

Final

East Helena Superfund Site Agricultural Lands Field Inspection

Prepared for
**United States Environmental Protection Agency,
Region VIII**

August 2003

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East Helena Agricultural Lands Field Inspection

A tour of the East Helena agricultural lands was conducted on June 24, 2003. With the exception of the addition of a walk-through of one of the topsoil borrow areas, the suggested agenda included in Appendix A was closely followed. The following summarizes observations and recommendations made by the participants. For more information regarding metals concentrations and varying treatments across the fields see existing Hydrometrics reports.

This summer 2003 inspection was preceded by an earlier field inspection on July 25, 2001, involving the same participants. Future follow-up inspections will be conducted.

Participants

Montana State University - Jeff Mosley, Professor and Researcher, Range Science, Dennis Neuman, Professor and Director, Reclamation Research Unit, Doug Dollhopf, Professor and Researcher, Soils and Reclamation Sciences
Lewis and Clark County - Joan Bowsher, Jan Williams, Debb Tillo
Asarco - Jon Nickel, Steve Lindberg (Consultant, Randall Construction)
MDEQ - Daryl Reed
USEPA - Scott Brown, Deanne Fischer (Consultant, CH2M Hill)

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* Note: Date imprinted on photos is not correct. All photos were taken on June 24, 2003.

East Fields

Observations:

- This 200 acres parcel, owned by Asarco, is located east of the Montana City Highway and south of Hwy 12. A map showing the location of the East Fields is included in Appendix B.
- Sampling of the East Fields was conducted during the the 1987 Phase I Remedial Investigation. Data collected at that time were krieged and plotted to show isocontour lines of lead concentrations. The maps included in the RI show isocontours of lead levels ranging from 1,000 mg/kg to 2,700 mg/kg (0 - 4 inch depth samples) in the fields east of the smelter. Since that time, portions of the fields have been deep tilled, and capped with excavated residential soils. The target surface soil lead concentration for these soils is 1,000 mg/kg or less (0-1 inch).
- The grasses throughout the east fields are healthy and ground cover is good to excellent. They consist mostly of crested wheatgrass. The vegetative cover inhibits blowing dust. Toadflax and whitetop weeds appear to be a minor problem.
- Management objectives (eliminating wind-caused erosion of contaminated soils, aesthetics, reducing risks to grazers and ground-dwellers, preventing pooling of water after rainstorms or snow melt, selecting suitable vegetation to reduce uptake of metals, etc.) are being met.

Recommendations:

- Dr. Mosley, MSU recommended that grazing by either horses, sheep, or cattle would benefit the vegetative community and promote growth, though water and fencing would need to be provided. He recommended that Asarco contact Rodney Kott, MSU, to see if an arrangement can be made to allow sheep to graze.
- Dr. Mosely recommended winter grazing, (October through January) to reduce the existing dead-fall. Supplemental protein would need to be provided for winter grazing. Sheep could be introduced into the property in the spring (May and June) to control weeds, and then horses, cattle or sheep in the summer. Horses may be considered for aesthetic reasons. Dairy cows are not recommended. He recommended approximately 25 head of cattle (or their equivalent) for the 200 acres (1 animal unit per 1½ acres per month for a 6 month grazing season).
- Chemicals (spraying) could also be used for weed control.
- Stormwater ponding may present a livestock arsenic exposure in some low lying areas.

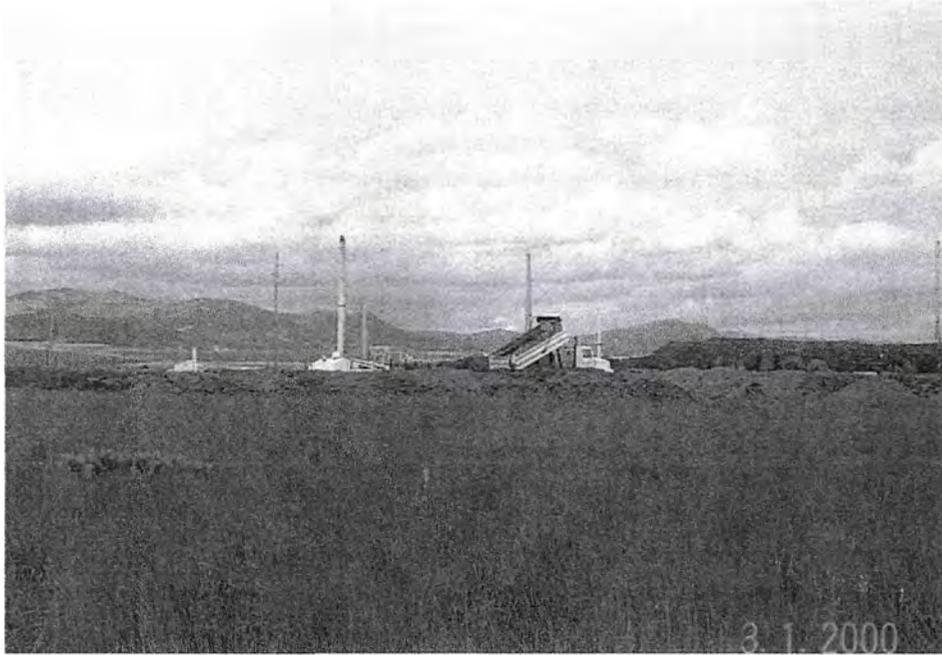


Figure 1 East Fields - looking west

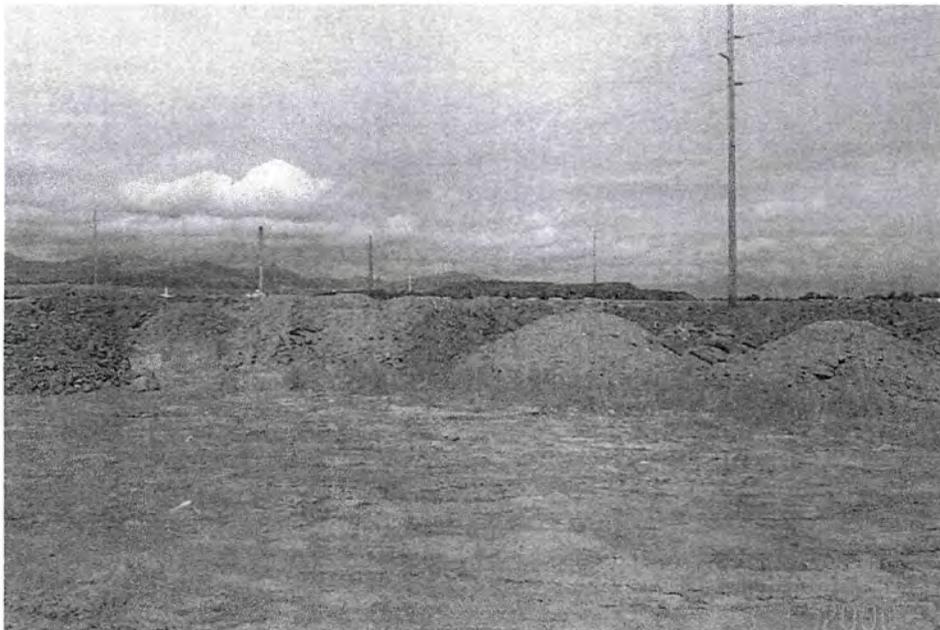


Figure 2 East Fields - looking west (East Fields continue to receive spoils from ongoing removals)

West Portion of East Fields

Observations:

- The 35 acres of Asarco land, located immediately east of the smelter, have a good to excellent stand of drought resistant grasses and vegetation (mostly crested wheatgrass). The area was sprayed and seeded in 2001. Weed controls by Asarco, since the inspection of 2001, show success in reducing Kochia. A map showing the location of the West Portion of the East Fields is included in Appendix B.
- Soil samples were collected during the 1987 Phase I Remedial Investigation. The data were krieged, and surface soil lead isocontours were plotted on an area map. The isocontours within the West Portion of the East Fields varied from 1,700 to 3,400 mg/kg (0-4 inch sample depth).
- The fields were deep tilled with a Western Reclamation Plow in 1996 and capped with excavated residential soils. Prior to tilling, three tons per acre of -100 mesh limestone were applied to the field to address depressed pHs in surface soils. Deep tilling the fields reduced the mean surface (0-4 inch) lead concentrations to approximately 1,400 mg/kg. The fields were subsequently covered with 12 inches of excavated residential soils containing an average of about 840 mg/kg lead. Please see the Asarco West Field Deep Till Remediation Report, Hydrometrics, July, 1997 for further information regarding the West Portion of the East Fields
- Excavated residential soils were last placed in the West Portion of the East Fields in 1999. This portion of the fields has undergone extensive soils regrading to achieve surface soils concentrations below an average of 1,000 mg/kg.
- MSU scientists were impressed with the reclamation efforts in both portions of the East Fields, but strongly recommended managed grazing.

Recommendations:

- The dead growth may be more palatable to livestock after the existing vegetation has been "knocked down". Burning, mowing and grazing are "knockdown" options. Burning would not likely be desirable because of close proximity to residences, and mowing would be difficult due to rough terrain. The most economical option would be to allow grazing.
- Both the east and west portions will require some new fencing and fence repair by the producer if grazed. Grazing will in time improve the palatability of wheatgrasses.
- Livestock (cattle, sheep, or horses) could be initially introduced in the fall and then in the spring of subsequent years.



