniques, and instrumentation to be employed, including requirements for maintenance and calibration of sampling equipment;
- Site control measures;
- Decontamination procedures;
- Emergency response plan for safe and effective responses to emergencies;
- Confined space entry (not normally expected); and
- Spill containment.

All personnel involved in the decommissioning activities at the Washington site will meet the requirements of the project-specific Site Health and Safety Plan, which include applicable requirements from the Contractor ALARA Program, Health Physics Program, Industrial Health and Safety Program, Training Program, and Quality Assurance Program.

3.5 RADIOACTIVE WASTE MANAGEMENT

As stated in Section 2.0, soil, slag material, or other material with a thorium-232 concentration of 30 pCi/g or more will be excavated and stockpiled on various staging areas on site. While placing excavated waste in one staging area, waste from another staging area will be loaded onto 20 yd^3 dump trucks and transported to an on-site permanent landfill area approximately 3,600 feet from the south pile. The south pile contaminated volume, 10,000 yd^3, will also be transported to the disposal cell. All waste staging areas will have bottoms with HDPE or VLDPE liners and will be wetted or covered to prevent the spread of fugitive dust.

Transport to the disposal cell will require the construction of an access road to the top of the ridge where the disposal cell will be located. The design criteria for the access road are as follows.

- The maximum slope will not exceed 8%, with the slope for the transition areas between 3 and 4%;
- The road width will be 15 ft. and the width for the transition area will be between 15 ft. and 35 ft.;
- The cross-slope for the road will be approximately 1% to 2%;
- The turning diameter for the transition area will be 50 ft. which is measured from the center line;
- The creek crossing will be designed at the narrowest location; and
- Care will be taken to avoid encroaching the wetland and dense tree areas.
- The area will be fenced and signs will be posted.

These design criteria will provide high transportation efficiency (i.e., cost-effectiveness) with maximum transport safety. Figure 3-3 presents a conceptualized engineering design of the road layout. Other safety features, such as deceleration ramps should the truck's brakes fail, will be reviewed for inclusion into the final design. Also, detailed grading analysis will be performed prior to final construction cost estimation and cut and fill analysis.

SECTION 4.0

4.0 FINAL RADIOLOGICAL STATUS SURVEYS

The purpose of the Final Radiological Status Surveys is to demonstrate that the radiological conditions of the Washington site satisfy the guidelines approved for use at the Washington site (Section 2.1.1 of this Decommissioning Plan), and that the site should, therefore, be released for restricted access pursuant to the applicable guidelines. These surveys will be performed with guidance from NUREG/CR 5849, "Manual for Conducting Radiological Surveys in Support of License Termination." The specific objectives of the Final Radiological Status Surveys are to demonstrate the following:

Residual Surface Activity of Building Surfaces and Structures

- Average surface contamination levels for each survey unit are within the authorized guideline values;
- Small areas of residual activity (hot spots) do not exceed the authorized guideline value for maximum residual surface activity;
- Reasonable efforts have been made to clean up removable activity, and remaining removable activity does not exceed the authorized guideline values; and
- Average exposure rates resulting from residual activity are less than 5 µrem/hr above background and no discrete point exceeds 10 µrem/hr above background (exposure levels are measured at 1 m from floor and lower wall surfaces and are averaged over areas not to exceed 10 m^2).
- Any surface contamination exceeding guidelines is expected to be of minimum volume, and will be scabbled and disposed of as required.

Volume Activity of Soil

- Average concentrations of natural thorium with daughters are within the authorized guideline value (soil radionuclide concentrations are averaged over a maximum area of 100 m^2);
- Reasonable efforts have been made to identify and remove areas of elevated soil activity that may exceed the guideline value by greater than a factor of $100/(A)^{1/2}$, where A is the area (in m^2) of the elevated activity; and
- Exposure rates resulting from residual activity are less than 5 µrem/hr above background with maximum exposure rates over any discrete area not to exceed 10

μrem/hr (exposure levels are measured at 1 m from the surface of the soil and are averaged over areas not to exceed 100 m^2).

The radiological conditions described above will be demonstrated at a 95% confidence level for each survey unit as a whole.

The number of samples collected per survey unit will be stratified based upon the potential for residual radioactivity. Contamination potential will be based upon a review of the results of the Radiological Characterization Survey and surveys taken during decontamination operations.

4.1 BACKGROUND DETERMINATIONS

Background values for use in comparing actual measurements of the Washington site radiological conditions to guideline values were determined during the Radiological Characterization Survey. Measurements determining background values will be confirmed in areas unaffected by radiological work at the site.

4.2 AREA CLASSIFICATION

For purposes of establishing the sampling and measurement frequency and pattern, the Washington site will be divided into Affected and Unaffected areas. The bases for these classifications are:

Affected Areas - Areas that have potential radioactive contamination (based on plant operating history) or known radioactive contamination (based on actual radiological surveys).

Unaffected Areas - All areas not classified as Affected Areas. These areas are not expected to contain residual radioactivity based upon survey information. These are areas where characterization and decontamination surveys detected no residual activity in excess of guideline values.

