1264382 - R8 SDMS

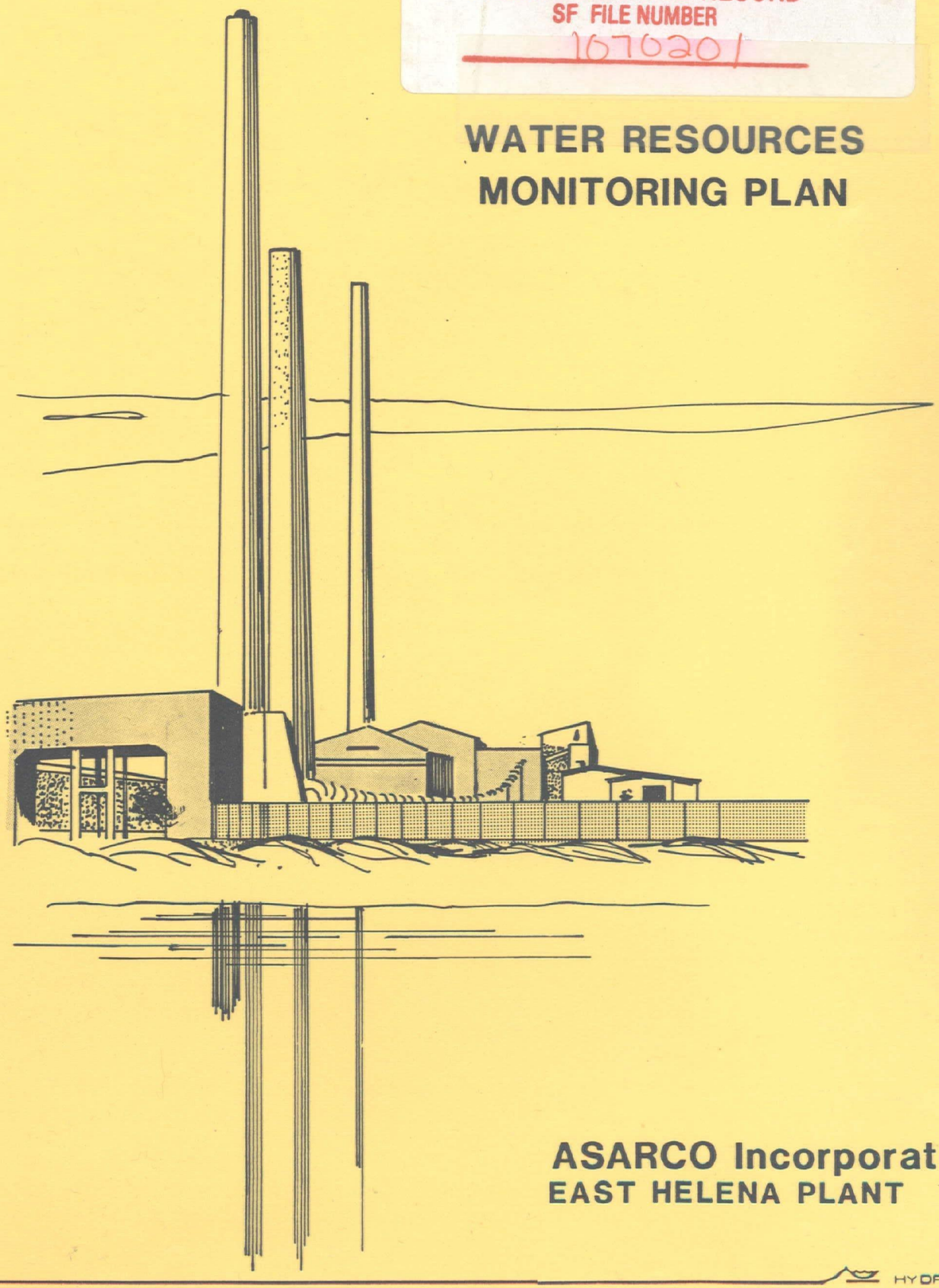
/ ASARCO

HYDROGEOLOGICAL INVESTIGATION OF THE ASARCO EAST HELENA PLANT

0081212

ADMINISTRATIVE RECORD
SF FILE NUMBER
1076201

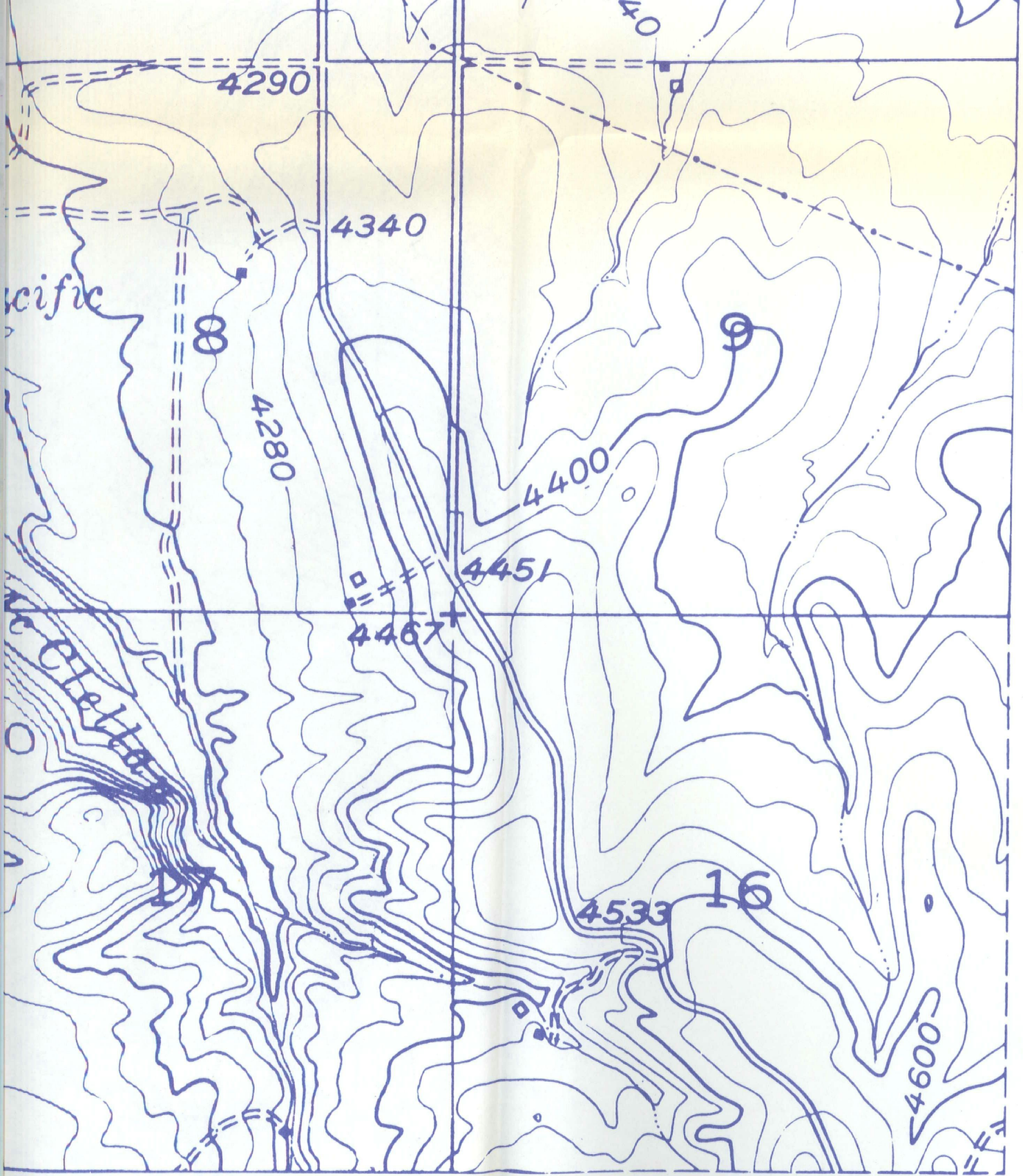
WATER RESOURCES MONITORING PLAN

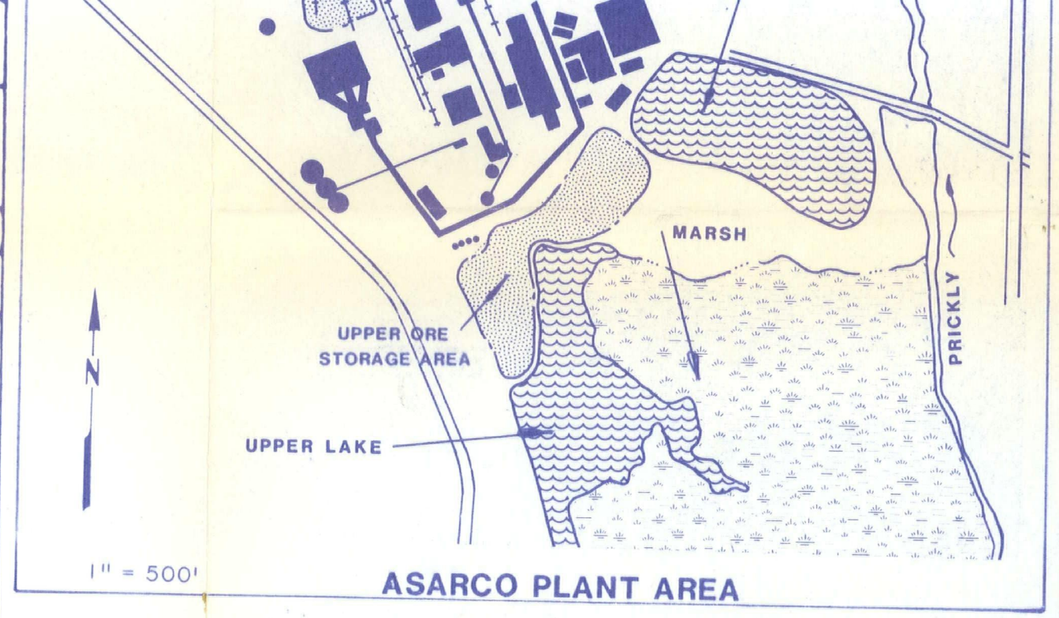


ASARCO Incorporated
EAST HELENA PLANT

HYDROMETRICS

6





SCALE

1000' 0 1000' 2000' 3000' 4000'

Source of Base: U.S. Geological Survey, 1:62,500, East Helena, 1950.

ASARCO INCORPORATED

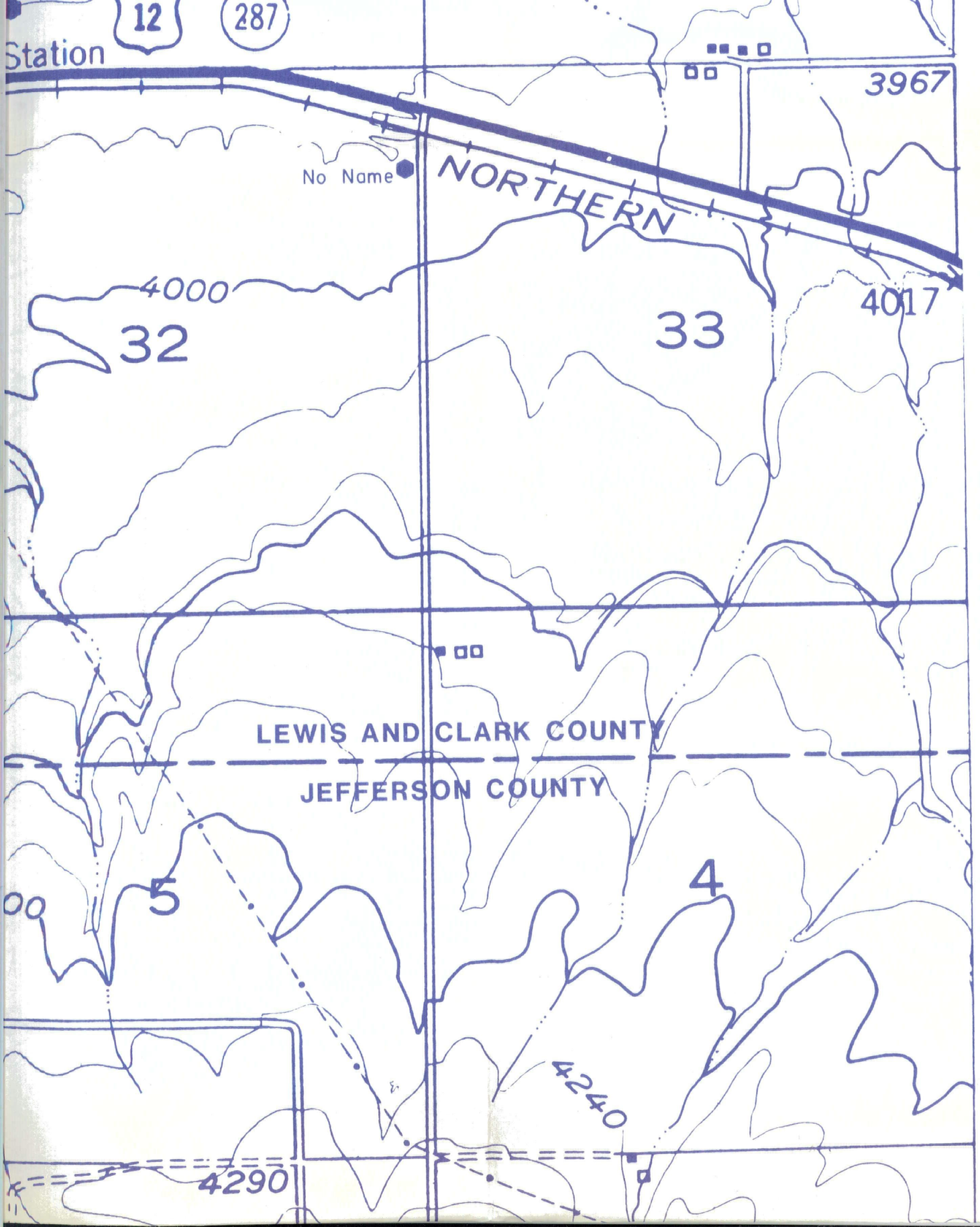
EAST HELENA, MONTANA

Drawn J.H.D. Checked J.G. Approved M.K.B. Date 12/15/83	PLAN MAP OF ASARCO EAST HELENA PLANT AREA	SHEET NO. 1

HYDROMETRICS

CONSULTING SCIENTISTS AND ENGINEERS

HELENA, MONTANA



18. Stratton
19. Tipton
20. Tusler
21. Walker

18. Holstine
19. Horn
20. Hysell
21. Johns
22. King
23. Knott
24. Marks
25. Murdock

1. Cox C.
2. Flage
3. Fox
4. Nordstrom
5. Ricks
6. Romasko
7. Vetsch
8. Wiebeck

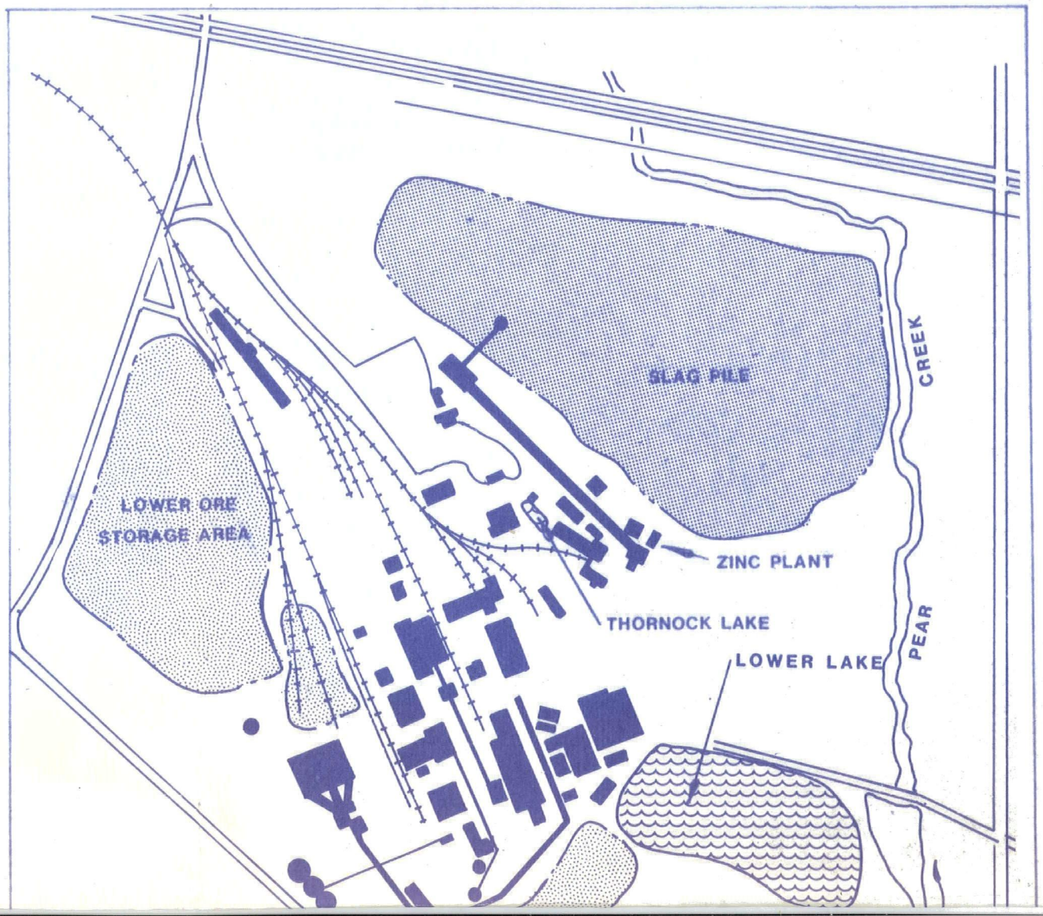
LEGEND

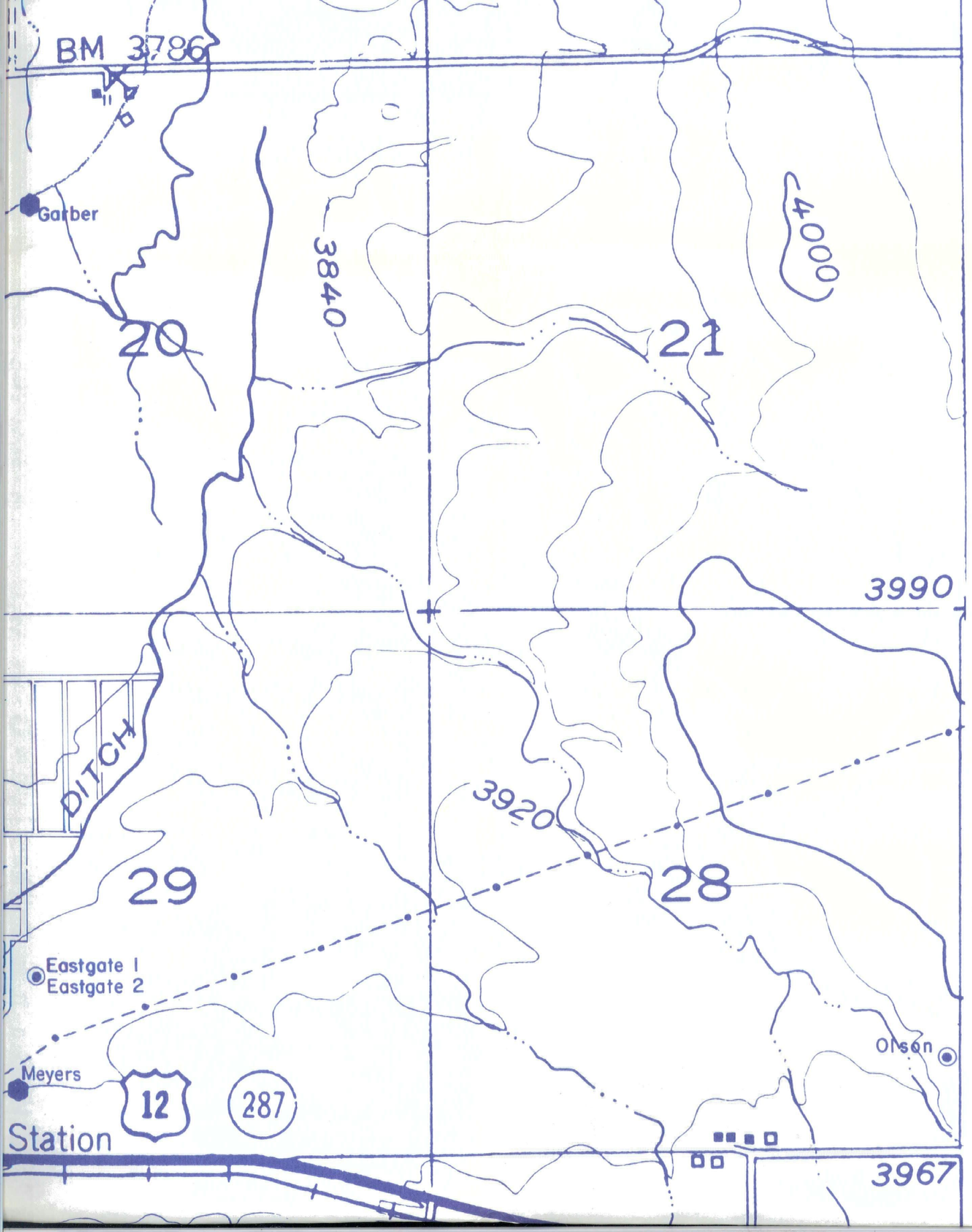
⊙ WELLS SAMPLED FOR WATER QUALITY

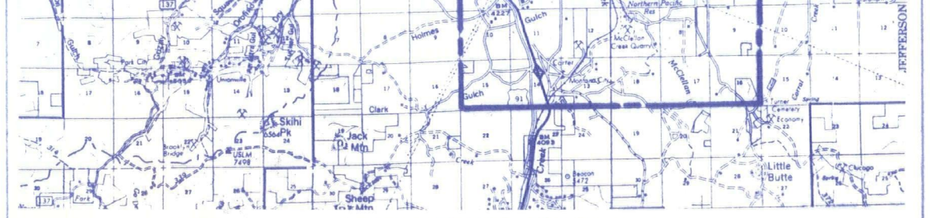
⬢ WELLS NOT SAMPLED

△ SURFACE WATER SAMPLE SITE

NOTE: SITES TO BE SAMPLED IN THE WATER RESOURCES MONITORING PLAN ARE HIGHLIGHTED (⊙ ⬢ △)