Figure 3 West Portion of the East Fields - looking southwest



Figure 4 West Portion of the East Fields - looking southwest



Figure 5 West Portion of the East Fields -
looking north

Diehl Property

Observations:

- The Diehl property was deep tilled to a depth of 24-30 inches in 1993. Original lead concentrations were within the range of 1,000 to 1,800 mg/kg. After four or more passes with the deep tiller, concentrations throughout the tilled soil profile were reduced to about 300 to 500 mg/kg. A map of the Diehl Property and associated soil sampling results are included in Appendix B.
- Lime was added as needed to raise the pH to greater than 7.
- The property is currently being developed for residential homes and some limited commercial development. A middle school was constructed shortly after the response action was taken.
- See existing Hydrometrics reports for additional pre- and post- sampling and tillage and liming rates.

Recommendations:

- The development looked good. Remediation of the property was successful. No changes were recommended. Although weeds are present.



Figure 6 Diehl Property - Looking east

La Casa Grande Park

Observations:

- The 2.8 acre La Casa Grande Park is located in a 250 lot subdivision. The park had surface soil lead concentrations ranging from 297 mg/kg to 2,166 mg/kg. It was tilled to a depth of approximately 10 inches. Lime was added for neutralization. Surface soil lead levels are now less than 500 mg/kg. A map and soil sampling results are included in Appendix B.
- A sprinkler system has been installed by the homeowners association (contact Richard Wilson). They broadcast seeded turf grass, but it did not take.
- Ground cover is good to excellent, though weeds have established in the baseball diamonds.

Recommendations:

- More involvement from other homeowners in the subdivision would help to reduce the burden of maintenance costs for the few homeowners who contribute.



Figure 7 La Casa Grande Park - looking northwest



Figure 8 La Casa Grande Park - looking northeast

Dartman Fields

Observations:

- In previous years, this 200 acre area was a major concern for wind-blown, contaminated dust, with numerous, large bare areas. Lead concentrations in the surface soils generally exceed 1000 mg/kg. Sampling data exist but are not available for the Dartman Fields.
- The Dartman Fields are owned by Asarco. They are labeled as Areas 4 and 6 on the map in Appendix C.
- Cleanup of contaminated ditches and channels is an ongoing activity.
- A marked improvement in vegetative cover was noted, in contrast to the severely over-grazed condition of these fields observed just two years ago. Few bare areas remain and the grasses are good to excellent. Some weed problems were noted although the lessee has initiated weed control.
- MSU scientists felt that the reduction in grazing animals together with increased moisture this year and last fall have improved the condition of this land remarkably, despite elevated metals and relatively poor soil conditions.
- A residential dust monitoring program (sampling of homes in the surrounding area) is in place. The Lewis and Clark County Health Department Lead Education and Abatement Program is conducting the program in 7 homes located downwind of the Dartman Fields.

Recommendations:

- A total of 23 cows and calves have been allowed to graze the area from May through October. Though this number is below the fields grazing capacity, no increase was recommended.
- Encourage the use of all 200 acres for uniform grazing, to prevent over-use in selected areas.
- It was recommended that some of the less vegetated areas be seeded.
- It was the opinion of the MSU scientists that vegetative cover was as good as it would get without additional work and that the absence of grazing cattle would not have an appreciable impact in reducing the dust generation from the pasture.
- However, if dust generation is a problem, Dr. Mosley recommended that no grazing will improve ground cover, bare areas should be seeded, and irrigation and fertilizer should be applied.



Figure 9 Dartman Fields - looking east



Figure 10 Dartman Fields - looking north

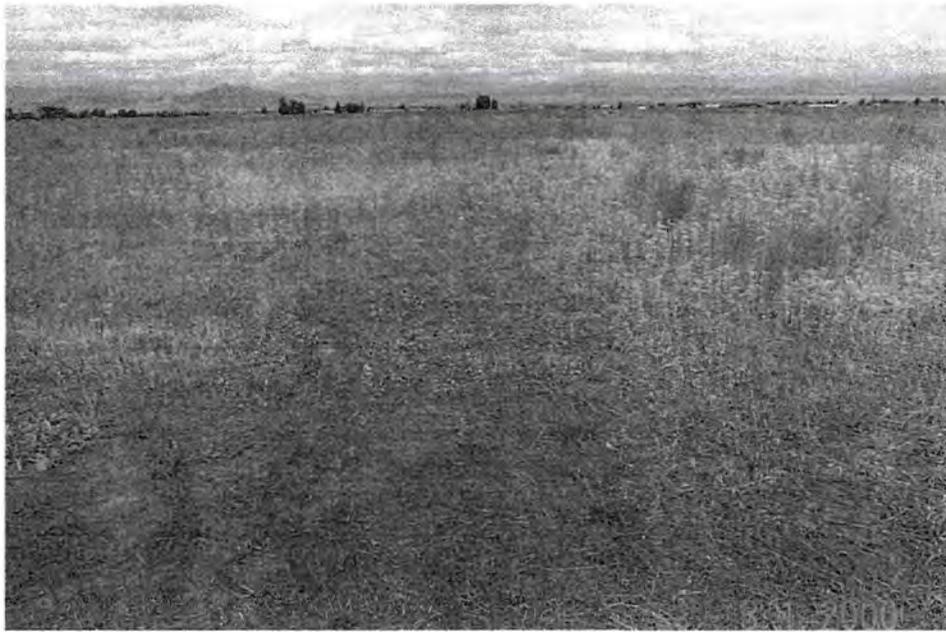


Figure 11 Dartman Fields - looking west

Menthe - Bahnny Borrow Area

Observations:

- This area is one of three areas in the Helena Valley from which replacement soils were strip-mined during the height of the removal action. Located immediately east of the former Girls' Reform School off Sierra Road, this area provided the majority of replacement soils. A map showing the location of the permitted mining locations is included in Appendix B.
- Approximately 12 inches of topsoil were mined from the approximately 150 acre parcel.
- The land has been seeded with alfalfa and grasses, and has been irrigated. Mustard is common throughout the alfalfa. The vegetation is excellent.
- The other 2 sources of topsoil are located off Arrowhead Lane and at Merritts farm near Lake Helena. Scott Brown inspected the site at Merritts farm and it is in excellent condition, as only 4 to 6 inches of topsoil were removed from a source that is at least 3 to 4 feet deep.

Recommendations:

- It was recommended that the borrow site located off Arrowhead Drive near the Masonic Home, where nearly all of the topsoil was removed in 1991 and 1992, be inspected. See attached maps for borrow site locations.



Figure 12 Menthe - Bahnny Borrow Area - looking northwest

Lamping Fields

Observations:

- This 330 acre parcel located west of Wiley Drive is owned by Asarco. The field has improved remarkably since 2001 and years prior, when it was severely overgrazed.
- The area was sampled in 2001. The fields were broken into one-acre sections and 16-spot composite samples (0-1 inch depth) were collected from each section. The lead levels ranged from 229 mg/kg in the northwest area to 4,042 mg/kg in the southeast area. A map showing the Lamping fields sampling sections is included in Appendix B. The fields are a portion of the area labeled Areas 2 and 3 on the map in Appendix C.
- Thirty pairs of Angus cattle graze May through October. The producer rotates his cows (cross-fencing), and the vegetation is good to excellent.

Recommendations:

- The current management of the pasture should continue.



Figure 13 Lamping Fields - looking east



Figure 14 Lamping Fields - looking north

Southern Agricultural Fields

Observations:

- The approximately 160-200 acre field located south of the smelter, is being leased from Asarco for wheat. This land has been repeatedly plowed and returned to wheat. This appears to be the best use of this land, although when in fallow, wind-blown dust may be a slight problem. Several miles of agricultural fields exist down-wind.
- These fields were included in the sampling collected for the 1987 Phase I Remedial Investigation. The sampling data show lead levels ranging from 250 mg/kg to 1,317 mg/kg (0-4 inch depth). It was noted that higher surface soil lead values (2,190 mg/kg) were recorded on elevated lands near the Upper Lake (located just north of the fields). Native grasses continue to prosper in this area, adjacent to plowed fields.
- The Southern Agricultural Fields are labeled Area 15 on the map in Appendix C. Please refer to the 1987 Phase I Remedial Investigation for sampling locations and results.

Recommendations:

- The current management of the pasture should continue.



Figure 15 Southern Agricultural Fields - looking southwest

Fields Located South of Manlove Addition

Observations:

- The fields, owned by Asarco, are located south of the Manlove Addition and west of the rodeo grounds. The fields are located in the area labeled as Area 15 on the map in Appendix C.
- Ground cover—dryland grasses and the like—is good, but repeated foot traffic would likely render areas barren.
- The surface soils in this area are contaminated with lead (levels of 1,000-2,000 mg/kg). The area remains in native condition and bare areas exist. Limited sampling data exist but are not available.
- A proposal to establish a paint ball course here is being considered by Asarco.

Recommendations:

- Potential recreational health risks must be clarified prior to approval of paint ball course.