4.3 REFERENCE GRID SYSTEM

A reference grid system has already have been established during the Radiological Characterization Survey. This grid system will also be used for the Final Radiological Status Survey. Portions of the grid system will have to be re-established as a result of decontamination activities that destroyed grid markings on original surfaces. Using the reference grid system established for the Radiological Characterization Survey saves the time that would be spent marking off a new grid scheme.

The entire Washington site shall be subdivided into many individual survey units having common contamination potential so that the radiological condition of the property is evaluated section-by-section. A survey unit is a grouping of contiguous surfaces, rooms, or areas with similar use history that have the same classification of contamination potential. In no case shall Affected and

Unaffected Areas be included within the same survey unit. When dividing areas into survey units, areas that are naturally distinguishable from other areas, in addition to sharing a common contamination potential, will be grouped into individual survey units.

4.4 SURFACE SCANS

Scanning of surfaces to identify locations of residual surface and near-surface activity will be performed according to the following schedule:

- Affected Area surfaces - 100% of floor and lower wall surfaces (< 2 meters from floor) and other surfaces in Affected Areas found to have residual activity in excess of guideline values during the Radiological Characterization Survey;
- Upper surfaces (> 2 meters from floor) of Affected Areas found to be non-contaminated during the Radiological Characterization Survey - scans in immediate vicinity of direct measurements; and
- Unaffected Area surfaces - 10% of floor and lower wall surfaces (< 2 meters from floor).

Building interior and exterior surface scans will be conducted for beta-gamma radiations. In selected areas, alpha radiation scans will be performed to verify that the beta-gamma radiation scans have identified the contaminated areas. Interior and immediately adjacent soil surfaces will be scanned for gamma radiation only.

The instruments having the lowest detection sensitivity will be used for the scans wherever physical surface conditions and measurement locations permit. Instruments with audible indicators will be used to identify locations having elevated levels of directly-measured radiation exceeding two times background. Locations of surface activity exceeding twice background shall be marked for further evaluation.

4.5 SURFACE ACTIVITY MEASUREMENTS

4.5.1 Direct Measurements

Direct measurements of alpha, beta-gamma, or gamma surface activity will be performed at selected locations using instrumentation similar to that selected for the same measurements performed during the Radiological Characterization Survey. Unless precluded by surface condition or physical parameters, the most sensitive of the instruments available will be used for direct surface measurements. Measurements will be performed by integrating counts over a sufficiently long period of time to achieve a satisfactorily low MDA. Count times will be determined on site based on background levels and detector efficiency.

If scanning methods are capable of detecting a residual thorium activity of less than 1,000 dpm/100 cm^2, direct surface activity measurements will be systematically performed at two meter intervals on floors and lower walls of Affected Areas and at the same intervals on upper surfaces of Affected Areas. If scanning methods produce an MDA that exceeds 1,000 dpm/100 cm^2, measurements will be performed at one meter intervals.

On upper surfaces of Affected Areas that are not scanned for the presence of residual activity (areas where the Radiological Characterization Survey detected no residual activity in excess of 5,000 dpm/100 cm^2), measurements will be performed at a minimum of 30 locations on both vertical and horizontal surfaces. These locations will include surfaces where radioactive material would likely settle and sufficient additional locations to provide coverage at a minimum of one location per 20 m^2 of surface area.

4.5.2 Removable Surface Activity Measurements

A smear sample for removable contamination will be collected from each location where a direct surface activity measurement is made. These samples will be analyzed for alpha and beta-gamma contamination.

4.6 EXPOSURE RATE MEASUREMENTS

Gamma exposure rates will be measured at a distance of one meter perpendicular to building surfaces, using a gamma scintillation instrument detector calibrated for natural thorium radiation energies. Measurements will be uniformly spaced according to the following pattern (based on parameters in NUREG - 5849):

Building interiors

Affected Areas:	one measurement per 4 m^2
Unaffected Areas:	one measurement per 50 m^2

Grounds (except areas of soil)

Affected Areas:	one measurement per 20 1 m^2 gridblocks
Unaffected Areas:	one measurement per 50 1 m^2 gridblocks

Soil areas

Affected Areas:	four measurements per 100 m^2 gridblock
Unaffected Areas:	one measurement per 100 m^2 gridblock

4.7 SOIL SAMPLING

4.7.1 Sampling of Surface Soil

Samples of surface soil will be systematically collected from the four points midway between the center and each gridblock corner for each 100 m^2 gridblock in Affected Areas. In Unaffected Areas, one sample will be collected from each 100 m^2 gridblock. At each surface sampling location, contact gamma radiation levels before and after sampling will be measured to determine whether subsurface contamination is present. Soil samples will be analyzed to determine radioactivity concentrations.

4.7.2 Sampling of Subsurface Soil

Because of the excavation scheme proposed to remove contaminated soils, no subsurface sampling is expected to be required (see Table 2-1). Section 3.5 details the extent of soil contamination (volume, depth, and concentration) and the proposed method for removal.