LOCATION MAP

INSET A

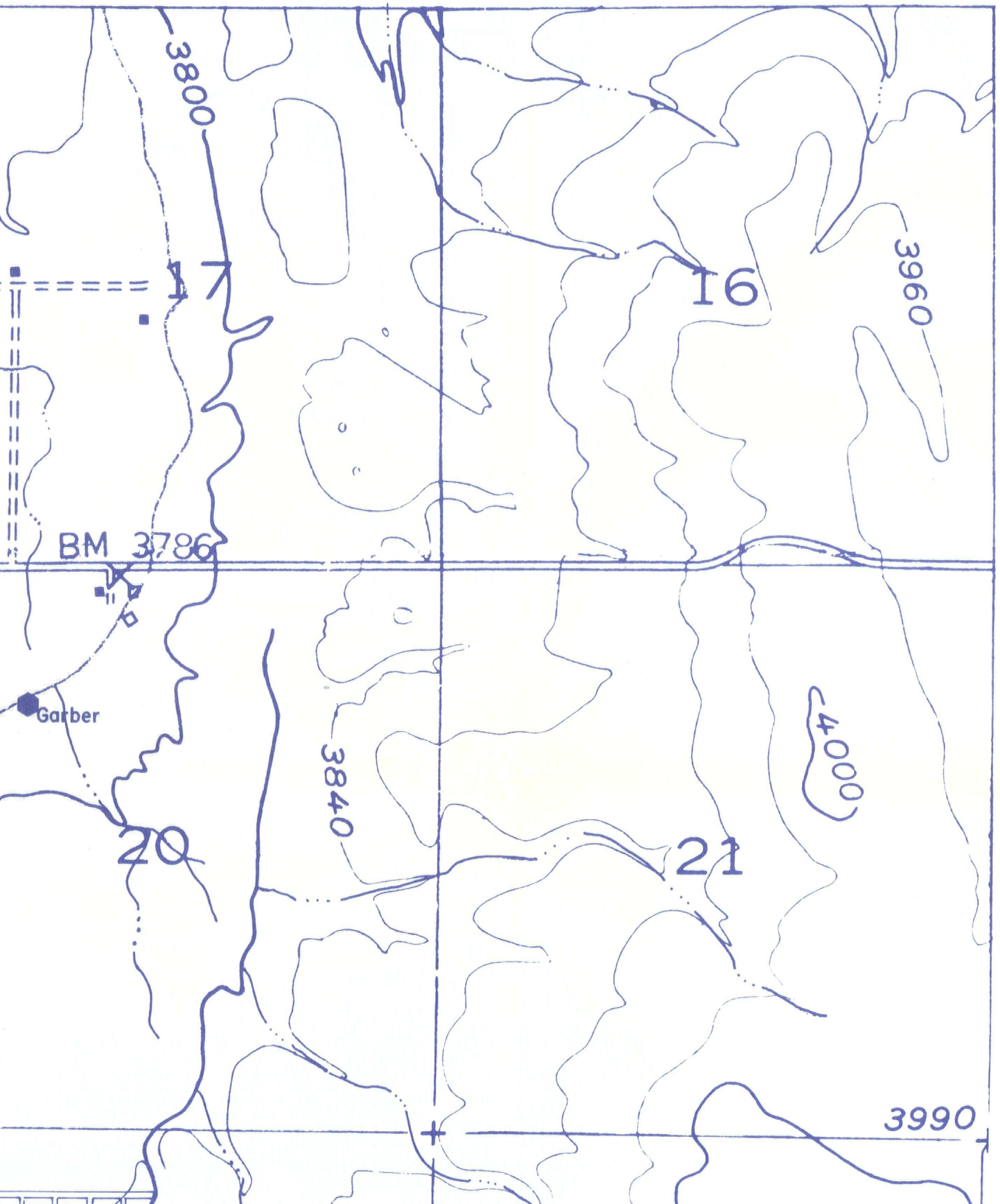
1. Clog
2. Dailey
3. Delong
4. Ferlicka
5. Gentry
6. Hokanson
7. Lipes 1
8. Lipes 2
9. Marron
10. McKeehan
11. Millegan 1
12. Millegan 2
13. Olson J
14. Petan
15. Pugh
16. Stern 1
17. Stern 2
18. Stratton
19. Tipton
20. Tusler
21. Walker

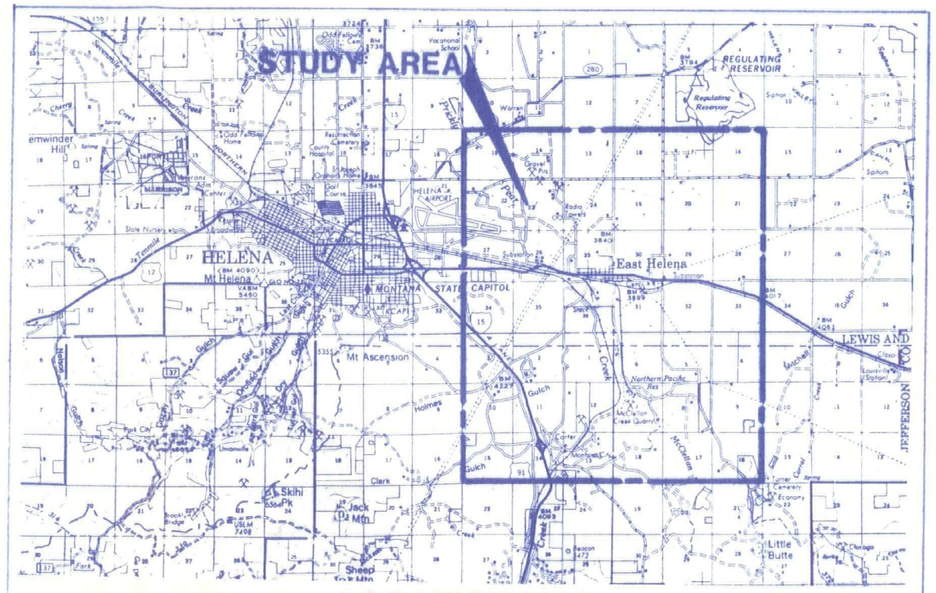
INSET B

1. Adams
2. Anderson
3. Armstrong 1
4. Armstrong 2
5. Blalock G.
6. Blalock J.
7. Branning
8. Chovanak
9. Chrest
10. Cousineau
11. Cox
12. Cox W.
13. Dullum
14. Fisher
15. Furios
16. Gipe
17. Hamburg
18. Holstine
19. Horn
20. Hysell
21. Johns
22. King
23. Knott
24. Marks
25. Murdock
26. O'Brien
27. Palmer
28. Parker
29. Pope
30. Quillen
31. Riis
32. Rudolph
33. Shannon
34. Street
35. Taplin
36. Van Diest
37. Vestal
38. Williams R.
39. Willis

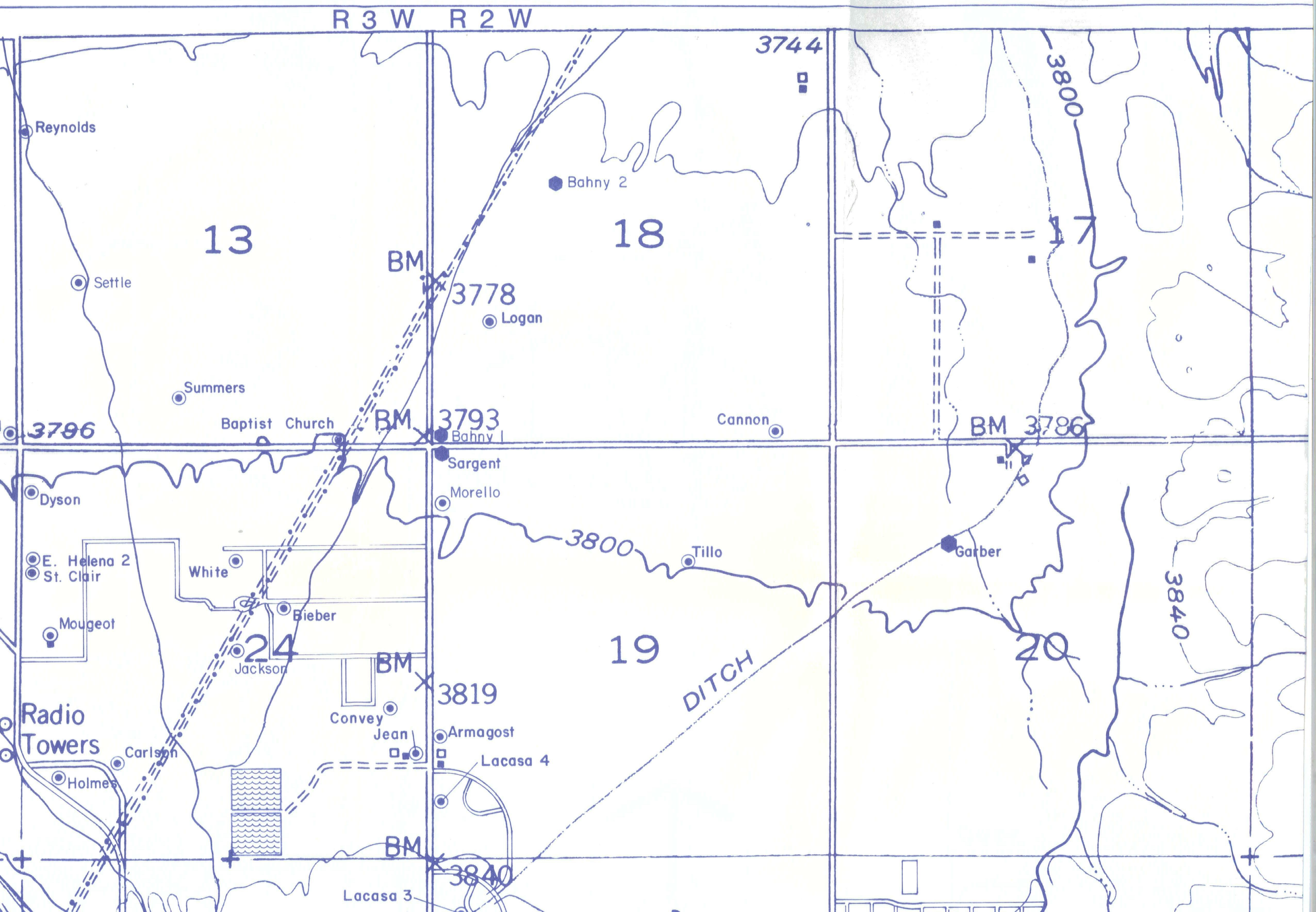
INSET C

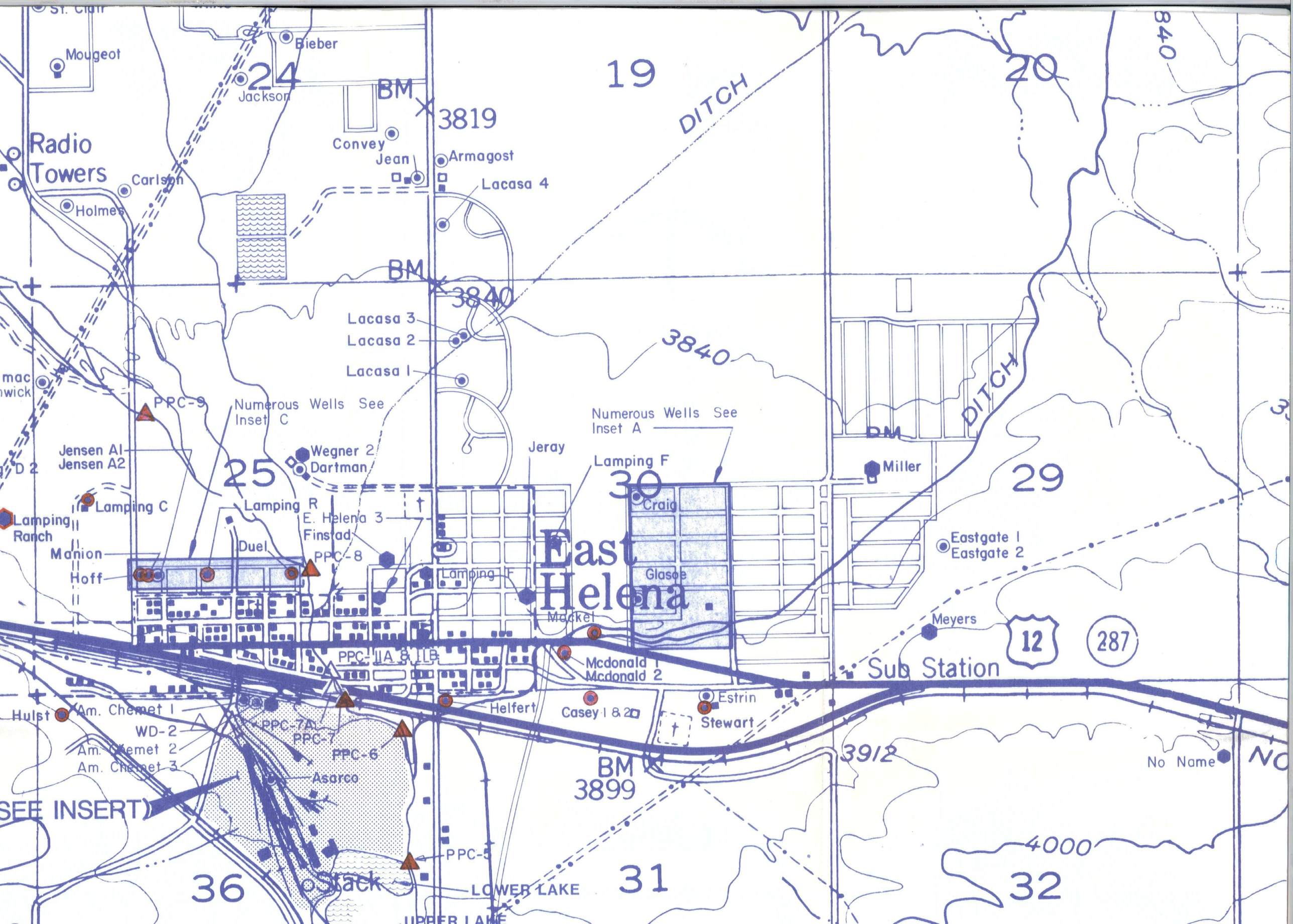
1. Cox C.
2. Flage
3. Fox
4. Nordstrom
5. Ricks
6. Romasko
7. Vetsch
8. Wiebeck