Figure 16 Fields south of Manlove Addition - looking south

Summary

- The inspection team members convened at the Firemen's Hall to summarize and discuss follow-up.
- Dr. Mosley offered to assist Asarco with protocols for best management practices and to provide a template that the leaser could follow to further improve the land use.
- Dr. Dollhopf and Prof. Neuman commented on the potential for increased commercial usage of surrounding agricultural lands, while simultaneously improving vegetation over the long term.
- Though all participants agreed that conditions have improved markedly, Dr. Dollhopf reiterated that the East Fields could be improved through grazing.
- It was suggested that a monitoring program be implemented to confirm that property lessees are managing the property well. Dr. Mosely will provide Asarco with a template to follow for this purpose.
- An inspection of the same fields, and the first strip-mined area near the Masonic Home was recommended for early fall..

Notes by Scott Brown/EPA, Deanne Fischer/CH2M HILL, Daryl Reed/MDEQ, Dennis Neuman/MSU Reclamation Research Unit, Jan Williams and DebbTillo/Lewis and Clark Lead Education and Abatement Program, and Jon Nickel/Asarco

APPENDIX A

SUGGESTED AGENDA FOR FIELD INSPECTION

JUNE 24, 2003 10:00 A.M. - 3:30 P.M.

AGRICULTURAL LANDS SURROUNDING THE EAST HELENA SUPERFUND SITE

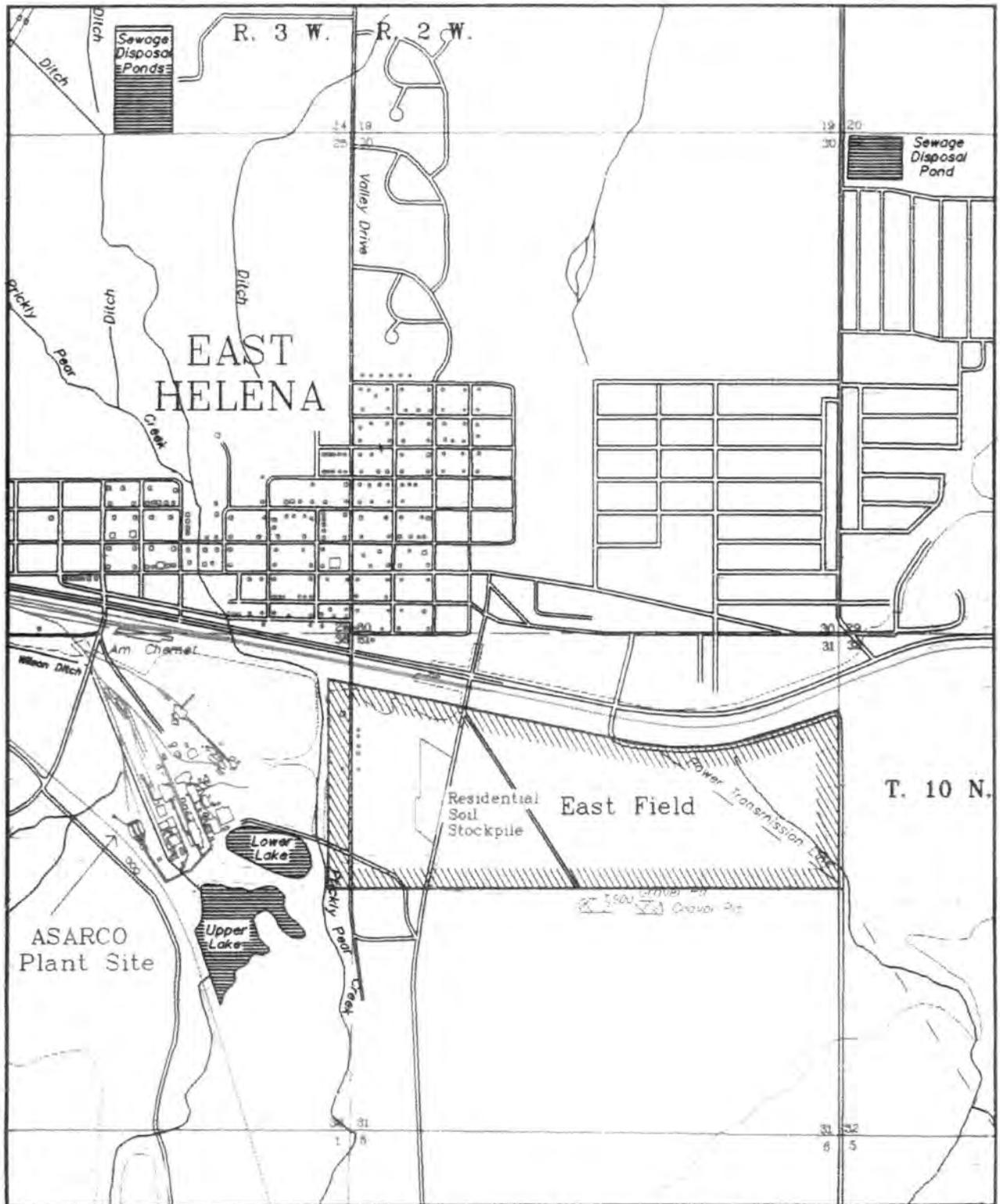
Participants: Range, Soil and Reclamation Scientists, Montana State University
Lewis and Clark County Extension Agent
Lewis and Clark County Environmental Health Division Staff
City of East Helena Officials and Interested Citizens
Asarco Incorporated Officials and Contractors
Montana Department of Environmental Quality Staff
U. S. Environmental Protection Agency Staff and Contractor

Purpose: Several hundreds of acres of undeveloped, largely agricultural lands surrounding East Helena and the smelter remain contaminated by heavy metals, arsenic, and, to varying degrees, acidic soils. Periodic field inspections have been conducted, and will continue in the future, utilizing the expertise of range, soil and reclamation scientists who conducted original remedial investigations and county extension officials. Their inspections and observations, followed by advice on how to manage the lands most effectively, ensure that plant growth and maintenance on these contaminated lands may be optimized.

1. Meet at 10:00 A.M. at the Pioneer Cabin immediately south of Highway 12, near the entrance to the East Field Demonstration Area. Inspect both the east and west portions of the area.
2. Proceed to the Diehl Fields, deep-tilled several years ago and now under commercial and residential development. Briefly inspect fields under development north and east of Diehl Fields.
3. Proceed to La Casa Grande Subdivision playground and ball field, tilled several years ago.
4. Proceed to north end of Dartman Fields, across Valley Drive from La Casa Grande Subdivision. Walk through and inspect north end of Dartman Fields.
5. (Approximately 12:30 P.M.) Proceed to Main Street Park for lunch sponsored by Lewis and Clark County Health Department. Brief discussion regarding observations and follow-up.
6. Proceed after lunch to Kennedy Park and area along Prickly Pear Creek set aside for recreational usage. Briefly observe fields north of Gail Street and west of the creek.
7. Proceed to Lamping Fields and Wilson Ditch north of Highway 12.
8. Proceed to wheat fields south of the smelter. Briefly observe riparian pastures south of Upper Lake.
9. Proceed to valley location(s) from which replacement soils were strip-mined.
10. (Approximately 3:00 P.M.) Proceed to the East Helena Firemen's Hall. Discuss observations and plan for follow-up recommendations.
11. Discuss late summer or early autumn inspection. Adjourn at 4:30 P.M.