4.8 OTHER MEASUREMENTS AND SAMPLES

4.8.1 Building Interiors

Exterior of piping and ventilation ducting in Affected Areas will be surveyed by beta-gamma scans to determine locations which exceed background (typically two times background). At these locations, and at available access points to pipe and ducting interiors, direct alpha measurements and smear samples for removable contaminants will be taken.

Remaining ducts, electrical boxes, conduits, or other interior surfaces in Affected Areas that may contain residual contamination, will be accessed at random, and measurements of direct and removable activity will be performed.

4.8.2 Building Exteriors

Measurements of direct and removable activity will be performed on exterior and interior surfaces of air exhaust equipment and at roof drains. Samples of roofing material will be obtained where direct measurements indicate contamination is present.

Exterior walls will be surveyed as if they were Unaffected Area interior walls. The exterior surface of the roof will be scanned for gamma radiation as if it were an Affected Area interior floor.

4.9 SAMPLE ANALYSES

Smears and swabs for removable contamination will be counted for gross alpha and gross beta-gamma activity. Soil will be analyzed for natural thorium concentration by gamma spectrometry. Chain-of-custody procedures will be observed for all sample analyses.

4.10 DATA INTERPRETATION

Radiological measurement data will be converted to units of dpm/100 cm^2 (surface activity), µrem/hr (exposure rates), and pCi/g (soil radionuclide concentrations) for comparison to guideline values. Values will be adjusted for contributions from natural background. Individual measurements and soil concentrations will be compared to guideline values for maximum activity locations. Average values for survey unit radiological parameters will be determined and compared to guideline values for average activity. Data collected during the Final Radiological Status Survey for each survey unit will be tested against the confidence level objective of 95% using guidance and procedures described in NUREG/CR 5849, "Manual for Conducting Radiological Surveys in Support of License Termination," June, 1992.

Additional remediation and/or further sampling and measurements will be performed where guidelines are not met or cannot be demonstrated to the 95% confidence level. Computations and comparisons will be repeated as necessary.

4.11 FINAL RADIOLOGICAL STATUS SURVEY REPORT

The Contractor will prepare a Final Radiological Status Survey Report that will provide a complete record of the radiological status of each survey unit at the Washington site.

5.0 FUNDING

An Environmental Reserve Fund has been set aside to address all activities required to complete the proposed work plan for Molycorp, Inc.'s Washington facility. Through the duration of the project, projected cost and actual cost will be compared against this reserve to assure that sufficient funding exists to execute the work plan. If a short fall of funding develops, the reserve fund will be supplemented.

SECTION 6.0

6.0 PHYSICAL SECURITY PLAN AND MATERIAL CONTROL AND ACCOUNTING PLAN PROVISIONS IN PLACE DURING DECOMMISSIONING

The numerous previous radiological assessments of the Washington site, particularly the most recent investigation performed by Foster Wheeler Environmental Corporation, have not identified any source material or special nuclear material at the site. Therefore, a Physical Security and Material Control Plan will not be developed or implemented during the decontamination and decommissioning. The Washington facility is located within an area having controlled access.

SECTION 7.0

7.0 RECORDS/REPORTS/NOTIFICATIONS

All records that are generated through the performance of the Washington facility decommissioning activities will be maintained in accordance with Molycorp, Inc.'s License requirements.

REFERENCES

"Disposal or Onsite Storage and Residual Thorium or Uranium from Past Operations," NRC Branch Technical Position, October, 1981.

Gallaghar, Robert G. Applied Health Physics, Inc. 1975. Summary of Actions Taken During 1972-74 to Comply with Requirements of the Nuclear Regulatory Commission. Appendix K to Plan for Site Characterization in Support of Decommissioning of the Molycorp, Inc. Washington PA Facility.

"Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material," NRC, April, 1993.

Martin, K.L. (ORISE) 1985. Radiological Survey of Molybdenum Corporation of America, Washington, Pennsylvania. Oak Ridge Associated Universities. Prepared for U.S. NRC, Region I Office.

Molycorp, Inc., Radiation Surveillance Associates, Inc., and Vail Engineering, Inc. Plan for Site Characterization in Support of Decommissioning of the Molycorp, Inc. Washington PA Facility.

Molycorp, Inc. Site Characterization Report for License Termination of the Washington, PA Facility. Prepared by Foster Wheeler Environmental Corporation 3 Vols., January, 1995.

NUREG/CR 5849, "Manual for Conducting Radiological Surveys in Support of License Termination," June, 1992.

U.S. Geological Survey. 1969. Washington West and East Topographic Quadrangle Maps. 7.5 Minute Series.

U.S. Nuclear Regulatory Commission Regulatory Guide 3.65, "Standard Format and Content of Decommissioning Plans for Licensees Under 10 CFR Parts 30, 40, and 70," August, 1989.

Wrenn, M.E. 1990. "A Sub-surface Survey for Thorium Content at the Molycorp Plant site in Washington, PA." Appendix I to Plan for Site characterization in Support of Decommissioning of the Molycorp, Inc. Washington PA Facility.

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