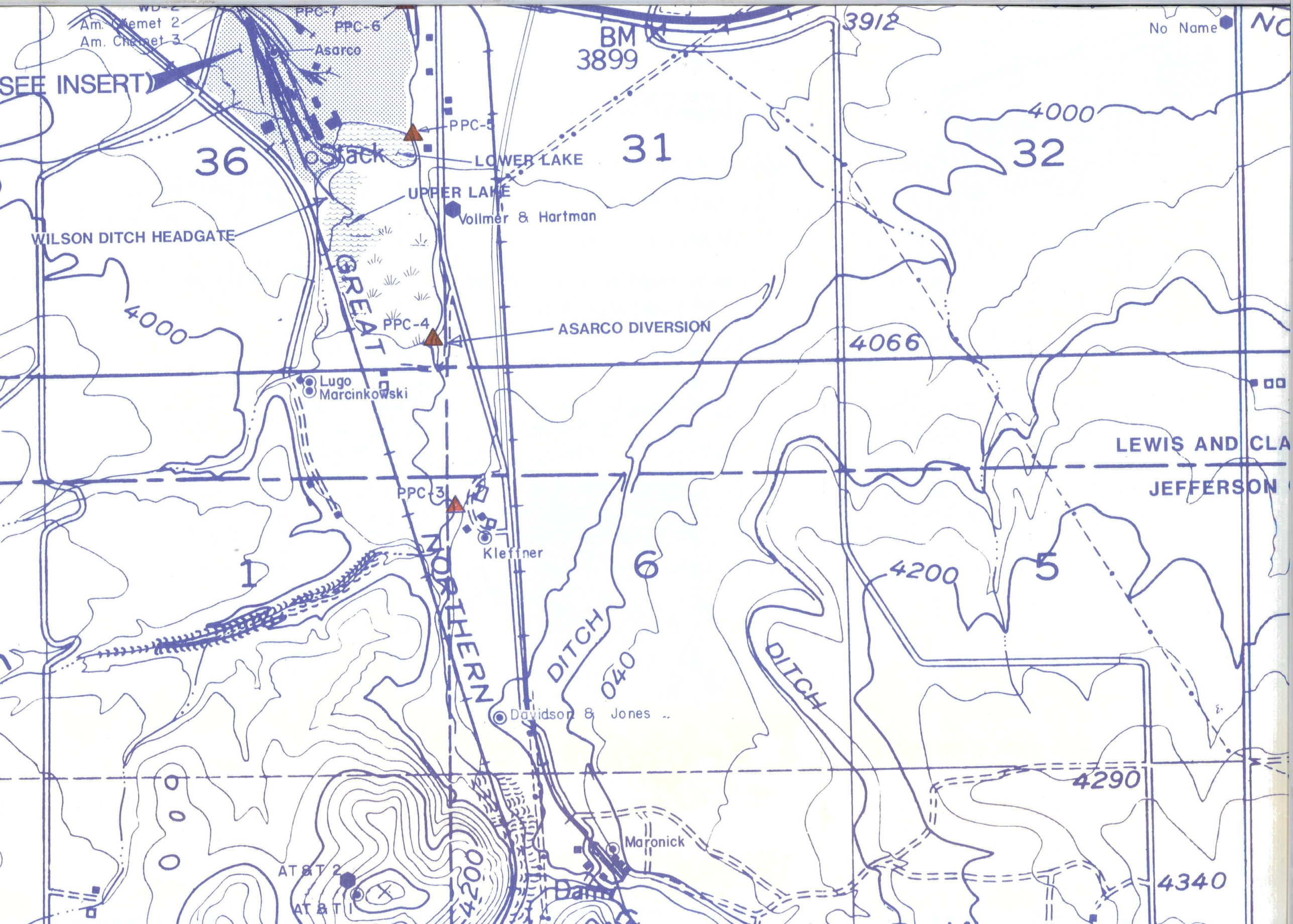


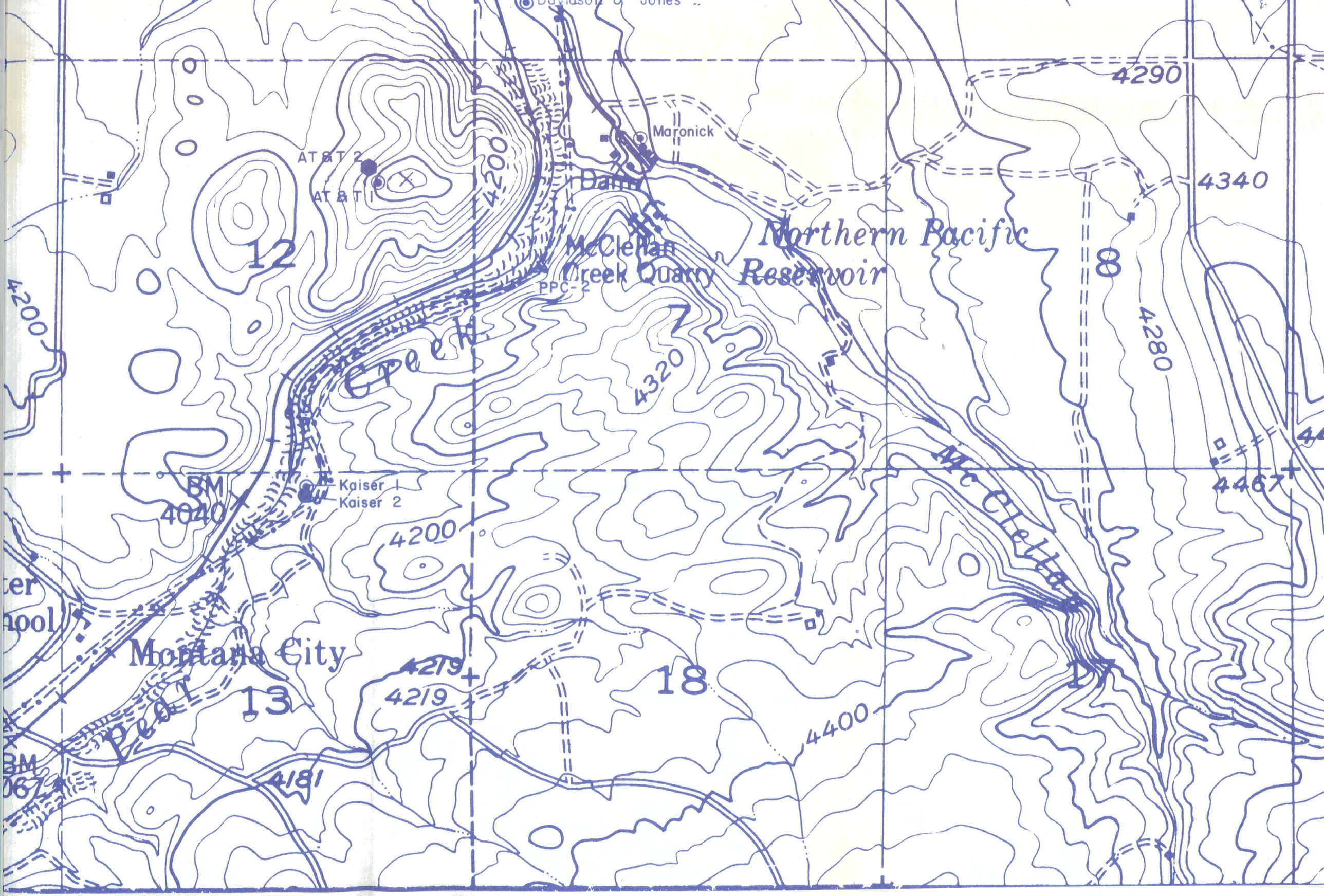


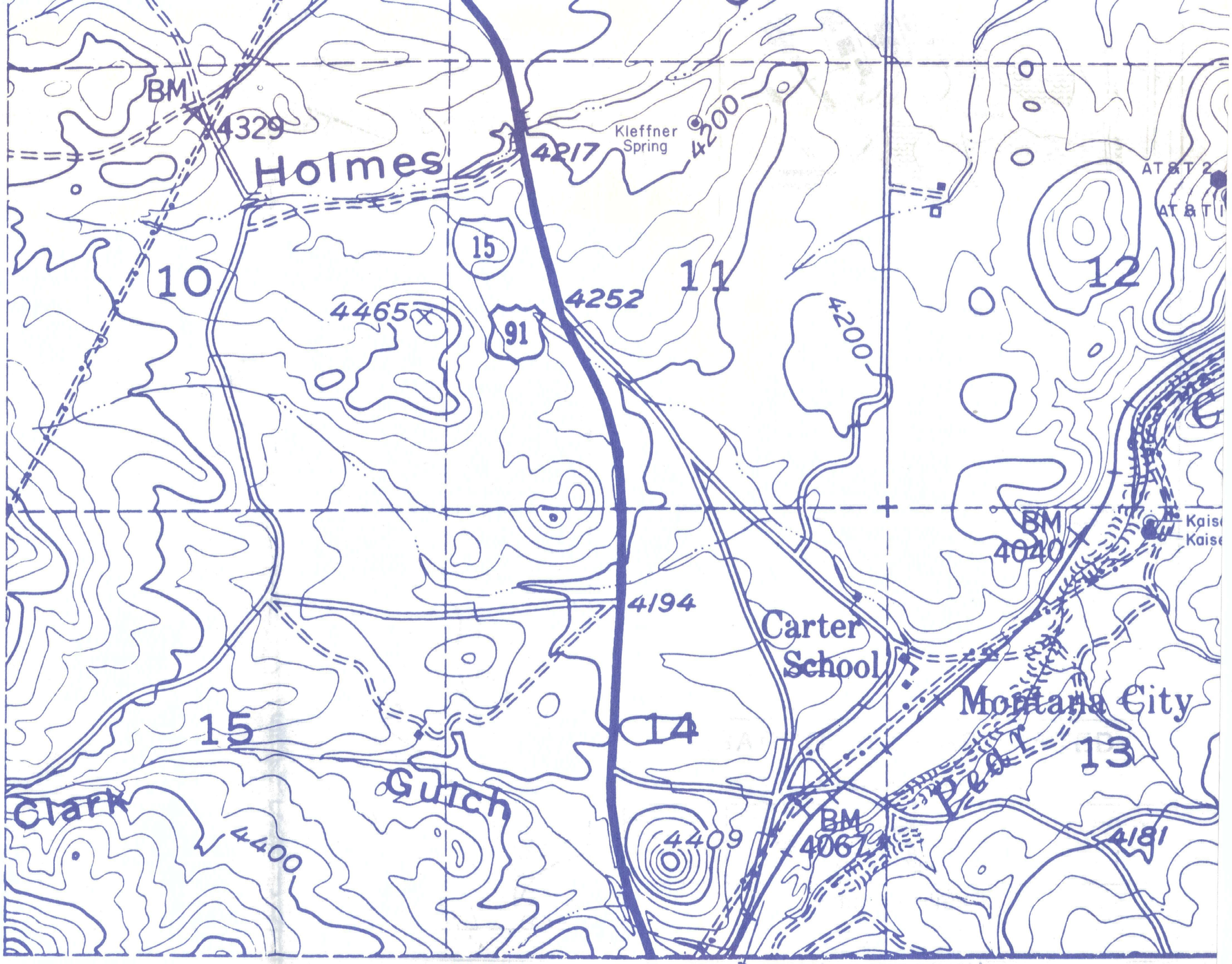
LOCATION MAP

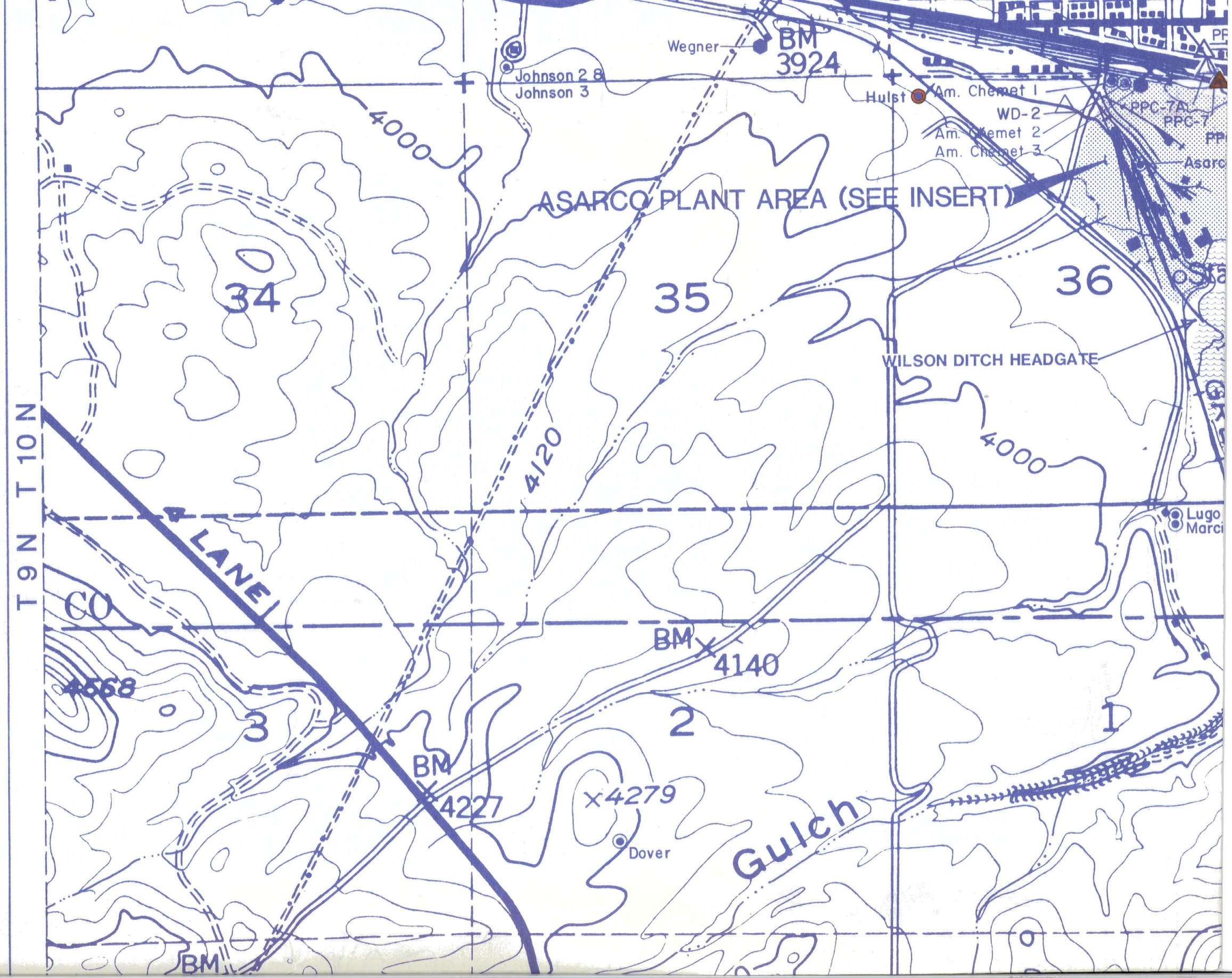

R 3 W
R 2 W
3744
3800
Reynolds
Bahny 2
13
18
17
BM
3778
Settle
Logan
Summers
3796
Baptist Church
BM
3793
Bahny 1
Cannon
BM 3786
Sargent
Dyson
Morello
3800
Tillo
Garber
E. Helena 2
St. Clair
White
Bieber
3840
Mougeot
24
Jackson
19
20
BM
3819
DITCH
Radio
Towers
Convey
Jean
Armagost
Carlson
Lacasa 4
Holmes
BM
3840
Lacasa 3

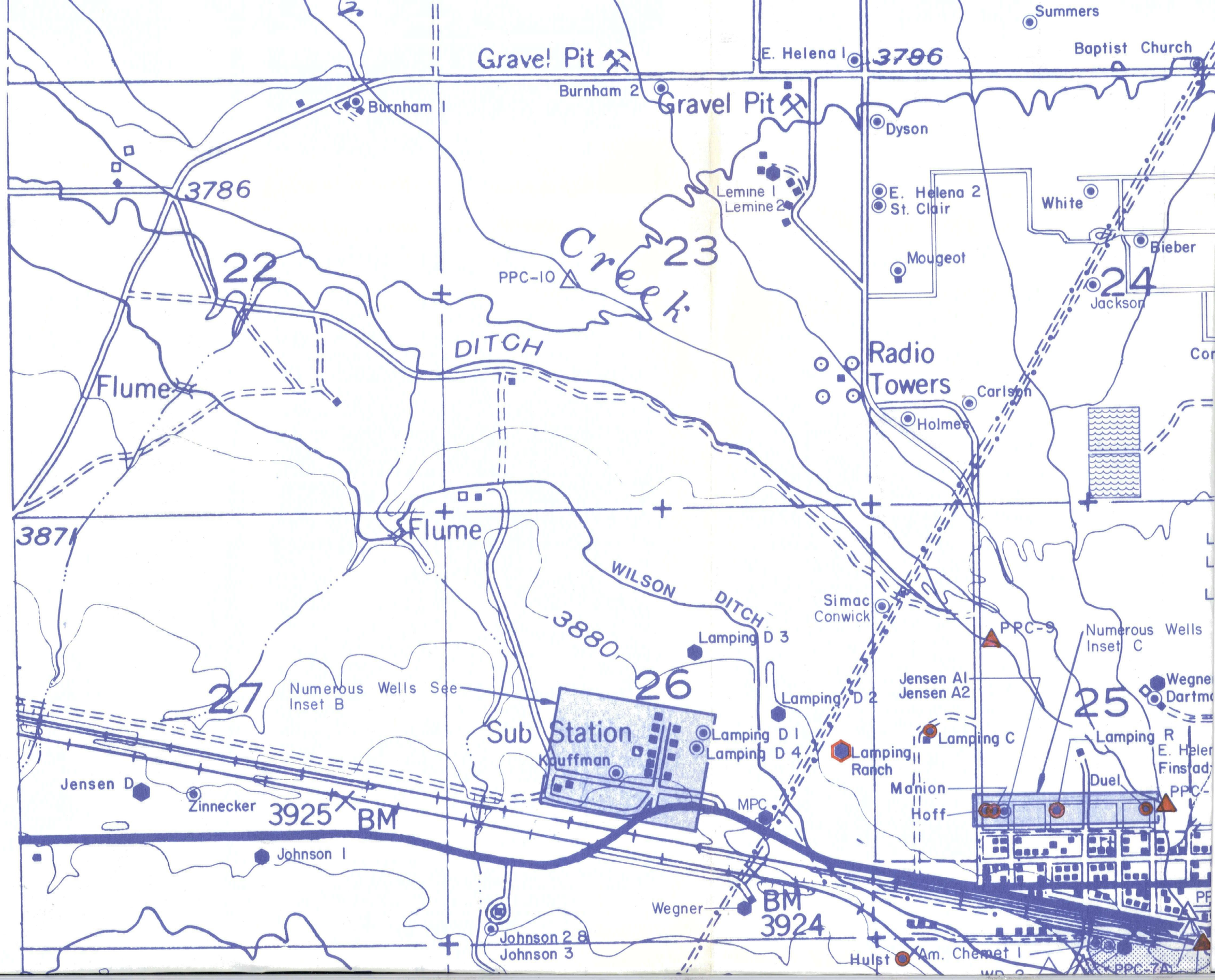

St. Clair
Mougeot
Bieber
24
Jackson
19
20
840
BM
3819
DITCH
Radio
Towers
Convey
Jean
Armagost
Carlson
Lacasa 4
Holmes
BM
3840
Lacasa 3
Lacasa 2
Lacasa 1
3840
mac
wick
PPC-9
Numerous Wells See
Inset C
Numerous Wells See
Inset A
Jeray
Lamping F
Jensen A1
Jensen A2
D 2
Wegner 2
Dartman
25
30
BM
Miller
29
Lamping C
Lamping R
E. Helena 3
Craig
Lamping
Ranch
Finstad
Duel
PPC-8
Eastgate 1
Eastgate 2
Manion
Hoff
Lamping F
Glasoe
East
Helena
Mackel
Meyers
12
287
PPC-11A & 11B
Mcdonald 1
Mcdonald 2
Sub Station
Hulst
Am. Chemet 1
Helfert
Casey 1 & 2
Estrin
Stewart
WD-2
PPC-7A
PPC-7
Am. Chemet 2
Am. Chemet 3
PPC-6
3912
BM
3899
No Name
Asarco
SEE INSERT)
PPC-5
4000
36
Stack
LOWER LAKE
31
32
UPPER LAKE

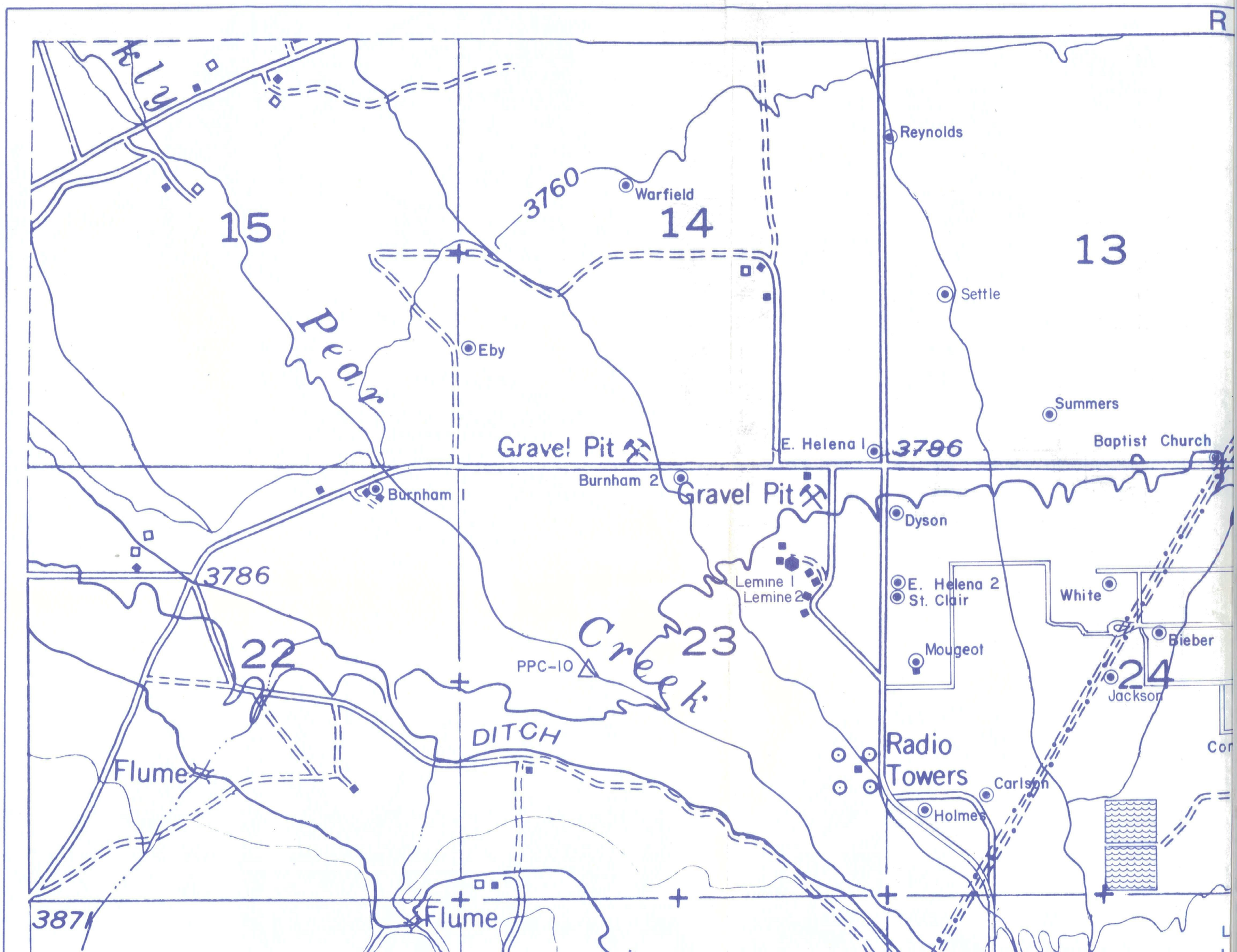

Am. Chemet 2
Am. Chemet 3
PPC-7
PPC-6
Asarco
(SEE INSERT)
BM
3899
3912
No Name
PPC-5
LOWER LAKE
UPPER LAKE
Vollmer & Hartman
36
31
32
4000
WILSON DITCH HEADGATE
GREAT
PPC-4
ASARCO DIVERSION
4066
Lugo
Marcinkowski
LEWIS AND CLA
JEFFERSON
PPC-3
Kleffner
NORTHERN
DITCH
040
DITCH
6
5
4200
Davidson & Jones
4290
Maronick
AT&T 2
AT&T
4340