APPENDIX B

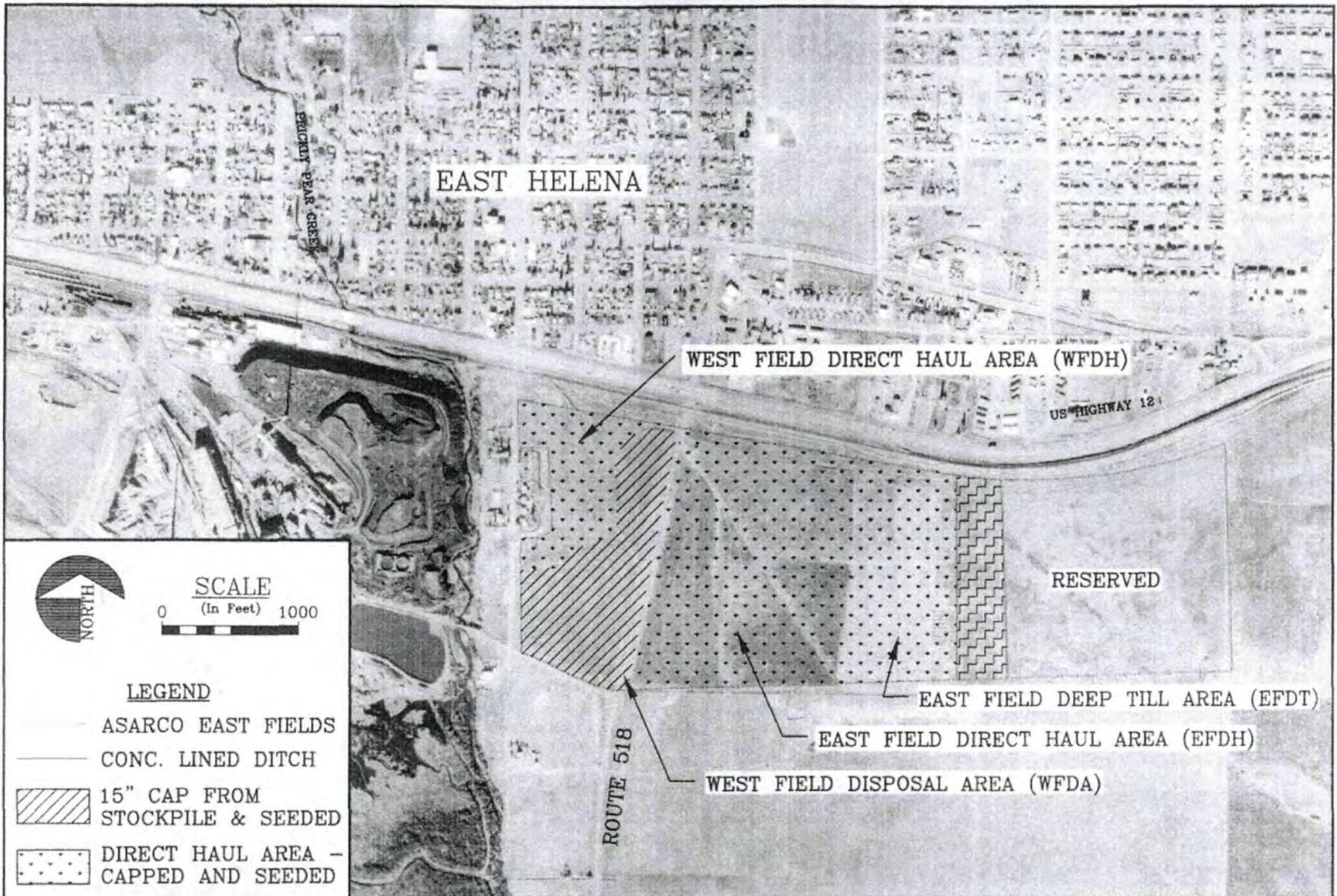
B-1 EAST FIELDS



SCALE: 1" = 1,500 feet ASE1992N (12/17/93)

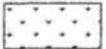


Figure 1-1-1
Plant Site Location Map



SCALE
 (In Feet) 0 1000

LEGEND

- ASARCO EAST FIELDS
- CONC. LINED DITCH
-  15" CAP FROM STOCKPILE & SEEDED
-  DIRECT HAUL AREA - CAPPED AND SEEDED
-  EFDT - RIPPED, DEEP TILLED (4X) AND SEEDED

ASARCO INCORPORATED
 EAST HELENA RESIDENTIAL SOILS
 REMOVAL ACTION 2001 YEAR END REPORT
 EAST HELENA, MONTANA

**EAST FIELDS
 RESIDENTIAL SOIL DISPOSAL AREA**

**FIGURE
 4-1**

R. 2 W.



12

Manlove Homestead

Montana Ave

Power Transmission Line

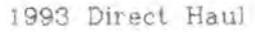
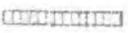
1250 1500 1750 2000 2250 2500 2750 3000 3250 3500 3750 4000 4250 4500 4750 5000 5250 5500 5750

Deer Creek

Montana City Highway

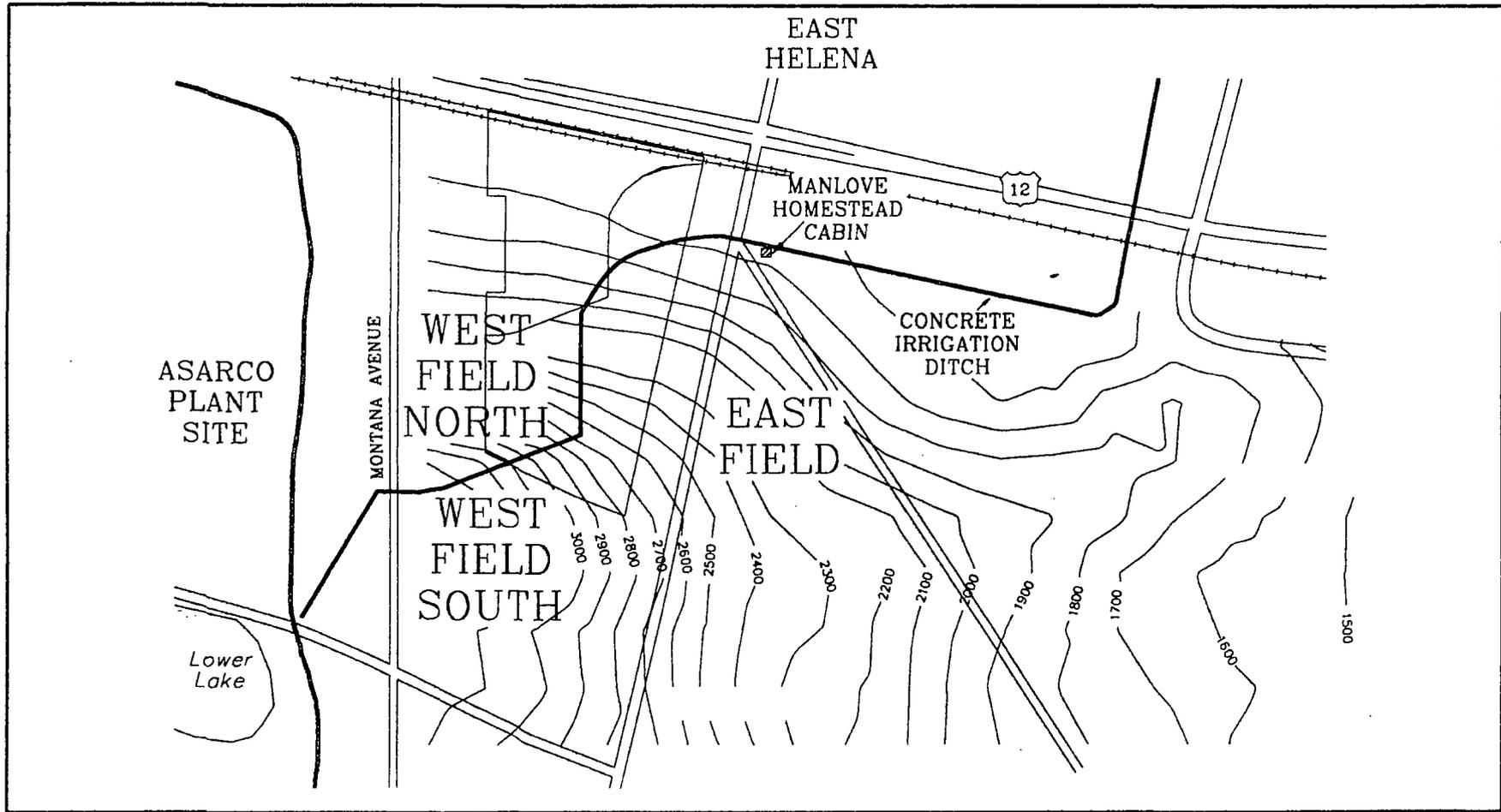
T.
10
N.

LEGEND

	1993 Direct Haul		Access Road (Restricted Access)
	ASARCO East Field		Highway Right-of-Way
	1993 Treatment Plots		Power Line
	Total Soil Lead Isoline (mg/kg) 0" to 4" Soil Depths		Grid Section Corners
	Residential Soil Stockpile		

Scale: 1" = 500'

B-2 WEST PORTION OF THE EAST FIELDS



Proj. No: 0792-
 Dwg. No: 952AA
 Drawn By: 0064
 Last Update: 3/4/97
 Ref. Dwg: 952A
 Rev. Date: 3/4/97



Hydrometrics, Inc.

FIGURE 3-3
WEST FIELD RESIDENTIAL
SOILS CAP AREA

**TABLE 5-1. POST-TILLAGE SURFACE LEAD CONCENTRATIONS
(MEASURED)**

Pit	North 0-4"	North 4-16"	South 0-15"
1	1,750	1,556	1,450
2	1,030	1,018	2,087
3	1,951	1,306	688
4	1,362	1,253	1,836
5	1,908	1,361	2,606
6	498	638	1,448
7	953	885	2,730
8	902	703	2,681
9	1,234	959	1,847
10	422	322	718
11	987	807	913
12	211	256	2,057
13	1,439	1,458	2,206
14			1,142
15			1,145
16			946
Mean	1,127	963	1,656

The weighted average mean post-tillage surface (0 to 16 inch) lead concentrations for the north portion of the West Field was 1,004 mg/kg $[(1,127 \times 4) + (963 \times 12) / 16]$. The mean post-tillage surface (0 to 15 inch) lead concentration for the south portion of the West Field was 1,656 mg/kg. The weighted average mean post-tillage surface (0 to 16 inch at the north and 0 to 15 inch at the south) lead concentration for the entire West Field was 1,364 mg/kg $[(1,004 \times 13) + (1,656 \times 16) / 29]$.