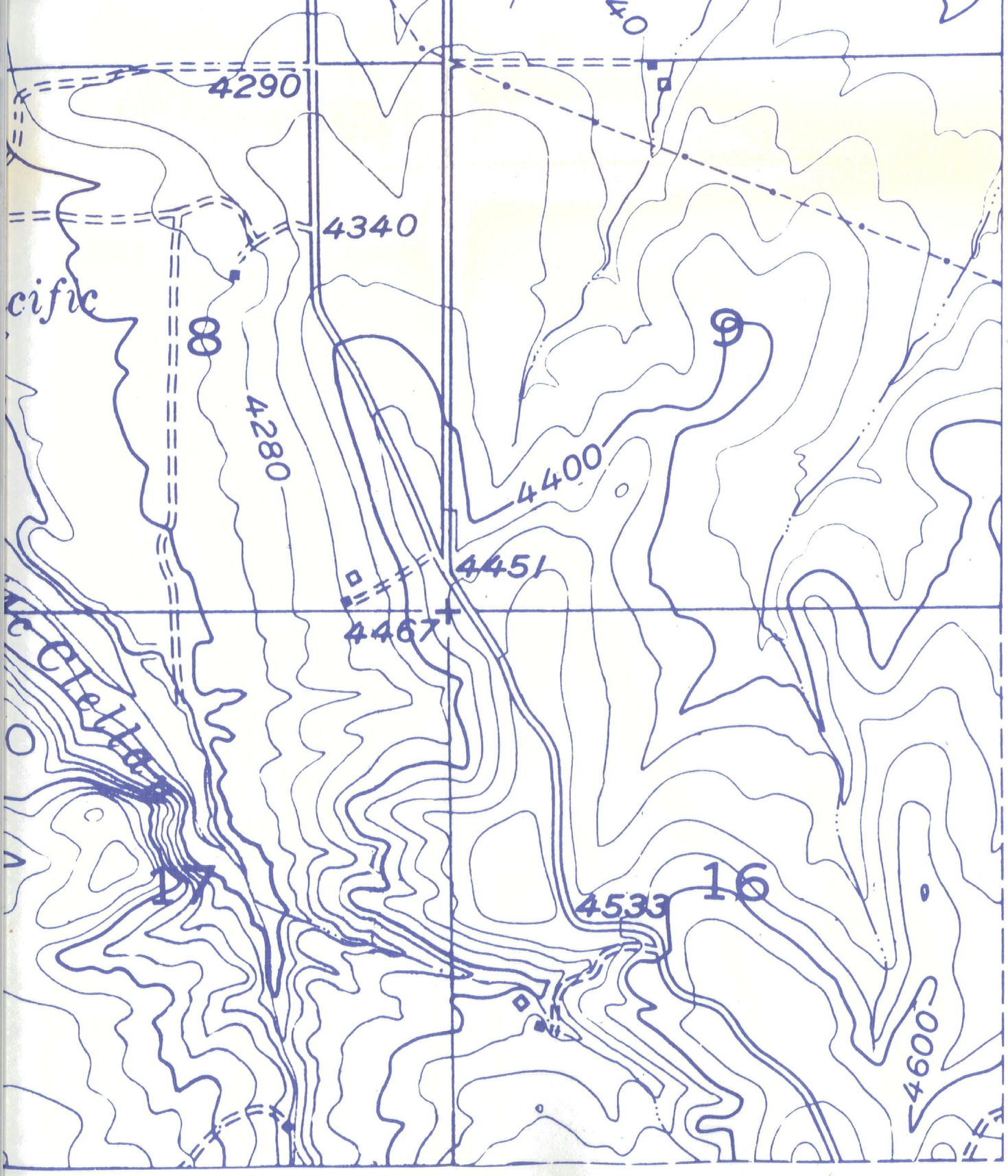

Davidson & Jones
4290
Maronick
AT&T 2
AT&T 1
4200
Dam
4340
Northern Pacific
McClellan
Reservoir
Creek Quarry
PPC-2
12
8
4200
Creek
4320
4280
BM
4040
Kaiser 1
Kaiser 2
4467
4200
McClellan
Montana City
4219
4219
13
18
17
4400
4181
BM
1/2 MILE SOUTH

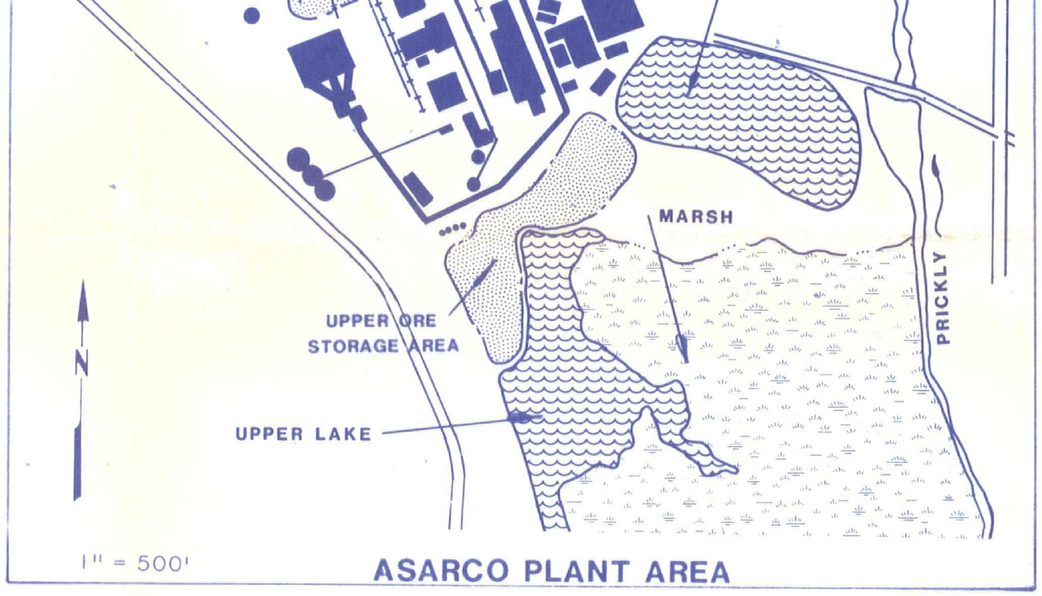

BM
4329
Holmes
4217
Kleffner
Spring
4200
AT&T 2
AT&T 1
15
10
11
12
4465
4252
91
4200
BM
4040
Kaise
Kaise
4194
Carter
School
Montana City
14
15
13
Clark
Gulch
4400
4409
BM
4067
Dept
4181
PPC-1 (1/2 MILE SOUTH)


Wegner
BM
3924
Johnson 2 8
Johnson 3
Hulst
Am. Chemet 1
WD-2
Am. Chemet 2
Am. Chemet 3
PPC-7A
PPC-7
Asarco
ASARCO PLANT AREA (SEE INSERT)
4000
34
35
36
WILSON DITCH HEADGATE
4000
4120
T 10 N
T 9 N
LANE
Lugo
Marci
CO
BM
4140
4568
3
2
1
BM
4227
4279
Dover
Gulch
BM


Summers
Baptist Church
Gravel Pit
E. Helena 1
3786
Burnham 2
Gravel Pit
Burnham 1
Dyson
3786
Lemine 1
Lemine 2
E. Helena 2
St. Clair
White
Bieber
Mougeot
22
23
Creek
PPC-10
24
Jackson
DITCH
Radio
Towers
Carlson
Holmes
Flume
Flume
3871
WILSON DITCH
Simac
Conwick
3880
Lamping D 3
PPC-9
Numerous Wells
Inset C
Jensen A1
Jensen A2
27
Numerous Wells See
Inset B
26
Lamping D 2
25
Wegner
Dartm
Sub Station
Lamping D 1
Lamping D 4
Lamping C
Lamping R
Kauffman
Lamping
Ranch
E. Helen
Finstad
Jensen D
Zinnecker
3925
BM
MPC
Manion
Duel
Hoff
PPC-
Johnson 1
Wegner
BM
3924
Johnson 2 8
Johnson 3
Hulst
Am. Chemet 1
PPC-7A


R
Reynolds
Warfield
3760
14
13
15
Settle
Eby
Pear
Summers
Gravel Pit
E. Helena 1
3796
Baptist Church
Burnham 2
Burnham 1
Gravel Pit
Dyson
3786
Lemine 1
Lemine 2
E. Helena 2
St. Clair
White
Creek
23
Bieber
22
PPC-10
Mougeot
24
Jackson
DITCH
Radio
Towers
Flume
Carlson
Holmes
3871
Flume





SCALE

1000' 0 1000' 2000' 3000' 4000'

Source of Base: U.S. Geological Survey, 1:62,500, East Helena, 1950.

ASARCO INCORPORATED

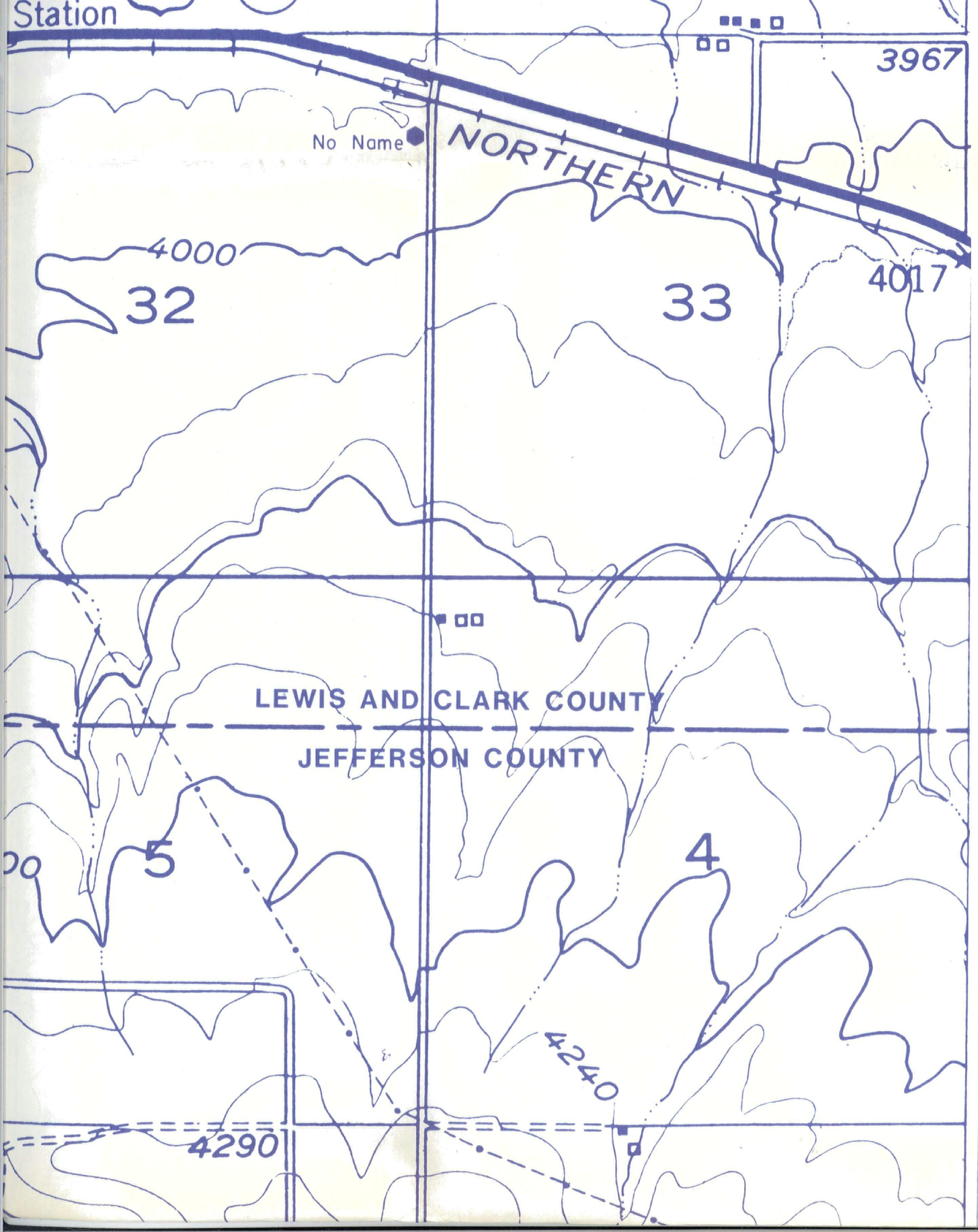
EAST HELENA, MONTANA

Drawn J.H.D. Checked J.G. Approved M.K.B. Date 12/15/83	PLAN MAP OF ASARCO EAST HELENA PLANT AREA	SHEET NO. 1

HYDROMETRICS

CONSULTING SCIENTISTS AND ENGINEERS

HELENA, MONTANA



20. Tusler
21. Walker

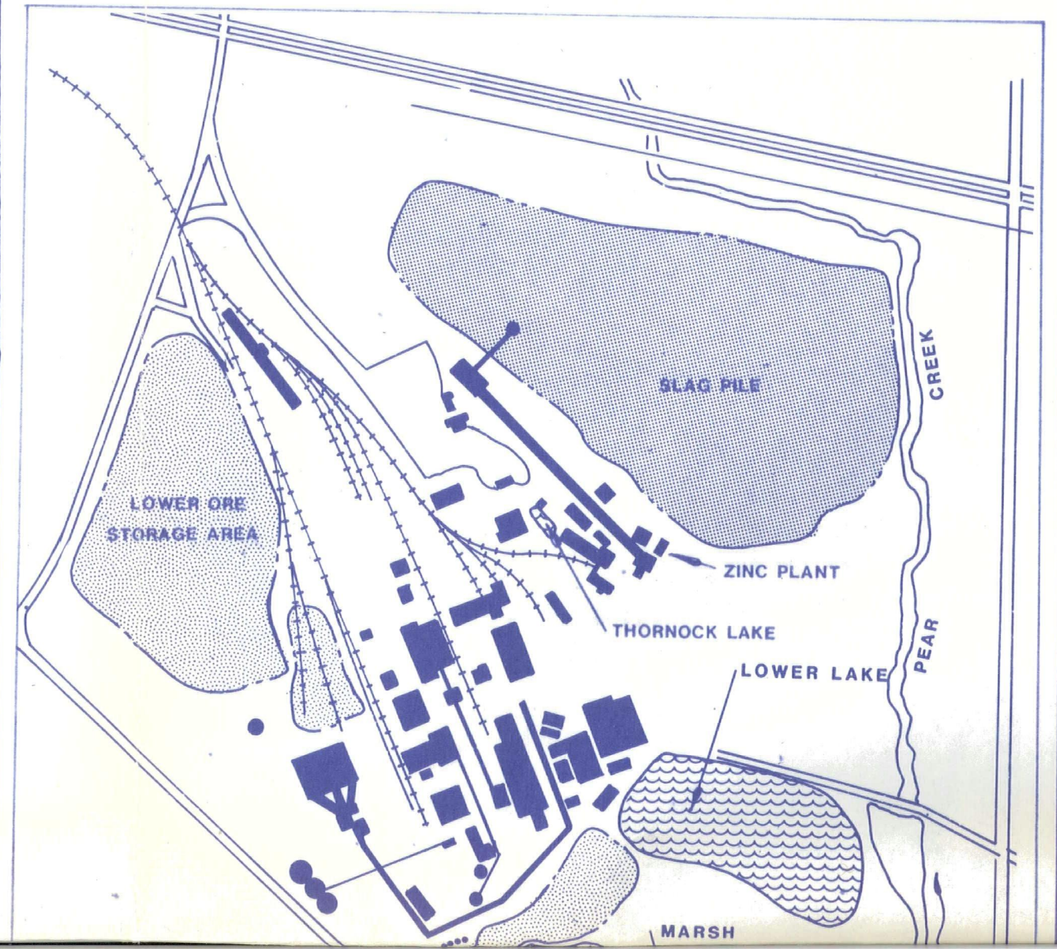
19. Horn
20. Hysell
21. Johns
22. King
23. Knott
24. Marks
25. Murdock

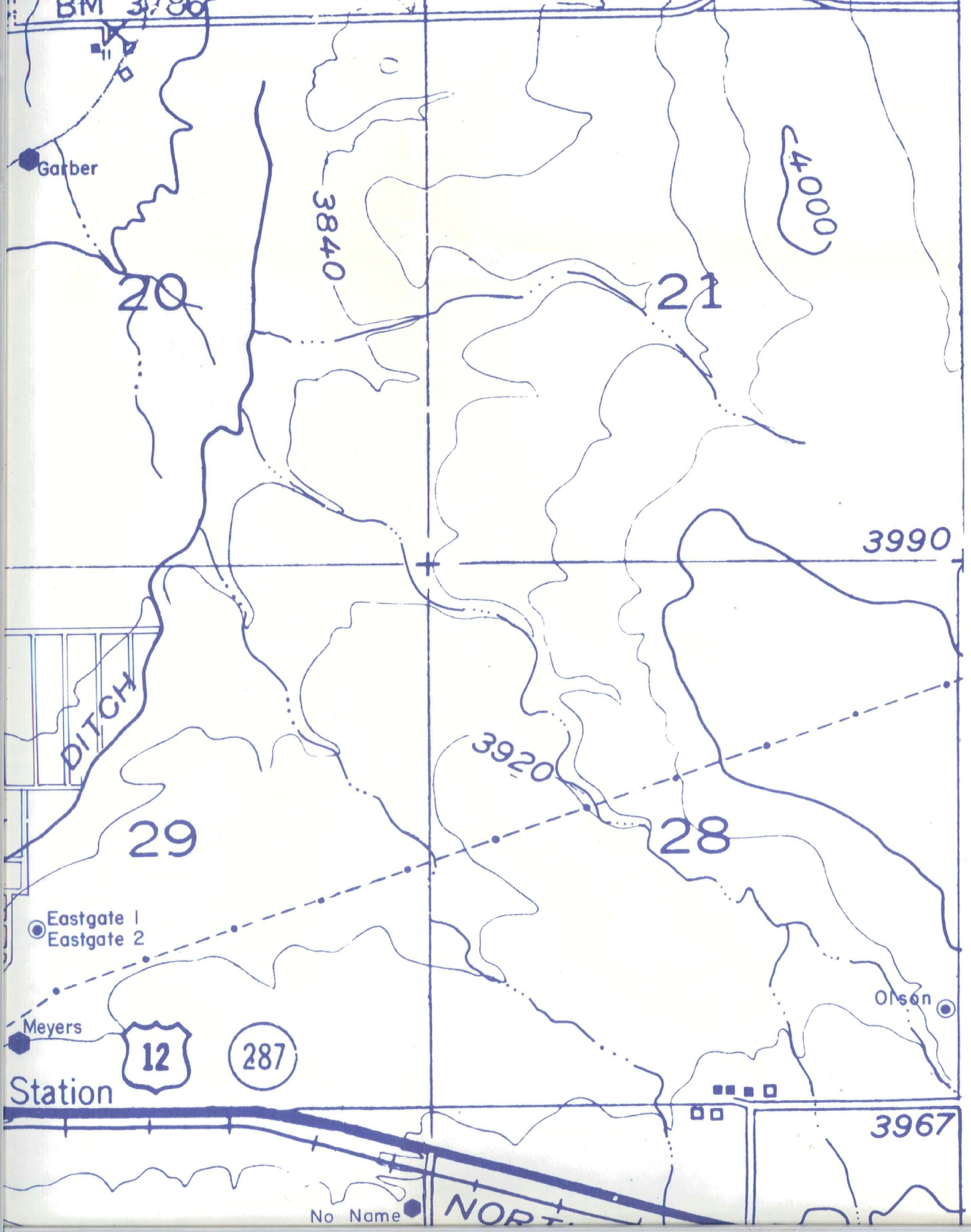
1. Cox C.
2. Flage
3. Fox
4. Nordstrom
5. Ricks
6. Romasko
7. Vetsch
8. Wiebeck

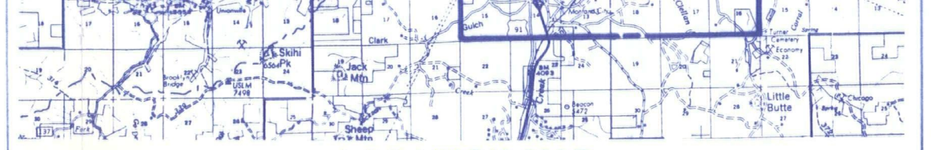
LEGEND

- WELLS SAMPLED FOR WATER QUALITY
- WELLS NOT SAMPLED
- SURFACE WATER SAMPLE SITE

NOTE: SITES TO BE SAMPLED IN THE WATER RESOURCES MONITORING PLAN ARE HIGHLIGHTED







LOCATION MAP

INSET A

1. Clog
2. Dailey
3. Delong
4. Ferlicka
5. Gentry
6. Hokanson
7. Lipes 1
8. Lipes 2
9. Marron
10. McKeehan
11. Millegan 1
12. Millegan 2
13. Olson J
14. Petan
15. Pugh
16. Stern 1
17. Stern 2
18. Stratton
19. Tipton
20. Tusler
21. Walker

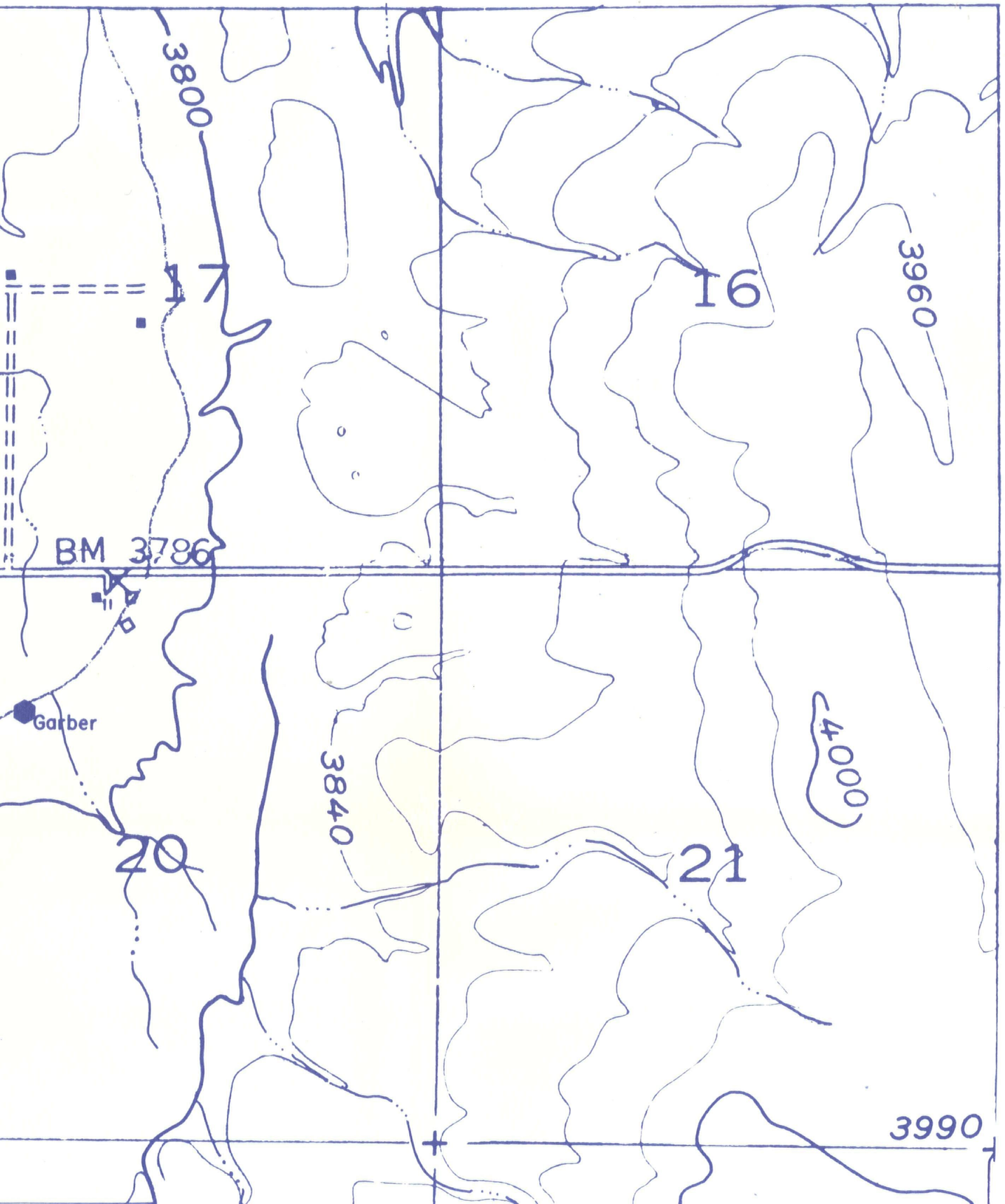
INSET B

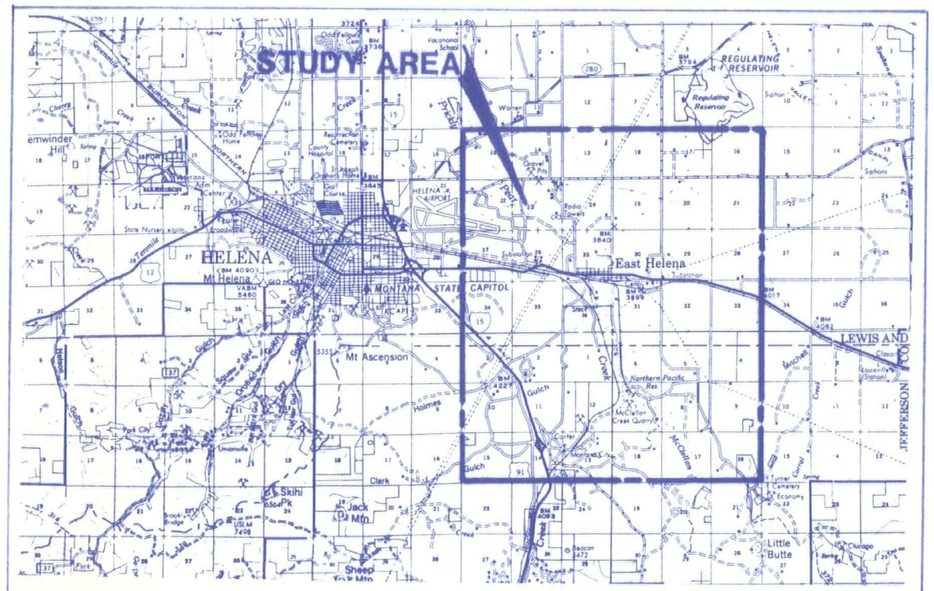
1. Adams
2. Anderson
3. Armstrong 1
4. Armstrong 2
5. Blalock G.
6. Blalock J.
7. Branning
8. Chovanak
9. Chrest
10. Cousineau
11. Cox
12. Cox W.
13. Dullum
14. Fisher
15. Furios
16. Gipe
17. Hamburg
18. Holstine
19. Horn
20. Hysell
21. Johns
22. King
23. Knott
24. Marks
25. Murdock
26. O'Brien
27. Palmer
28. Parker
29. Pope
30. Quillen
31. Riis
32. Rudolph
33. Shannon
34. Street
35. Taplin
36. Van Diest
37. Vestal
38. Williams R.
39. Willis

INSET C

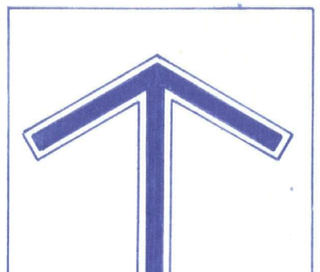
1. Cox C.
2. Flage
3. Fox
4. Nordstrom
5. Ricks
6. Romasko
7. Vetsch
8. Wiebeck

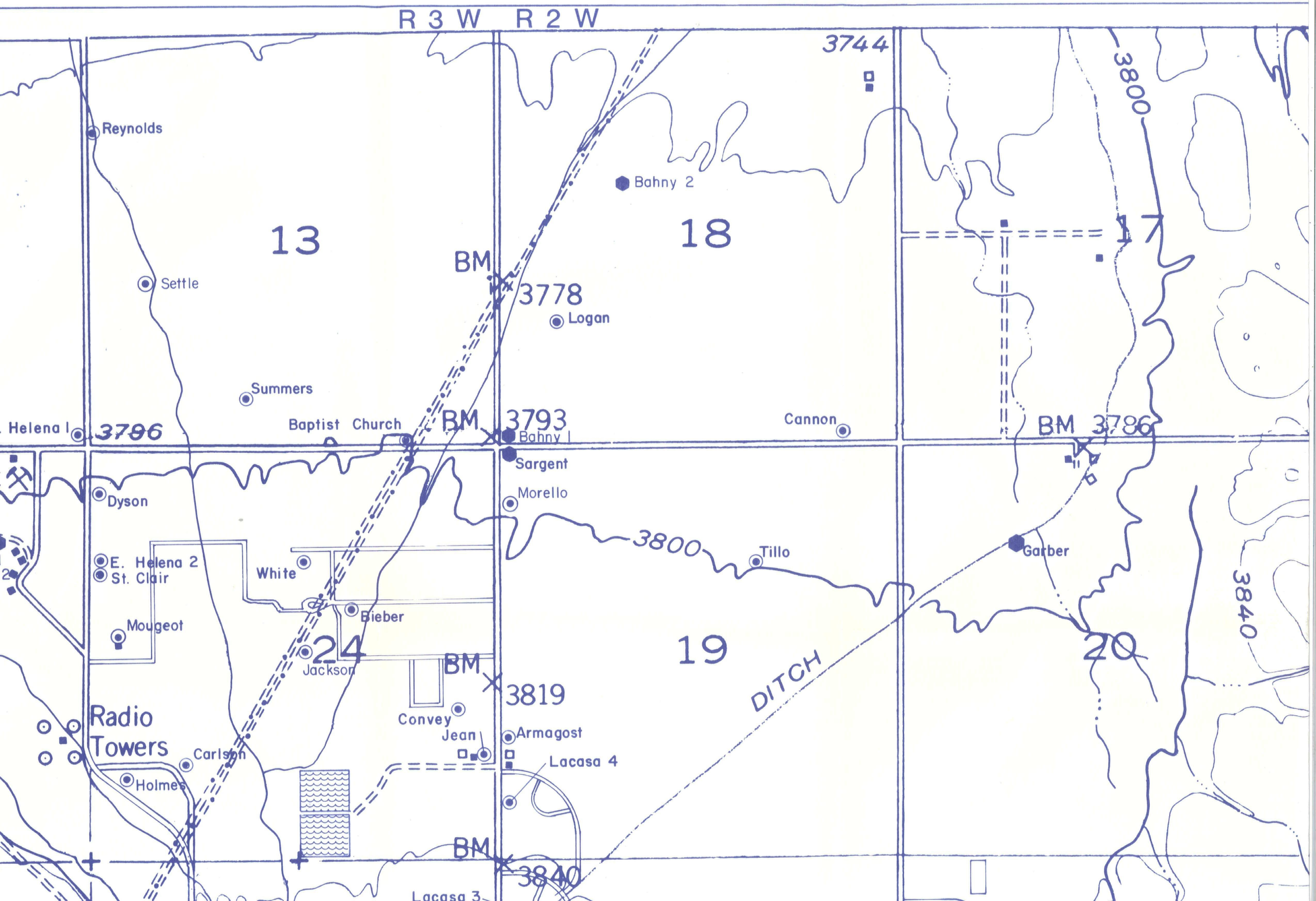
0081214

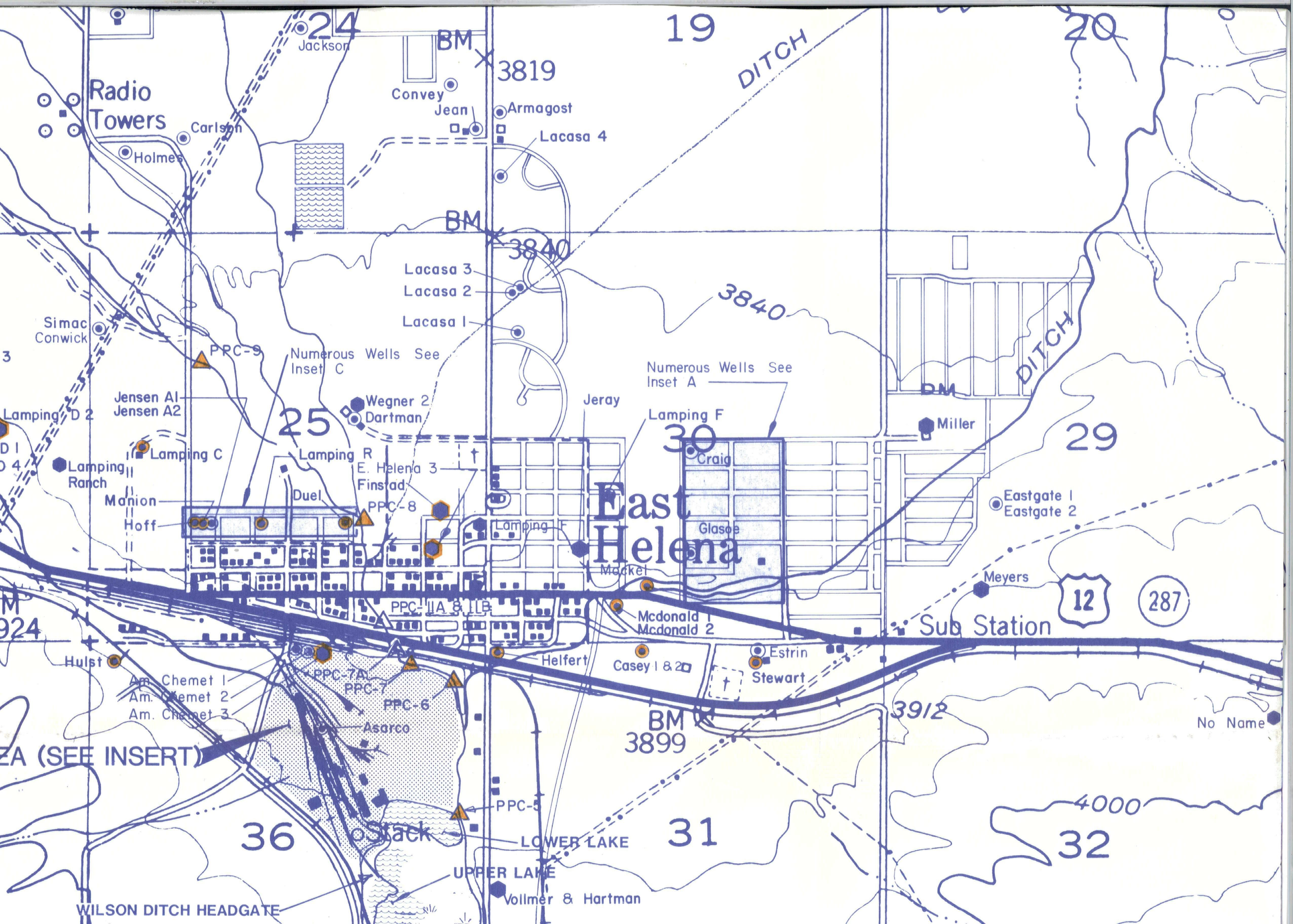


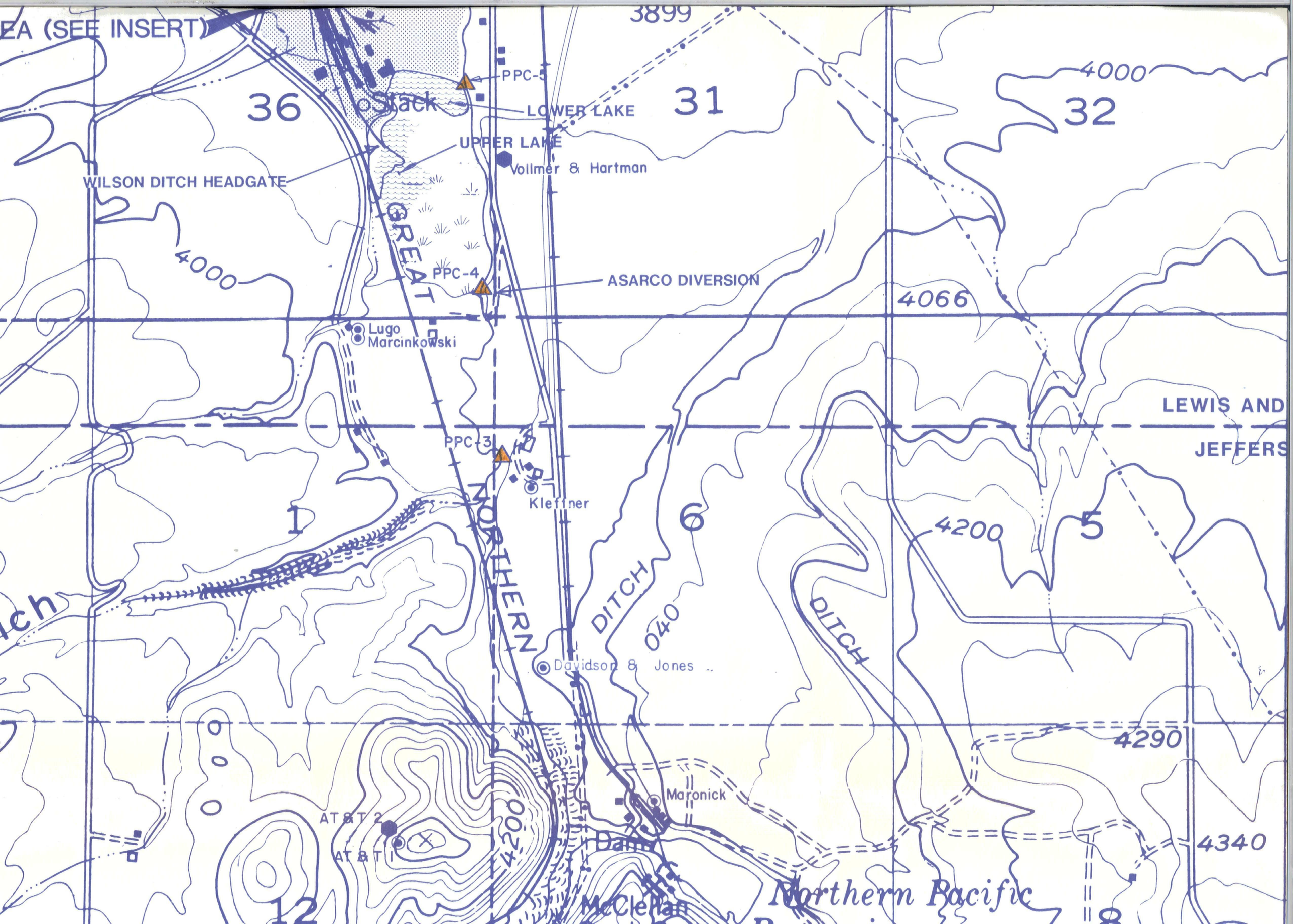


LOCATION MAP




R 3 W
R 2 W
3744
3800
Reynolds
Bahny 2
13
18
17
BM
3778
Settle
Logan
Summers
Helena I
3786
Baptist Church
BM
3793
Bahny I
Cannon
BM 3786
Sargent
Morello
Dyson
3800
Tillo
Garber
E. Helena 2
St. Clair
White
Bieber
3840
Mougeot
24
19
20
Jackson
BM
3819
DITCH
Radio
Towers
Convey
Jean
Armagost
Carlson
Lacasa 4
Holmes
BM
3840
Lacasa 3