B-3 DIEHL PROPERTY

	MA01	MA02	MA03	MA04	
	$\frac{697}{285}$	$\frac{878}{287}$	$\frac{1150}{338}$	$\frac{627}{331}$	
DUDLEY STREET	MA08	MA07	MA06	MA05	
	$\frac{860}{408}$	$\frac{1410}{265}$	$\frac{1053}{308}$	$\frac{1336}{356}$	
	MA09	MA10	MA11	MA12	
	$\frac{1812}{332}$	$\frac{987}{351}$	$\frac{954}{364}$	$\frac{1284}{457}$	
KING STREET	MA16	MA15	MA14	MA13	
	$\frac{3041}{472}$	$\frac{2005}{295}$	$\frac{1342}{354}$	$\frac{1491}{390}$	
	MA17	MA18	MA19	MA20	
	$\frac{1227}{369}$	$\frac{1064}{427}$	$\frac{1119}{380}$	$\frac{1618}{352}$	
CLINTON STREET	MB01	MB02	MB03	MB04	
	$\frac{345}{398}$	$\frac{1209}{403}$	$\frac{1260}{428}$	$\frac{1687}{442}$	
GROSCHELL STREET	MB08	MB07	MB06	MB05	OAK AVENUE
	$\frac{1022}{376}$	$\frac{1741}{460}$	$\frac{1437}{414}$	$\frac{1739}{376}$	
	MB09	MB10	MB11	MB12	
	$\frac{2036}{422}$	$\frac{2351}{572}$	$\frac{1808}{393}$	$\frac{1683}{405}$	
RIGGS STREET	MB16	MB15	MB14	MB13	
	$\frac{2247}{517}$	$\frac{2820}{550}$	$\frac{2005}{442}$	$\frac{2464}{549}$	
	MB17	MB18	MB19	MB20	
	$\frac{2228}{473}$	$\frac{1872}{498}$	$\frac{1710}{499}$	$\frac{1954}{432}$	
MAIN STREET					

OAK AVENUE

LEGEND

MA13	SITE CODE
1539	PRE-TILLAGE 0-1" Pb
402	POST-TILLAGE 0-1" Pb

NOT TO
SCALE



OLD HWY 12 EAST

Proj. No: 0180
Dwg. No: MAMBXRF
Drawn By: 0065
Last Update: 4/23/97
Ref. Dwg: MAMB
Rev. Date: 4/23/97

Hydrometrics, Inc.

FIGURE 2-4
PRE/POST_TILLAGE
SURFACE_SAMPLE_RESULTS
DIEHL_PROPERTY

TABLE 2-3. LEAD MEANS AND STANDARD DEVIATIONS

Stat. Basic Stats

Summary Table of Means (pre.sta)
N=160 (No missing data in dep. var. list)

Depth_In	PB_MG_KG Means	PB_MG_KG N	PB_MG_KG Std. Dev.
0-1	1539.325	40	592.3597
0-4	831.375	40	481.4487
4-16	114.400	40	122.7958
16-30	38.850	40	28.8298
All Grps	630.987	160	720.9968

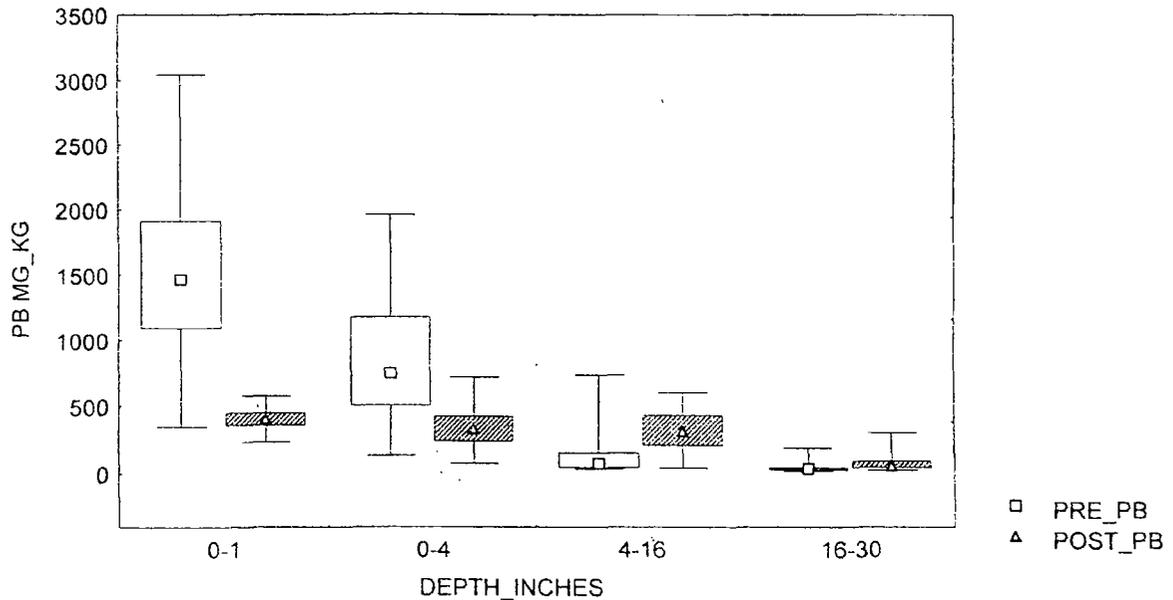
TABLE 2-6. POST-TILLAGE MEAN SURFACE LEAD CONCENTRATIONS

DEPTH_IN	Summary Table of Means (pre.sta)					
	PRE_PB Means	PRE_PB N	PRE_PB Std. Dev.	POST_PB Means	POST_PB N	POST_PB Std. Dev.
0-1	1539.325	40	592.3597	401.6750	40	79.2401
0-4	831.375	40	481.4487	343.9500	40	145.1568
4-16	114.400	40	122.7958	320.6250	40	143.1232
16-30	38.850	40	28.8298	78.6500	40	61.5886
All Grps	630.987	160	720.9968	286.2250	160	167.3078

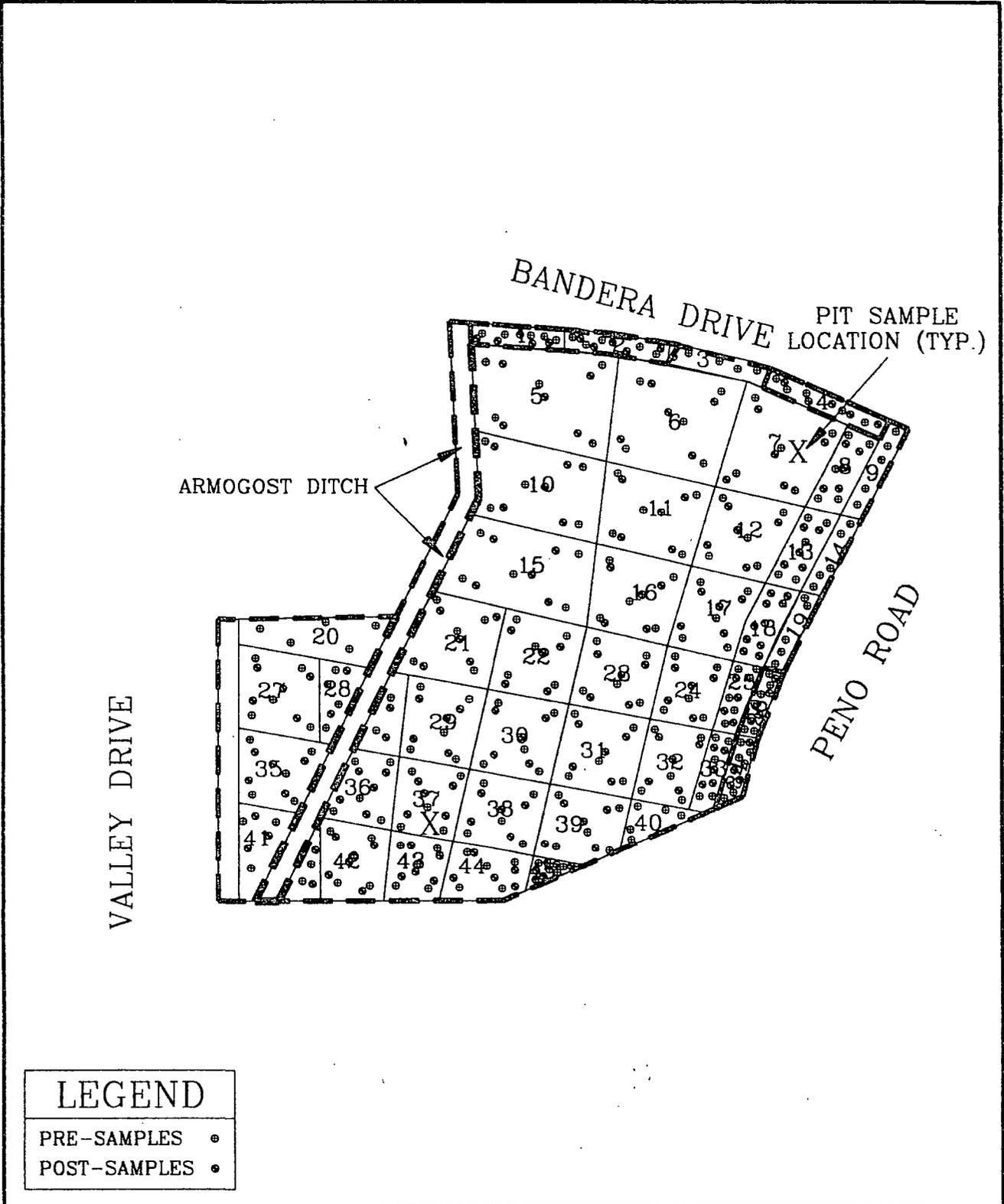
FIGURE 2-8. POST PROFILE LEAD CONCENTRATIONS