24
Jackson
BM
3819
19
DITCH
20
Radio
Towers
Carlson
Holmes
Convey
Jean
Armagost
Lacasa 4
BM
3840
Lacasa 3
Lacasa 2
Lacasa 1
3840
Simac
Conwick
PPC-9
Numerous Wells See
Inset C
Numerous Wells See
Inset A
Jeray
Lamping F
Jensen A1
Jensen A2
Wegner 2
Dartman
25
30
Miller
DITCH
29
Lamping D 2
Lamping C
Lamping R
Craig
Lamping
Ranch
E. Helena 3
Finstad
Manion
Duel
PPC-8
Hoff
Lamping F
East
Helena
Glasoe
Eastgate 1
Eastgate 2
Mackel
Meyers
12
287
PPC-11A & 11B
Mcdonald 1
Mcdonald 2
Sub Station
Hulst
Helfert
Casey 1 & 2
Estrin
Stewart
Am. Chemet 1
Am. Chemet 2
Am. Chemet 3
PPC-7A
PPC-7
PPC-6
3912
BM
3899
No Name
Asarco
EA (SEE INSERT)
PPC-5
4000
36
Stack
LOWER LAKE
31
32
UPPER LAKE
Vollmer & Hartman
WILSON DITCH HEADGATE


EA (SEE INSERT)
3899
PPC-5
LOWER LAKE
36
31
32
4000
Stack
UPPER LAKE
Vollmer & Hartman
WILSON DITCH HEADGATE
GREAT
4000
PPC-4
ASARCO DIVERSION
4066
Lugo
Marcinkowski
LEWIS AND
JEFFERS
PPC-3
Kleffner
1
6
5
4200
NORTHERN
DITCH
040
DITCH
Davidson & Jones
4290
Maronick
AT&T 2
AT&T 1
4340
Dam
McClellan
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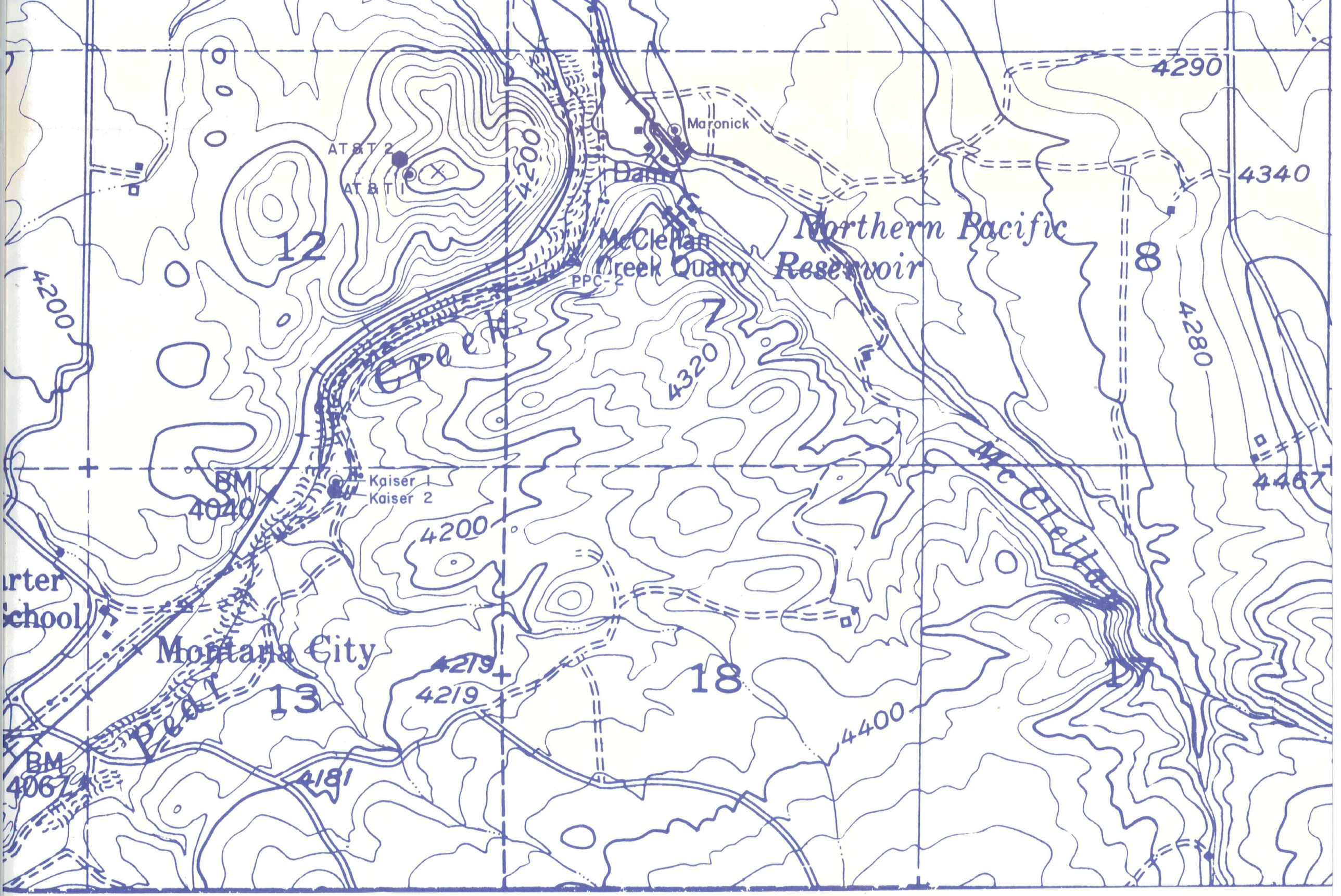

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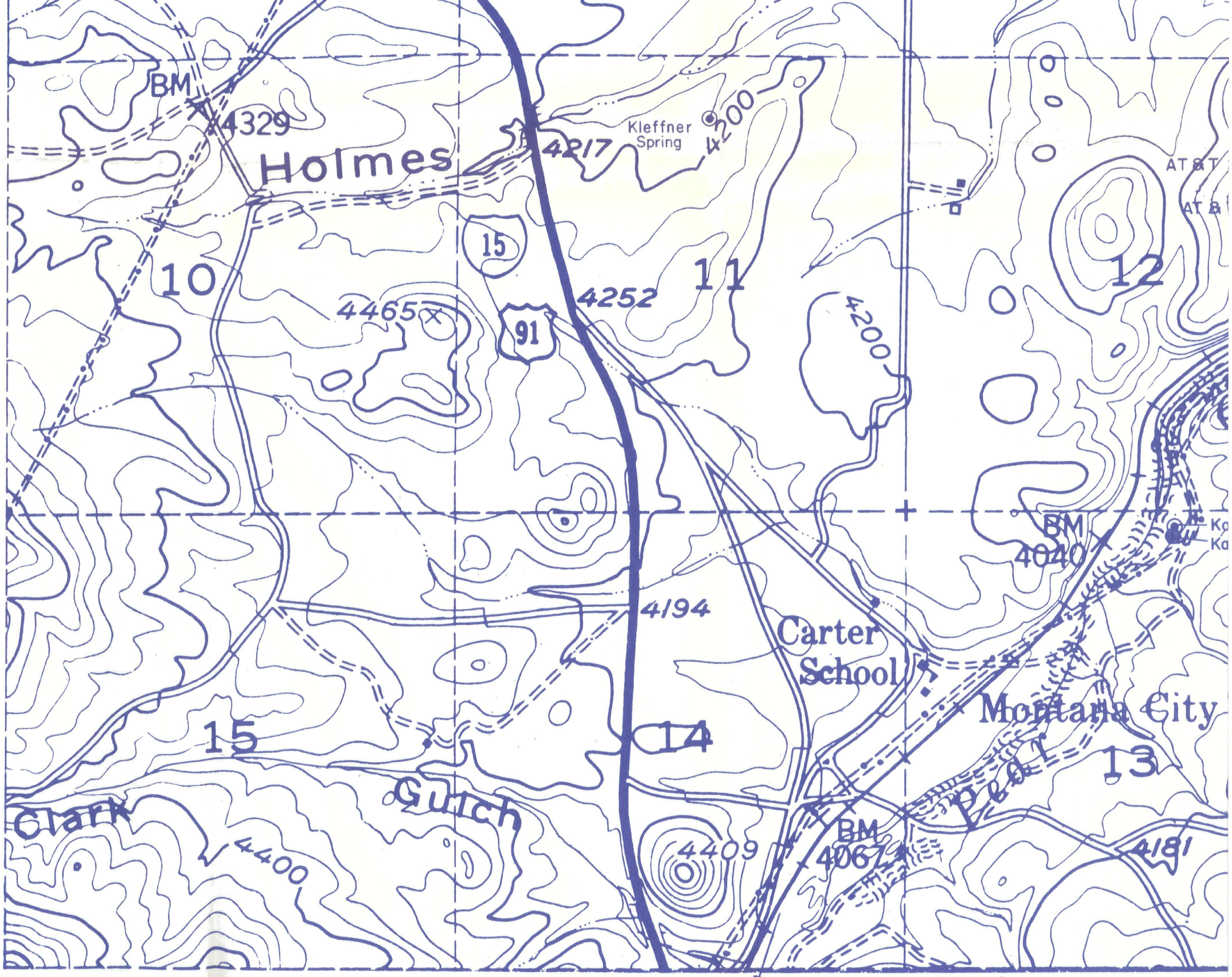
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Carter
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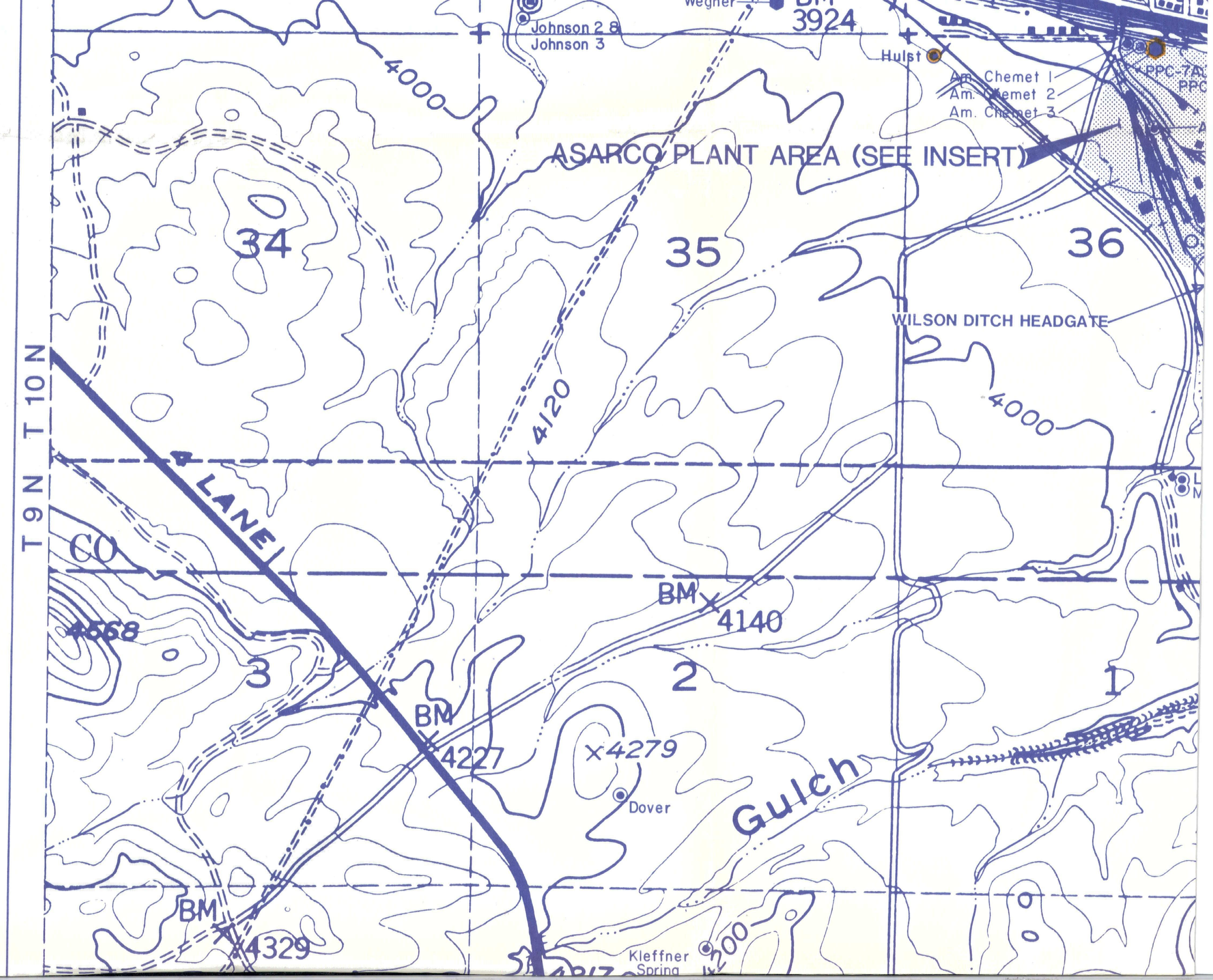
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WILSON DITCH HEADGATE
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LANE
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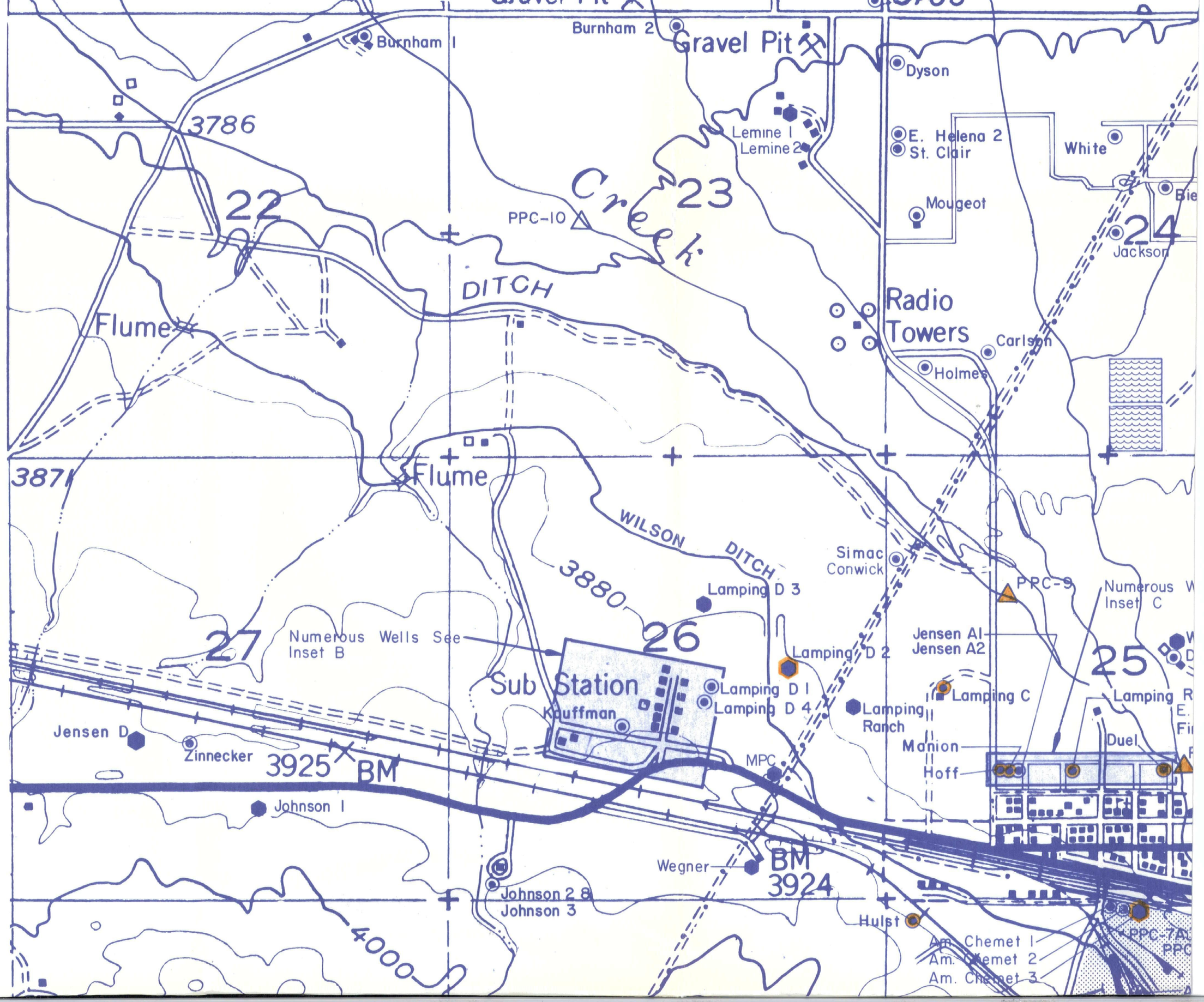
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PPC-10
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Jackson
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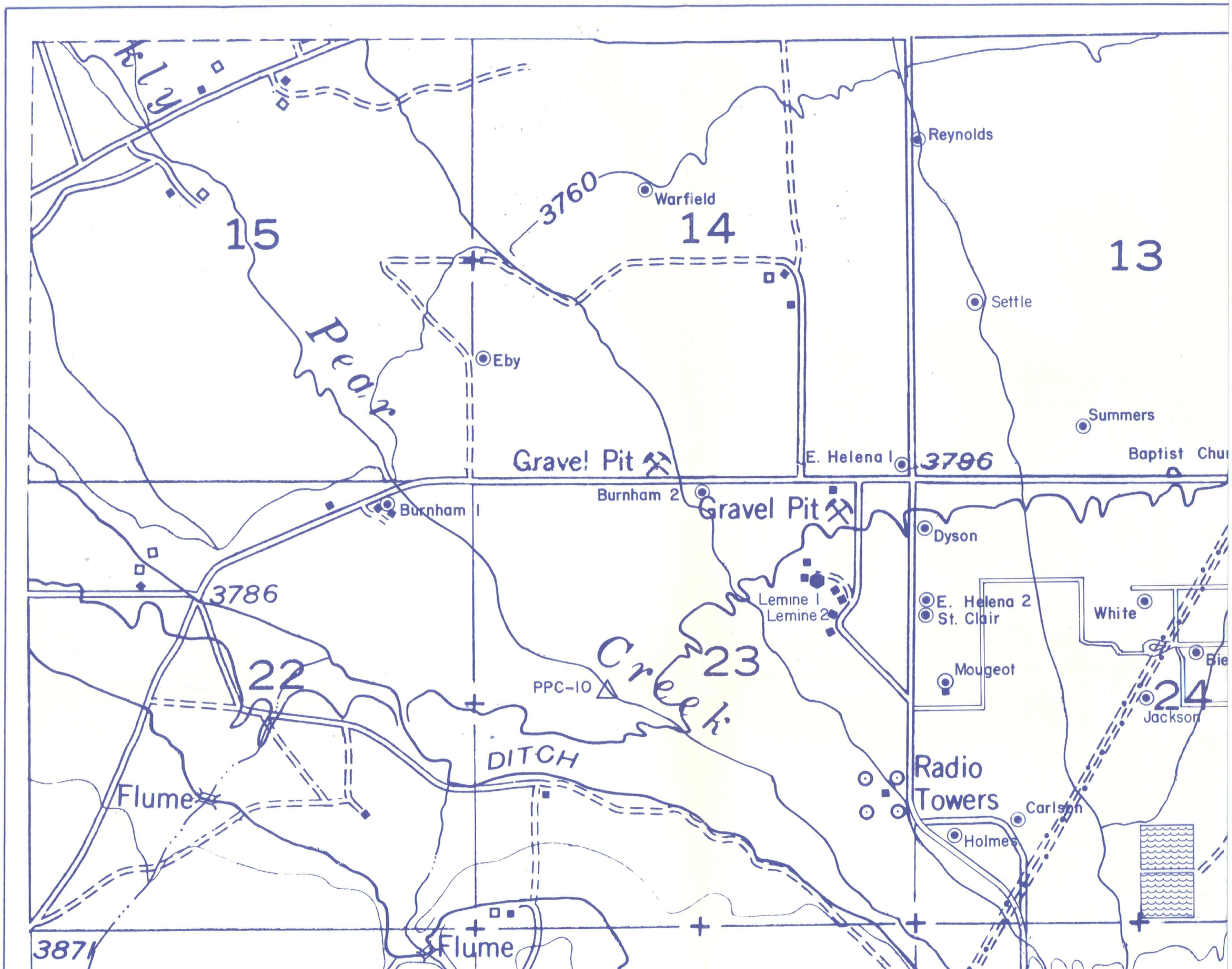
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Burnham 1
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Radio
Towers
Carlson
Holmes
Flume
Flume

0081215

HYDROGEOLOGICAL INVESTIGATION OF THE ASARCO EAST HELENA PLANT

WATER RESOURCES MONITORING PLAN

Prepared By:

ASARCO Incorporated
East Helena Plant
East Helena, Montana 59635

With Technical Assistance From

HYDROMETRICS
2727 Airport Road
Helena, Montana 59601
406/443-4150

March 2, 1984

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HYDROGEOLOGICAL INVESTIGATION OF THE ASARCO EAST HELENA PLANT WATER RESOURCES MONITORING PLAN

INTRODUCTION

Water resources monitoring in the vicinity of the ASARCO East Helena Plant is part of a comprehensive evaluation, requested by plant management, of the relationship of the plant and groundwater resources. A preliminary evaluation of hydrogeology at the East Helena Plant was completed by Hydrometrics in January 1984. This recent report presented information on plant facilities, hydrogeology, a well inventory, water resources and the plant water system and provided a good background for planning detailed monitoring and investigation of hydrogeology of the plant site area.