FIGURE 2-8 PROFILE LEAD CONCENTRATIONS

Median; Box: 25%, 75%; Whisker: Min, Max
Pre and Post Samples



B-4 LA CASA GRANDE PARK



REVISED 2/2/98

SAMPLE LOCATION MAP

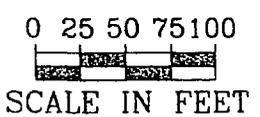


FIGURE 2-8
 SITE CODE TA16
 ADDRESS LACASA GRANDE PARK II
 OWNER HOME OWNERS ASSOC

SECTOR	SAMPLE NUMBER (1)	LAB NUMBER	SAMPLE DATE	SAMPLE TIME	SAMPLE DEPTH in.(2)	SAMPLE TYPE (3)	ANALYSIS DATE	Pb (ppm)	As (ppm)	Cd (ppm)	U95 Pb VALUE (4) (ppm)	COMMENTS	Pb FIELD REPLICATE (RPD) (5)
SITE CODE: TA16													
Bob St. Clair La Casa Grand Hom P.O. Box 325 East Helena, MT 59635 Corner of Bandera & Valley Dr.													
PRE SOIL CONCENTRATIONS													
01	PRE-TA16-1	95X-01727	04/21/95	0930	0-1	PRE	06/25/95	820	98	17	878		
02	PRE-TA16-2	95X-01728	04/21/95	0940	0-1	PRE	06/25/95	534	62	10	592		
03	PRE-TA16-3	95X-01729	04/21/95	0950	0-1	PRE	06/25/95	422	53	11	480		
04	PRE-TA16-4	95X-01730	04/21/95	1000	0-1	PRE	06/25/95	633	60	21	691		
05	PRE-TA16-5	95X-01731	04/21/95	1010	0-1	PRE	06/25/95	530	66	16	588		
06	PRE-TA16-6	95X-01732	04/21/95	1020	0-1	PRE	06/25/95	388	51	14	446		
07	PRE-TA16-7	95X-01733	04/21/95	1030	0-1	PRE	06/25/95	505	43	12	563		
07 P1	PRE-TA16-7P1	96X-06480	08/08/96	0940	0-4	PRE	08/10/96	108	35	< 5	167		
07 P2	PRE-TA16-7P2	96X-06481	08/08/96	0945	4-16	PRE	08/10/96	540	83	9	598		
07 P3	PRE-TA16-7P3	96X-06482	08/08/96	0950	16-30	PRE	08/10/96	40	30	< 5	99		
08	PRE-TA16-8	95X-01734	04/21/95	1040	0-1	PRE	06/25/95	392	60	< 5	450		
09	PRE-TA16-9	95X-01735	04/21/95	1050	0-1	PRE	06/25/95	406	50	13	464		
10	PRE-TA16-10	95X-01736	04/21/95	1100	0-1	PRE	06/25/95	545	54	17	603		
11	PRE-TA16-11	95X-01737	04/21/95	1110	0-1	PRE	06/25/95	298	47	9	357		
12	PRE-TA16-12	95X-01738	04/21/95	1120	0-1	PRE	06/25/95	321	41	7	379		
13	PRE-TA16-13	95X-01739	04/21/95	1130	0-1	PRE	06/25/95	325	50	5	383		
14	PRE-TA16-14	95X-01740	04/21/95	1140	0-1	PRE	06/25/95	393	57	12	451		5.2%
14 R	PRE-TA16-50	95X-01741	04/27/95	1150	0-1	PRE	06/25/95	414	52	14	472		
15	PRE-TA16-15	95X-01742	04/21/95	1200	0-1	PRE	06/25/95	1093	100	18	1152		

Notes: (1) P = Pit Sample; GS = Garden Sample; R = Replicate; GA = Garage Sample; TR = Tree Roots.

(2) Depth at which samples were taken. For PST samples the excavation depth was used; * = Final Excavation Depth.

(3) PRE = Pre Removal Sample; PST = Post Removal Sample; DH = Direct Haul Sample; CM = Continuous Monitoring Sample; NON = Nondisturbed sampling area; DIS=urbed sampling area; (4) Upper 95% Confidence Value for Lead

SECTOR	SAMPLE NUMBER (1)	LAB NUMBER	SAMPLE DATE	SAMPLE TIME	SAMPLE DEPTH in.(2)	SAMPLE TYPE (3)	SAMPLE ANALYSIS DATE	Pb (ppm)	As (ppm)	Cd (ppm)	U95 Pb VALUE (4)	COMMENTS	Pb FIELD REPLICATE (RPD) (5)
SITE CODE: TA16													
Bob St. Clair La Casa Grand Hom													
P.O. Box 325 East Helena, MT 59635													
Corner of Bandera & Valley Dr.													
PRE SOIL CONCENTRATIONS													
	16	PRE-TA16-16	95X-01743	04/21/95	1400	0-1	PRE 06/25/95	302	57	6	361		
	17	PRE-TA16-17	95X-01744	04/21/95	1410	0-1	PRE 06/25/95	269	50	9	328		
	18	PRE-TA16-18	95X-01745	04/21/95	1420	0-1	PRE 06/25/95	343	41	10	401		
	19	PRE-TA16-19	95X-01746	04/21/95	1430	0-1	PRE 06/25/95	307	61	10	366		
	20	PRE-TA16-20	95X-01747	04/21/95	1440	0-1	PRE 06/25/95	1409	102	25	1470		
	21	PRE-TA16-21	95X-01748	04/21/95	1450	0-1	PRE 06/25/95	968	129	18	1027		
	22	PRE-TA16-22	95X-01749	04/21/95	1500	0-1	PRE 06/25/95	390	56	9	448		
	23	PRE-TA16-23	95X-01750	04/21/95	1510	0-1	PRE 06/25/95	238	44	< 5	297		
	24	PRE-TA16-24	95X-01751	04/21/95	1520	0-1	PRE 06/25/95	307	40	10	366		
	25	PRE-TA16-25	95X-01752	04/27/95	0945	0-1	PRE 06/25/95	337	37	10	395		
	26	PRE-TA16-26	95X-01753	04/27/95	0950	0-1	PRE 06/25/95	548	52	19	606		2.5%
	26 R	PRE-TA16-60	95X-01754	04/27/95	0955	0-1	PRE 06/26/95	562	46	18	620		
	27	PRE-TA16-27	95X-01755	04/27/95	1020	0-1	PRE 06/26/95	912	80	16	971		
	28	PRE-TA16-28	95X-01756	04/27/95	1025	0-1	PRE 06/26/95	1384	118	32	1445		
	29	PRE-TA16-29	95X-01757	04/27/95	1030	0-1	PRE 06/26/95	1341	162	20	1401		
	30	PRE-TA16-30	95X-01758	04/27/95	1035	0-1	PRE 06/26/95	673	106	11	731		
	31	PRE-TA16-31	95X-01759	04/27/95	1040	0-1	PRE 06/26/95	546	73	12	604		
	32	PRE-TA16-32	95X-01760	04/27/95	1045	0-1	PRE 06/26/95	532	72	12	590		
	33	PRE-TA16-33	95X-01761	04/27/95	1050	0-1	PRE 06/26/95	323	46	9	381		

Notes: (1) P = Pit Sample; GS = Garden Sample; R = Replicate; GA = Garage Sample; TR = Tree Roots.

(2) Depth at which samples were taken. For PST samples the excavation depth was used; * = Final Excavation Depth.

(3) PRE = Pre Removal Sample; PST = Post Removal Sample; DH = Direct Haul Sample; CM = Continuous Monitoring Sample; NON = Nondisturbed sampling area; DIS = urbed sampling area; (4) Upper 95% Confidence Value for lead

SECTOR	SAMPLE NUMBER (1)	LAB NUMBER	SAMPLE DATE	SAMPLE TIME	SAMPLE DEPTH in.(2)	SAMPLE TYPE (3)	ANALYSIS DATE	Pb (ppm)	As (ppm)	Cd (ppm)	U95 Pb VALUE (4) (ppm)	COMMENTS	Pb FIELD REPLICATE (RPD) (5)
SITE CODE: TA16													
Bob St. Clair La Casa Grand Hom													
P.O. Box 325 East Helena, MT 59635													
Corner of Bandera & Valley Dr.													
PRE SOIL CONCENTRATIONS													
34	PRE-TA16-34	95X-01762	04/27/95	1055	0-1	PRE	06/26/95	518	59	14	576		
35	PRE-TA16-35	95X-01763	04/27/95	1120	0-1	PRE	06/26/95	635	56	17	693		
36	PRE-TA16-36	95X-01764	04/27/95	1125	0-1	PRE	06/26/95	1210	98	23	1270		
37	PRE-TA16-37	95X-01765	04/27/95	1130	0-1	PRE	06/26/95	977	112	24	1036		
37 P1	PRE-TA16-37P1	96X-06483	08/08/96	1015	0-4	PRE	08/10/96	423	80	18	481		
37 P2	PRE-TA16-37P2	96X-06484	08/08/96	1020	4-16	PRE	08/10/96	69	34	< 5	128		
37 P3	PRE-TA16-37P3	96X-06485	08/08/96	1025	16-30	PRE	08/10/96	26	19	< 5	85		
38	PRE-TA16-38	95X-01766	04/27/95	1135	0-1	PRE	06/26/95	1057	144	11	1116		
39	PRE-TA16-39	95X-01767	04/27/95	1140	0-1	PRE	06/26/95	1189	144	16	1249		
40	PRE-TA16-40	95X-01768	04/27/95	1145	0-1	PRE	06/29/95	634	74	11	692		
40 R	PRE-TA16-70	95X-01769	04/27/95	1150	0-1	PRE	06/29/95	567	56	12	625		
41	PRE-TA16-41	95X-01770	04/27/95	1215	0-1	PRE	06/29/95	1555	110	30	1617		
42	PRE-TA16-42	95X-01771	04/27/95	1220	0-1	PRE	06/29/95	2099	141	36	2166		
43	PRE-TA16-43	95X-01772	04/27/95	1225	0-1	PRE	06/29/95	1049	112	17	1108		
44	PRE-TA16-44	95X-01773	04/27/95	1230	0-1	PRE	06/29/95	509	90	7	567		
45	PRE-TA16-45	95X-01774	04/27/95	1235	0-1	PRE	06/29/95	746	80	8	804		

Notes: (1) P = Pit Sample; GS = Garden Sample; R = Replicate; GA = Garage Sample; TR = Tree Roots.