The objective of this water resources monitoring program will be to obtain a comprehensive understanding of hydrogeological conditions at the plant site and areas peripheral to the plant. Elements of the investigation include assembly and evaluation of existing water quality data; an extensive groundwater and surface water monitoring program and a technical evaluation of site hydrogeology. This information also has been assembled for preparation of a Montana Groundwater Pollution Control System (MGWPCS) permit application for the Montana Department of Health and Envionmental Sciences.

EXISTING WATER QUALITY DATA

In past years, considerable water quality data have been obtained from streams and groundwater in the vicinity of the ASARCO East Helena Plant area. Additionally, ASARCO has monitored the quality of process water on the plant site. As a background to the monitoring program, existing water quality data were obtained and reviewed. The following describes water quality in the general area of the plant.

GROUNDWATER

Groundwater quality in the Helena Valley near East Helena has been discussed by Lorenz and Swenson (1951), Moreland and others (1976) and Moreland and Leonard (1980). Additional groundwater quality data has been collected by ASARCO and the USGS (Appendix 1). Typical groundwater from the shallow alluvial aquifer is a moderately hard to hard, calcium-bicarbonate type with low concentrations of dissolved solids and metals. Total dissolved solids levels are generally in the range of 200 to 500 mg/l. Groundwater of this type is acceptable for irrigation and domestic use and meets state and federal drinking water standards (16.20.203 MCA; 40 CFR Parts 141 and 143).

Water quality in seeps along the north edge of the slag dump (Figure 1) has also been monitored by ASARCO and the Montana Water Quality Bureau (Appendix 1). In early 1979, shortly after slag dump sprinkling was begun, seeps appeared in which water quality was similar to the Lower Lake water used for sprinkling.

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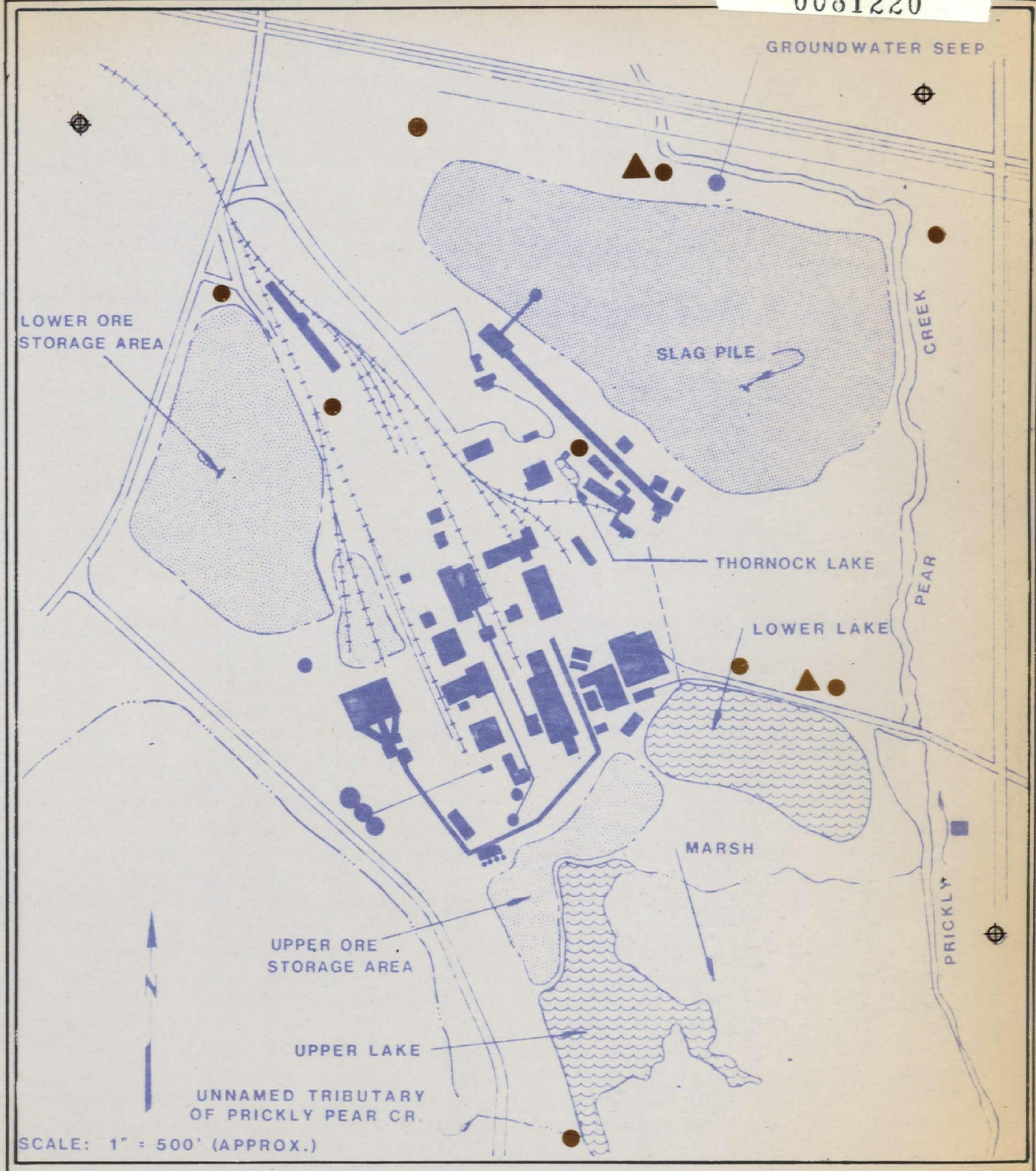


PLANT SITE MONITORING WELLS

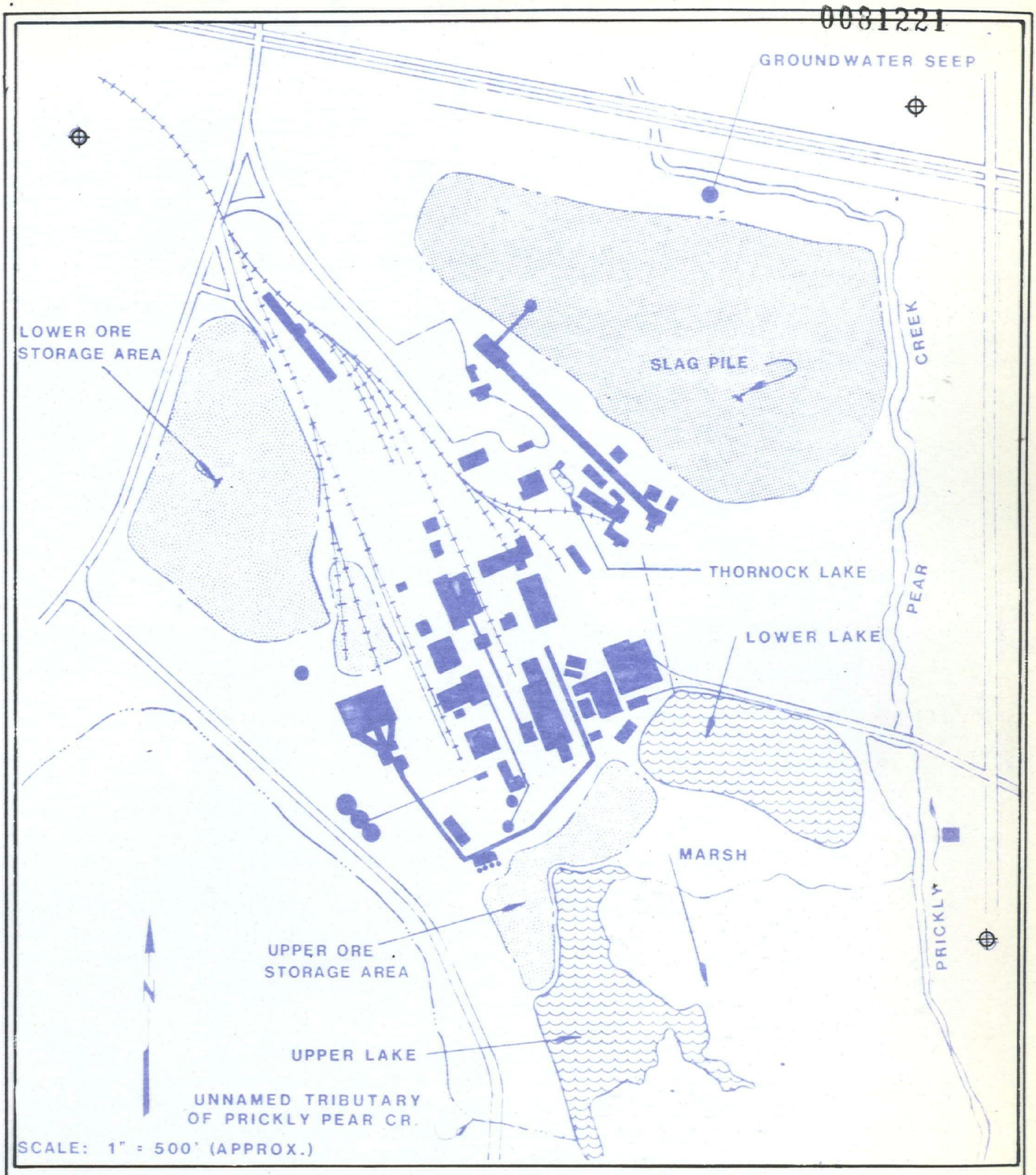
● **SHALLOW WELL**

▲ **DEEPER WELL**

FIGURE I

PLAN MAP OF ASARCO
EAST HELENA PLANT FACILITIES

PREPARED BY:
HYDROMETRICS



PLANT SITE MONITORING WELLS

SHALLOW WELL

DEEPER WELL

FIGURE I

PLAN MAP OF ASARCO
EAST HELENA PLANT FACILITIES

PREPARED BY:
HYDROMETRICS

In May 1981, flood water deposited considerable sediment over the upstream seep. Flow from this seep has apparently ceased. When the sprinkling program was terminated in 1982, water quality of the remaining downstream seep improved and flows significantly declined. The seep now flows only seasonally.

SURFACE WATER

Surface water in the ASARCO East Helena Plant area includes Prickly Pear Creek and the Upper Lake. Water quality of Prickly Pear Creek both upstream and downstream of the plant has been monitored by ASARCO and the Montana Water Quality Bureau. Descriptions of sampling stations are in Table 1 and a tabulation of water quality data from stations approximately five miles upstream to two miles downstream of the plant is in Appendix 2. The stream has been sampled along its entire length by the Water Quality Bureau periodically from 1973 to the present. Parameters analyzed were common ions, metals and arsenic. ASARCO has collected stream samples monthly from 1979 to the present. Samples were analyzed for metals and arsenic. Stream water in this reach typically is a good quality, calcium-bicarbonate type with moderate concentrations of metals and arsenic. The headwaters of Prickly Pear Creek contain numerous abandoned mines and receive acid mine drainage. As a result, metals and arsenic concentrations in the creek are higher than in other undisturbed mountain watershed in Western Montana (Water Quality Bureau, 1981).

TABLE 1. DESCRIPTION OF SURFACE WATER QUALITY SAMPLING SITES

Site Number and Location	Description	Distance Above or Below Plant
PPC-1 09N03W23CAA	Prickly Pear Creek at DNRC gaging station.	5.5 miles above plant.
PPC-1A 09N03W13BAD	Prickly Pear Creek above Kaiser Cement plant.	3.5 miles above plant.
PPC-2 09N02W07BCC	Prickly Pear Creek below Kaiser Cement plant.	2.5 miles above plant.
PPC-3 09N02W06BCB	Prickly Pear Creek at Kleffner ranch.	1.2 miles above plant.
PPC-4 09N03W36DAD	Prickly Pear Creek at ASARCO diversion.	0.7 mile above plant.
PPC-4A 09N03W36DAD	Prickly Pear Creek below ASARCO diversion.	0.65 mile above plant.
PPC-4B 10N03W36ADD	Prickly Pear Creek at 02 plant.	0.2 mile above plant.
PPC-5 10N03N36ADD	Prickly Pear Creek at Smelter dam.	0.15 mile above plant.
PPC-6 10N03W36AAA	Prickly Pear Creek above North Seep.	Adjacent to plant.
PPC-7 10N03W36AAB	Prickly Pear Creek below North Seep.	Adjacent to plant.
PPC-7A 10N03W31DCD	Prickly Pear Creek at South edge East Helena	0.1 mile below plant.
PPC-8 10N03W31DBD	Prickly Pear Creek at North edge East Helena	0.3 mile below plant.
PPC-9 10N03W31BDB	Prickly Pear Creek at Highway 443	1.0 mile below plant.
PPC-10 10N03W14DCC	Prickly Pear Creek above Helena sewage treatment plant.	2.2 miles below plant.
PPC-11A & 11B 10N03W31DCD	Prickly Pear Creek at Pacific Street Bridge - 11-A East Bank, 11B-West Bank.	0.1 mile below plant.

Upper lake is located just south and upstream of the East Helena Plant and receives flow from a diversion on Prickly Pear Creek about one-half mile south of the plant. Consequently, water quality of the lake is directly related to that in Prickly Pear Creek.

PROCESS WATER

Process water impoundments include Thornock and Lower Lakes which are used for collection and storage of process waters (see Figure 1 for locations). Water quality samples have been obtained from 1981 to the present (Appendix 3). Lower Lake water typically is poor quality with moderate to high concentrations of metals and arsenic. No water quality samples have been collected from Thornock Lake but its water quality is expected to be similar to that of Lower Lake.

WATER RESOURCES MONITORING

The quantity and quality of groundwater and surface water will be monitored on a periodic basis. Sampling site locations and sampling frequency and parameters are designed to provide a comprehensive understanding of water resources in the ASARCO plant area and will be used to describe existing water quality characteristics, groundwater classification and local hydrogeology in preparation of a MGWPCS permit application.

GROUNDWATER

Groundwater onsite and offsite will be monitored to determine quality, depth to water, aquifer characteristics and to provide an estimate of annual fluctuations. A total of eleven monitoring wells are planned for the plant site and will provide data on subsurface stratigraphy, lithology and aquifer hydraulic char-acteristics. Groundwater movement in the area is generally northward. Direction of groundwater movement was considered in locating all monitoring wells. Tentative locations are shown on Figure 1. The exact location, depth and number of wells is subject to revision as information is collected.

Nine wells will be completed in the first shallow aquifer encountered. This shallow water-bearing zone is expected to be present at a depth of less than 60 feet. Of the nine wells, one well will be located south and upgradient of the plant to document water quality above the complex. Two wells will be drilled downgradient from Lower Lake and

one downgradient of Thornock Lake to determine groundwater characteristics near these impoundments. Two wells will be drilled north of the Lower Storage Area to determine if groundwater has been influenced by ore storage in this rea. Three monitoring wells will be drilled near the slag pile along the north plant boundary. Two of the wells will be located south of Prickly Pear Creek to monitor shallow groundwater movement from the plant site toward the creek. The third well will be drilled downgradient (north) of the creek to determine groundwater characteristics north of Prickly Pear Creek.

Two wells will be completed in the next deeper water-bearing zone, one downgradient of Lower Lake and one downgradient of the plant complex. These wells will determine groundwater movement and quality in the deeper aquifer in the plant area.

Existing wells peripheral to the plant property also will be used to monitor groundwater. Many of these wells have previously been sampled by ASARCO and the U. S. Geological Survey to determine groundwater quality. Existing wells to be sampled are peripheral to and primarily downgradient of the ASARCO plant. A total of 16 wells (highlighted on Plate 1) will be examined of which 8 to 10 will be selected for long-term monitoring. Well selection will depend on the owner allowing access, well construction details such as depth and perforated zones, and use of the well in previous sampling programs. Preference will be given to wells that previously have been in a sampling program and that have well construction data. Wells peripheral to the plant site that

will be considered for the groundwater monitoring program are:

WELL	LOCATION	PREVIOUS SAMPLING	WELL LOG AVAILABLE
Hulst	10N03W36BBBB	Yes	Yes
Am. Chemet 2	10N03W36ABBB	Yes	Yes
AM. Chemet 3	10N03W36ABBB	No	Yes
Helfert	09N02W31BBBB	Yes	Yes
Casey 2	10N02W31BAAB	Yes	No
McDonald 1	10N02W30CDCA	Yes	Yes
Mockel	10N02W30CDDA	Yes	Yes
East Helena 3	10N03W25DDBA	No	No
Duel	10N03W25DBDC	Yes	Yes
Hoff	10N03W25DBCD	Yes	Yes
Manion	10N03W25CACC	Yes	Yes
Lamping D. 2	10N03W26ADC	No	No
Lamping C.	10N03W25CBBA	Yes	No
Stewart	10N03W31ABAB	Yes	Yes
Lamping R.	10N03W25CADC	Yes	No
Lamping F. 1	10N02W31CBD	No	Yes

Another element in groundwater monitoring will be the seep present north of the slag pile (Figure 1). Water from this seep will be monitored to determine seasonal variations in flow and quality.

Monitoring Frequency and Parameters

All plant site monitoring wells and the seep north of the slag pile will be sampled four times annually during the first year. Offsite

wells will be sampled twice per year. Parameters to be measured at each sampling period are listed in Table 2. Parameters selected for monitoring include the common cations and anions that comprise the major solution hydrochemical matrix. Also included are trace elements that are associated with the plant process. The other parameters, such as pH and specific electrical conductivity, define the water physiochemical condition. Groundwater from all plant wells will have a complete analysis twice per year and a partial analysis twice per year. Groundwater from offsite wells will have a complete analysis once per year and a partial analysis once per year. Water levels will be measured in all plant monitoring wells each time they are sampled plus four other times per year.