(2) Depth at which samples were taken. For PST samples the excavation depth was used; * = Final Excavation Depth.

(3) PRE = Pre Removal Sample; PST = Post Removal Sample; DH = Direct Haul Sample; CM = Continuous Monitoring Sample; NON = Nondisturbed sampling area; DIS = urbed sampling area; (4) Upper 95% Confidence Value for Lead

SECTOR	SAMPLE NUMBER (1)	LAB NUMBER	SAMPLE DATE	SAMPLE TIME	SAMPLE DEPTH in. (2)	SAMPLE TYPE (3)	ANALYSIS DATE	Pb (ppm)	As (ppm)	Cd (ppm)	U95 Pb	Pb FIELD
											VALUE (4)	REPLICATE (RPD) (5)

SITE CODE: TA16												
Bob St. Clair La Casa Grand Hom												
P.O. Box 325 East Helena, MT 59635												
Corner of Bandera & Valley Dr.												
PST SOIL CONCENTRATIONS												
01	PST-TA16-1	97X-02092	10/23/97	1140	*10-11	PST	10/23/97	120	45	< 5	188	
02	PST-TA16-2	97X-02093	10/23/97	1150	*10-11	PST	10/23/97	273	49	< 5	340	8.4%
02 R	PST-TA16-80	97X-02094	10/23/97	1200	*10-11	PST	10/24/97	297	42	< 5	364	
04	PST-TA16-4	97X-02090	10/20/97	1315	*10-11	PST	10/23/97	46	26	< 5	114	14.0%
04 R	PST-TA16-70	97X-02091	10/20/97	1325	*10-11	PST	10/23/97	40	31	< 5	108	
05	PST-TA16-5	97X-01526	09/04/97	1250	0-1	PST	09/07/97	212	52	< 5	279	
06	PST-TA16-6	97X-01527	09/04/97	1300	*0-1	PST	09/07/97	253	60	6	320	
07	PST-TA16-7	97X-01528	09/04/97	1310	*0-1	PST	09/07/97	233	47	< 5	300	
08	PST-TA16-8	97X-01529	09/04/97	1320	*0-1	PST	09/07/97	281	59	5	348	
10	PST-TA16-10	97X-01530	09/04/97	1330	*0-1	PST	09/07/97	298	66	8	365	
11	PST-TA16-11	97X-01531	09/04/97	1340	*0-1	PST	09/07/97	261	52	< 5	328	
12	PST-TA16-12	97X-01532	09/04/97	1350	*0-1	PST	09/07/97	192	50	< 5	259	
13	PST-TA16-13	97X-01533	09/04/97	1400	*0-1	PST	09/08/97	296	54	< 5	363	
15	PST-TA16-15	97X-01534	09/04/97	1410	*0-1	PST	09/08/97	246	53	< 5	313	
16	PST-TA16-16	97X-01535	09/04/97	1420	*0-1	PST	09/08/97	245	64	< 5	312	
17	PST-TA16-17	97X-01536	09/04/97	1430	*0-1	PST	09/08/97	253	63	< 5	320	
18	PST-TA16-18	97X-01537	09/04/97	1440	*0-1	PST	09/08/97	388	85	7	455	
20	PST-TA16-20	97X-01538	09/04/97	1450	*0-1	PST	09/08/97	243	58	< 5	310	
21	PST-TA16-21	97X-01539	09/04/97	1500	*0-1	PST	09/08/97	208	53	< 5	275	

Notes: (1) P = Pit Sample; GS = Garden Sample; R = Replicate; GA = Garage Sample; TR = Tree Roots.

(2) Depth at which samples were taken. For PST samples the excavation depth was used; * = Final Excavation Depth.

(3) PRE = Pre Removal Sample; PST = Post Removal Sample; DH = Direct Haul Sample; CM = Continuous Monitoring Sample; NON = Nondisturbed sampling area; DIS=urbed sampling area; (4) Upper 95% Confidence Value for Lead

SECTOR	SAMPLE NUMBER (1)	LAB NUMBER	SAMPLE DATE	SAMPLE TIME	SAMPLE DEPTH in.(2)	SAMPLE TYPE (3)	SAMPLE ANALYSIS DATE	Pb (ppm)	As (ppm)	Cd (ppm)	U95 Pb VALUE (4)	COMMENTS	Pb FIELD REPLICATE (RPD) (5)
SITE CODE: TA16													
Bob St. Clair La Casa Grand Hom													
P.O. Box 325 East Helena, MT 59635													
Corner of Bandera & Valley Dr.													
PST SOIL CONCENTRATIONS													
22	PST-TA16-22	97X-01540	09/04/97	1510	*0-1	PST	09/08/97	319	73	< 5	386		
23	PST-TA16-23	97X-01541	09/04/97	1520	*0-1	PST	09/08/97	378	73	8	445		
24	PST-TA16-24	97X-01542	09/04/97	1530	*0-1	PST	09/08/97	303	65	6	370		
25	PST-TA16-25	97X-01543	09/04/97	1540	*0-1	PST	09/08/97	204	48	< 5	271		
26	PST-TA16-26	97X-02087	10/17/97	0830	*10-11	PST	10/23/97	75	30	< 5	143		
27	PST-TA16-27	97X-01544	09/04/97	1550	*0-1	PST	09/08/97	413	76	11	480		
28	PST-TA16-28	97X-01545	09/04/97	1600	*0-1	PST	09/08/97	282	58	< 5	349		
29	PST-TA16-29	97X-01546	09/04/97	1610	*0-1	PST	09/08/97	162	39	< 5	229		
30	PST-TA16-30	97X-01547	09/04/97	1620	*0-1	PST	09/08/97	210	45	< 5	277		
31	PST-TA16-31	97X-01548	09/04/97	1630	*0-1	PST	09/08/97	287	58	< 5	354		
32	PST-TA16-32	97X-01549	09/04/97	1650	*0-1	PST	09/08/97	276	57	6	343		
33	PST-TA16-33	97X-01550	09/04/97	1650	*0-1	PST	09/08/97	337	65	7	404		
34	PST-TA16-34	97X-02088	10/17/97	0835	*9-10	PST	10/23/97	158	35	< 5	226		1.3%
34	PST-TA16-60	97X-02089	10/17/97	0840	*9-10	PST	10/23/97	156	41	< 5	224		
35	PST-TA16-35	97X-01551	09/04/97	1700	*0-1	PST	09/08/97	217	52	< 5	284		
36	PST-TA16-36	97X-01552	09/04/97	1710	*0-1	PST	09/08/97	229	47	< 5	296		
37	PST-TA16-37	97X-01553	09/04/97	1720	*0-1	PST	09/08/97	166	54	< 5	233		
38	PST-TA16-38	97X-01554	09/04/97	1730	*0-1	PST	09/08/97	173	46	< 5	240		
39	PST-TA16-39	97X-01555	09/04/97	1740	*0-1	PST	09/08/97	325	59	6	392		

Notes: (1) P = Pit Sample; GS = Garden Sample; R = Replicate; GA = Garage Sample; TR = Tree Roots.

(2) Depth at which samples were taken. For PST samples the excavation depth was used; * = Final Excavation Depth.

(3) PRE = Pre Removal Sample; PST = Post Removal Sample; DH = Direct Haul Sample; CM = Continuous Monitoring Sample; NON = Nondisturbed sampling area; DIS = urbed sampling area; (4) Upper 95% Confidence Value for Lead

SECTOR	SAMPLE NUMBER (1)	LAB NUMBER	SAMPLE DATE	SAMPLE TIME	SAMPLE DEPTH in. (2)	SAMPLE TYPE (3)	ANALYSIS DATE	Pb (ppm)	As (ppm)	Cd (ppm)	U95 Pb VALUE (4) (ppm)	COMMENTS	Pb FIELD REPLICATE (RPD) (5)

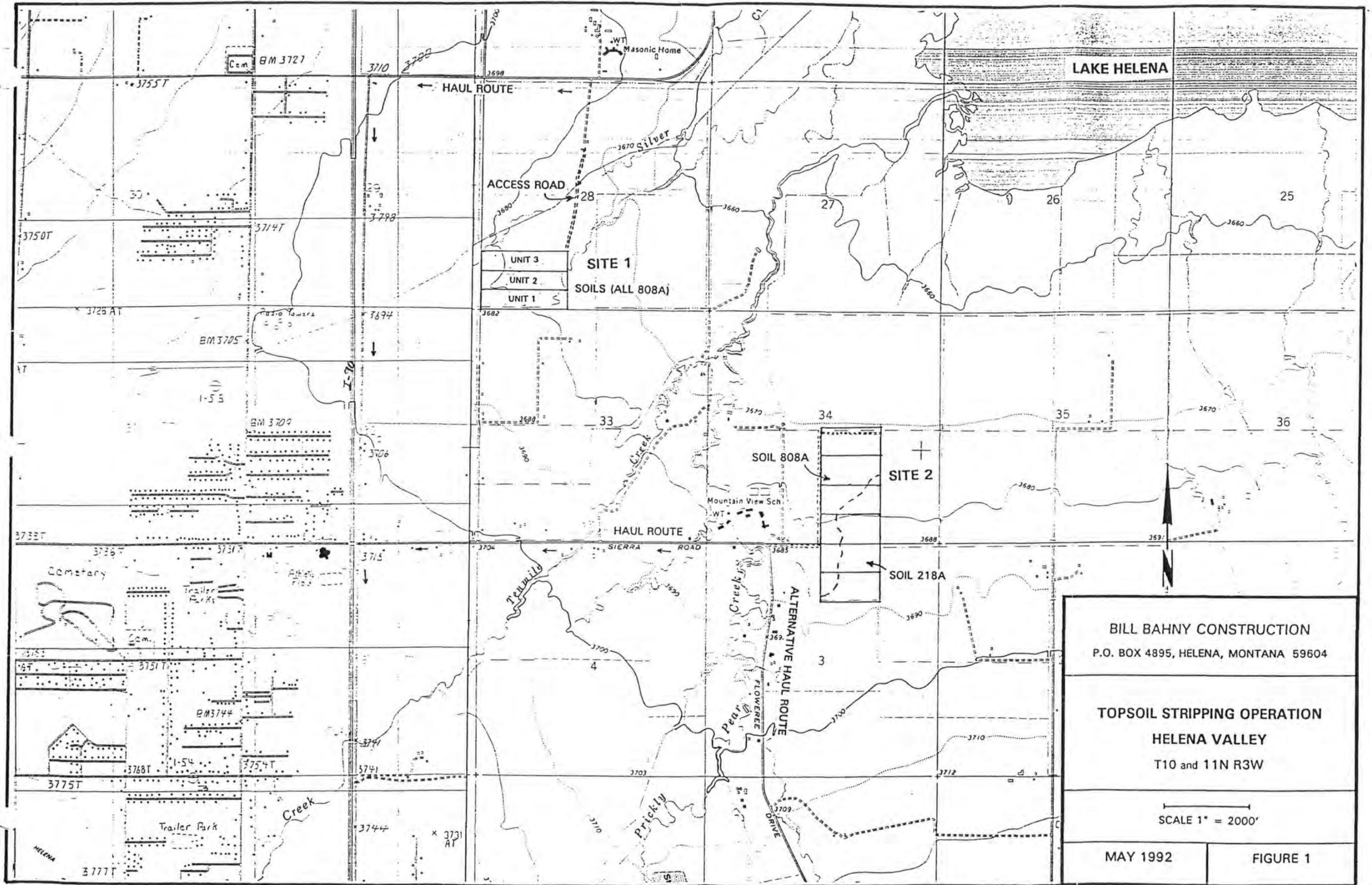
SITE CODE: TA16													
Bob St. Clair La Casa Grand Hom													
P.O. Box 325 East Helena, MT 59635													
Corner of Bandera & Valley Dr.													
PST SOIL CONCENTRATIONS													
40	PST-TA16-40	97X-01556	09/04/97	1750	*0-1	PST	09/08/97	197	52	< 5	264		
41	PST-TA16-41	97X-01557	09/04/97	1800	*0-1	PST	09/08/97	263	56	7	330		
42	PST-TA16-42	97X-01558	09/04/97	1810	*0-1	PST	09/08/97	205	50	< 5	272		
43	PST-TA16-43	97X-01559	09/04/97	1820	*0-1	PST	09/08/97	155	39	< 5	223		
44	PST-TA16-44	97X-01560	09/04/97	1830	*0-1	PST	09/08/97	203	50	6	270		
45	PST-TA16-45	97X-01561	09/04/97	1840	*0-1	PST	09/08/97	177	38	< 5	244		2.9%
45 R	PST-TA16-50	97X-01562	09/04/97	1850	*0-1	PST	09/08/97	172	40	7	239		

Notes: (1) P = Pit Sample; GS = Garden Sample; R = Replicate; GA = Garage Sample; TR = Tree Roots.

(2) Depth at which samples were taken. For PST samples the excavation depth was used; * = Final Excavation Depth.

(3) PRE = Pre Removal Sample; PST = Post Removal Sample; DH = Direct Haul Sample; CM = Continuous Monitoring Sample; NON = Nondisturbed sampling area; DIS=urbed sampling area; (4) Upper 95% Confidence Value for lead

B-5 MENTHE-BAHNY BORROW AREA



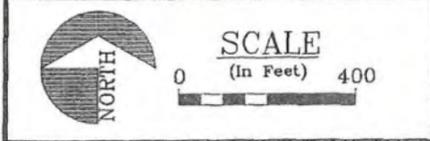
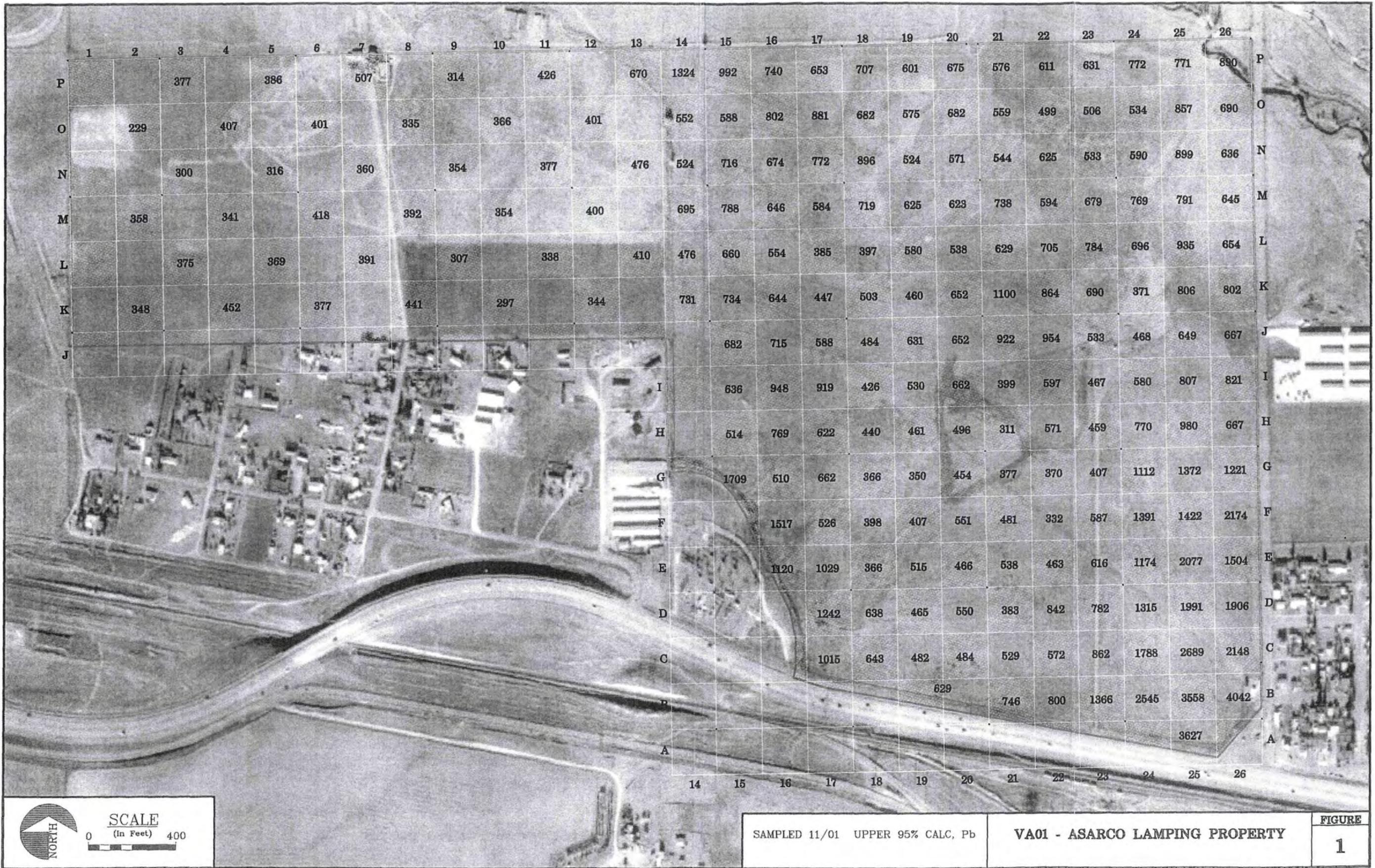
BILL BAHNY CONSTRUCTION
 P.O. BOX 4895, HELENA, MONTANA 59604

TOPSOIL STRIPPING OPERATION
 HELENA VALLEY
 T10 and 11N R3W

SCALE 1" = 2000'

MAY 1992	FIGURE 1
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B-6 LAMPING FIELDS



SAMPLED 11/01 UPPER 95% CALC, Pb

VA01 - ASARCO LAMPING PROPERTY

FIGURE 1

APPENDIX C