Monitoring Well Construction

Monitoring wells will be drilled using a forward rotary rig. Construction of monitoring wells will be as shown in Figures 2 and 3. It is anticipated that schedule 40 PVC or steel casing will be used and will be perforated in the target zones using vertical saw-cut slots. All monitoring wells will be surged by mechanical means or with compressed air to ensure all drilling debris has been removed and a good hydraulic connection has been established with the water-bearing zone. All monitoring well construction will be supervised by an experienced hydrogeologist from Hydrometrics.

TABLE 2. PARAMETERS TO BE MONITORED IN WELLS AND SEEPS

COMPLETE ANALYSIS

Specific Electrical Conductivity	Calcium (Ca)	Bicarbonate (HCO_3)
pH (Lab)	Magnesium (Mg)	Carbonate (CO_3)
Total Dissolved Solids (TDS)	Sodium (Na)	Sulfate (SO_4)
Static Water Level	Potassium (K)	Chloride (Cl)
Temperature		

Arsenic (As)	Copper(Cu)	Lead (Pb)	Zinc (Zn)
Cadmium (Cd)	Iron (Fe)	Manganese (Mn)	

All metals will be measured as dissolved.

PARTIAL ANALYSIS

Specific Electrical Conductivity	Arsenic (As)
pH (lab)	Lead (Pb)
Static Water Level	Zinc (Zn)
Total Dissolved Solids (TDS)	Cadmium (Cd)
Temperature	

All metals will be measured as dissolved.

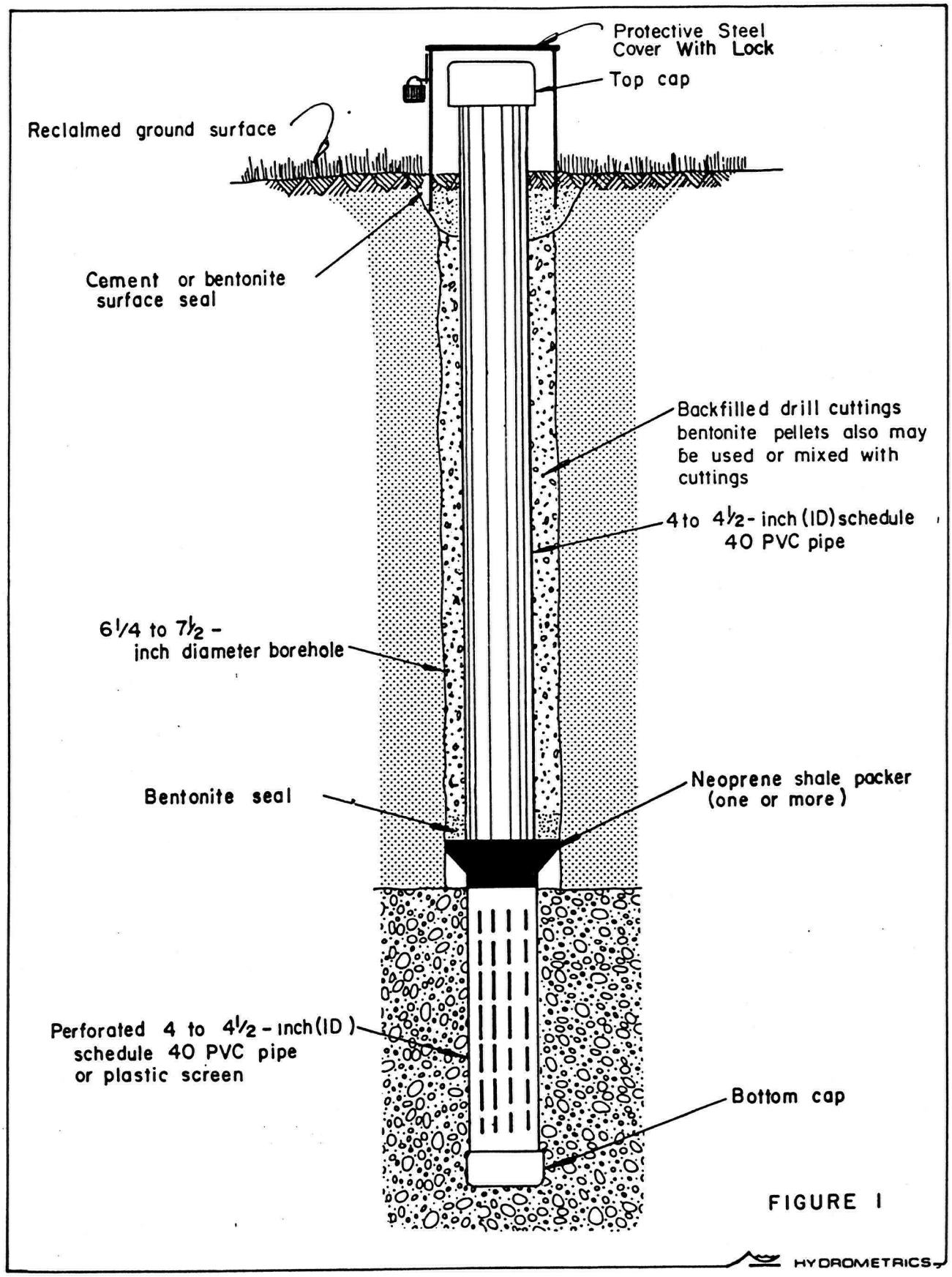


FIGURE 2. **TYPICAL MONITORING WELL INSTALLATION USING PLASTIC CASING**

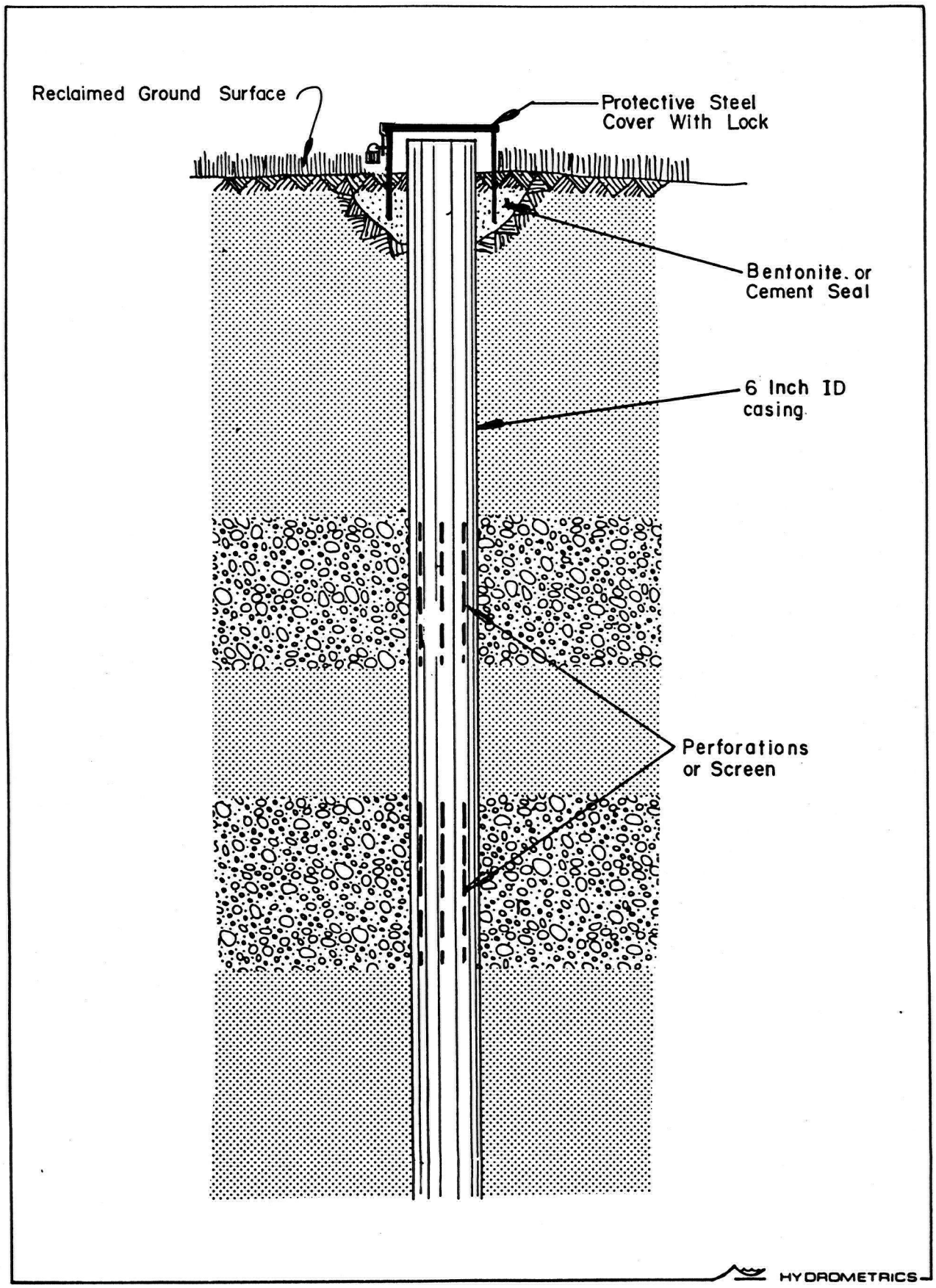


FIGURE 3. **TYPICAL MONITORING WELL INSTALLATION USING DRIVEN STEEL CASING**

SURFACE WATER

In shallow alluvial aquifer systems such as the East Helena Plant area, groundwater commonly is interrelated with surfce water. Consequently, an evaluation of surface water in the ASARCO plant area is an important component in understanding the overall hydrological system. Surface waters to be monitored include sites on Prickly Pear Creek and Upper Lake, Lower Lake and Thornock Lake. Monitoring will determine the quantity and quality of surface water and seasonal quality variations. A total of seven sites will be used for surface water monitoring on Prickly Pear Creek. These are: PPC-3, PPC-4, PPC-5, PPC-6, PPC-7, PPC-8 and PPC-9 (see Plate I for locations). These sites will be used to determine changes in flow and water quality occurring in the stream from upstream to downstream of the plant. These sites are located at key points along the creek and have been sampled in the past.

Monitoring Frequency and Parameters

Sites PPC-4, PPC-5 and PPC-8 are primary sampling sites and will be sampled eight times per year. Sampling will be seasonal as follows:

Early season low flow	- February to April
Spring Runoff	- April to June
Summer low flow	- Late July and August
Fall low flow	- Late September to November

Four samples, one for each seasonal period, will be collected and will undergo a complete analysis (Table 3). Sites also will be sampled at four other times per year (between seasonal samples) and will undergo a

partial analysis (Table 3). These four additional sampling periods will give a more comprehensive record of key parameters.

Stations PPC-3, PPC-6, PPC-7 and PPC-9 are secondary sites and will be sampled eight times per year concurrently with sites PPC-4, PPC-5 and PPC-8. All samples from these four secondary sites will undergo a partial analysis.

This program is similar to ASARCO's present sampling and analysis program except streamflows will be measured at all stations and a complete analysis is done four times per year at three stations. Stations upstream of PPC-3 and downstream of PPC-9 are not included.

Upper Lake, Lower Lake and Thornock Lake also will be sampled seasonally at the same time periods the primary sites (PPC-4, PPC-5 and PPC-8) are sampled. These pond samples will undergo a complete analysis.

The rational for parameters selected for surface water monitoring is the same as described in the groundwater section. These parameters define solution chemistry, trace elements concentrations and physio-chemical conditions.

TABLE 3. PARAMETERS TO BE MONITORED IN SURFACE WATER

COMPLETE ANALYSIS

Specific Electrical Conductivity	Calcium (Ca)	Bicarbonate (HCO_3)
Total Dissolved Solids (TDS)	Magnesium (Mg)	Carbonate (CO_3)
Total Suspended Solids (TSS)	Sodium (Na)	Sulfate (SO_4)
Temperature	Potassium (K)	Chloride (Cl)
pH		
Flow		

Arsenic (As)	Copper (Cu)	Lead (Pb)	Zinc (Zn)
Cadmium (Cd)	Iron (Fe)	Magnesium (Mn)	

All metals will be measured as both total and dissolved.

PARTIAL ANALYSIS

Specific Electrical Conductivity	Arsenic (As)
Total Dissolved Solids (TDS)	Lead (Pb)
Total Suspended Solids (TSS)	Zinc (Zn)
Temperature	Cadmium (Cd)
pH	
Flow	

All metals will be measured as both total and dissolved.

SAMPLING AND MEASUREMENT METHODS

Methods used in surface water and groundwater sampling, measurements of flow and water level and other testing will be in accordance with currently accepted professional practices.

SAMPLING

Sampling of all monitoring wells will be done in acordance with techniques recommended by the U. S. Geological Survey (1977) and the U. S. Environmental Protection Agency (1982). Samples from wells on the plant site will be obtained after removal of at least three well bore volumes of water by use of a small submersible pump or, if the well yields insufficient water for pumping, by use of a bailer. Existing wells peripheral to the ASARCO plant will be sampled by collecting water at the faucet nearest the wellhead. These wells will be pumped, using the existing pump, for a sufficient period to remove at least three well bore volumes of water prior to sampling.

Prickly Pear Creek will be sampled by dividing the channel cross section into quadrants and sampling the center of each quadrant. The sample will then be composited and transferred to the sample bottle.

Filtration and acidification of samples will be done in the field immediately after sample collection. Preservation and storage of samples will be in accordance with EPA (1982) recommendations and all samples will be shipped as soon as possible to the laboratory.

All sample bottles will be labeled and clearly identified by site, date collected and sample treatment This information will be written on the bottle label using a waterproof pen or pencil.

WATER LEVELS

Water levels in wells will be measured using a steel tape graduated in 0.01 foot increments or with a calibrated electric probe with a maximum error of 0.05 foot. Water levels will be measured each sampling period in all onsite wells and in those offsite wells where access to the well bore is available.

Water levels in Lower and Thornock Lakes will be measured by use of a staff gage or mesurement from an established reference point.

Relative elevations of all groundwater monitoring sites will be determined to within 0.2 feet by surveying. Mapped locations will be determined by measurement of distance to known landmarks.

FLOWS

Flows from springs or seeps will be measured by filling a container of known volume and measuring the time required for filling. Flow in Prickly Pear Creek will be determined by using a Gurley-type flow meter. The stream will be divided into subsections and the width, depth and water velocity in each section measured. Total streamflow will be determined by adding the flows of all subsections. This

technique is in accordance with U. S. Geological Survey (1977 and 1968) measurement methods.

LABORATORY ANALYSIS AND QUALITY ASSURANCE

All samples will be sent to the ASARCO laboratory in Salt Lake City for chemical analysis. Analytical procedures will be in accordance with techniques from 40 CFR 136 or 40 CFR 141 or equivalent methods. Quality assurance for the water analysis will be achieved by the following:

1) Metal blanks (pure distilled water) will be filtered and acidified in the field and sent to the laboratory for analysis.

2) Unidentified duplicates of samples will be submitted to the ASARCO laboratory.

3) Splits of selected samples will be submitted to Energy Labs, Billings, Montana for analysis.

4) Samples with known concentrations of selected parameters will be submitted to the ASARCO laboratory for analysis.

Approximately 5 to 10 percent of the samples tested will be quality control samples.

In addition to these external quality controls, the laboratory will maintain a documented record of internal quality control for each parameter tested.

Within four hours of sampling the pH and Specific Electrical Conductivity (SC) of each field sample will be tested in either the ASARCO plant laboratory in East Helena or in Hydrometrics' laboratory. These measurements will be compared to analytical results from the ASARCO laboratory in Salt Lake City.

SITE HYDROGEOLOGY

Onsite monitoring wells will provide geological and hydrological information needed to identify aquifers in the plant area and determine their characteristics. Specific information needed is aquifer geological and hydraulic properties, depth to groundwater and direction and rate of movement of groundwater. This information provides a framework for understanding groundwater quality and surface water-groundwater relationships in preparation of a MGWPCS permit application.

AQUIFER IDENTIFICATION AND CHARACTERISTICS

Nine monitoring wells will be completed in the first water-yielding strata beneath the ground surface and two in the next deeper water-bearing strata. This will provide information in the depth of the groundwater system. Domestic wells north of the plant site have a range in depth from 30 to 150 feet.

It is important that the monitoring wells yield sufficient water to obtain representative water samples and to allow aquifer testing. The monitoring wells will provide information on approximate aquifer transmissivity, water level fluctuations and lithology of water-yielding zones and overlying strata. If possible, stratigraphic correlations will be made between monitoring wells and with existing wells peripheral to the plant site.

The two deeper monitoring wells will provide information on depth to the next water-bearing strata and the thickness, lithology and stratigraphy of deeper layers. Also water level and water quality data from the deeper monitoring wells will provide information on vertical hydraulic characteristics of strata in the plant area.

GROUNDWATER DEPTH AND MOVEMENT

The monitoring wells provide information on aquifer water levels and seasonal variations in water levels. These data can be used to develop a water level or potentiometric map. Such a map shows contours of equal water levels (equi-potential water contours). The direction of groundwater movement is at 90 degrees to the equi-potential contours. The potentiometric map will define the direction of groundwater movement in the area.

The rate of flow of groundwater in the area can be determined from the groundwater gradient (taken from the potentiometric map) and from transmissivity determined by aquifer testing.

AQUIFER HYDRAULIC CHARACTERISTICS

Monitoring wells will be tested by pumping, bailing or slug injection of water to determine transmissivity. Transmissivity is a measure of the relative ease with which an aquifer transmits water. The rate of groundwater flow in an aquifer is directly proportional to transmissivity. Aquifer tests will be conducted using techniques described by Ferris and others (1962), Theis (1963) and Lohman (1972).

Most, if not all, onsite monitoring wells will be tested to determine aquifer transmissivity.

DATA PROCESSING AND REPORTING

Processing of monitoring information will be an important element of this hydrogeological investigation. All data including water levels, streamflows, water quality analysis will be entered into Hydrometrics data management system which is designed to detect unusual or erroneous data upon entry. The need for retesting, resampling or additional laboratory analysis is then determined soon after receiving results.

At the end of one year of monitoring, all results will be incorporated into a comprehensive report. The report will present data and information using appropriate maps, graphs and tabulations and will evaluate the groundwater and surface water systems. This report will be submitted to the Montana Water Quality Bureau for their review and use.

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APPENDIX 1

ASARCO PLANT AREA GROUNDWATER QUALITY DATA

ASARCO GROUNDWATER QUALITY

SAMPLING SITE	AM CHEMET-1	AM CHEMET-1	AM CHEMET-2	AM CHEMET-2	ARMAGOST	BIEBER	BIEBER	BURNHAM-1	BURNHAM-1	BURNHAM-2
SAMPLE DATE	10/17/83	10/17/83	10/17/83	10/17/83	01/26/83	03/20/83	06/14/83	10/17/83	10/17/83	06/16/83
LOCATION	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W
LOCATION	36ABB	36ABB	36ABBB	36ABBB	19CBCC	24ACDA	24ACDA	22AABB	22AABB	23ABBB
LAB	ASARCO	EPA	ASARCO	EPA	ASARCO	ASARCO		ASARCO	EPA	
SAMPLED BY	ASARCO	USGS	ASARCO	USGS	ASARCO	ASARCO	USGS	ASARCO	USGS	USGS
PHYSICAL PARAMETERS										
WATER TEMPERATURE (C)	12.0		15.0				9.5	8.0		8.5
SPEC. COND. (UMHOS/CM) LAB	310		1150				418	375		310
PH LAB	7.05		6.96				7.2	7.33		7.1
DEPTH TO SWL BELOW MP (FT)							39.06			25.90
COMMON IONS										
CALCIUM (CA)		34		139			49.1		44	35.9
MAGNESIUM (MG)		4.6		10			11.3		3.0	8.2
SODIUM (NA)		18		66					17	
POTASSIUM (K)		9.3		33					11	
SULFATE (SO4)		27		490					61	
CHLORIDE (CL)		2.0		42					4.0	
TRACE ELEMENTS										
ALUMINUM (AL) DISS							0.018			<0.009
ANTIMONY (SB) DISS							0.042			0.013
ARSENIC (AS) DISS	0.006	<0.010	<0.005	<0.010	<0.004	<0.004		0.041	<0.010	
BERYLLIUM (BE) DISS							<0.002			<0.002
BORON (B) DISS							0.002			<0.001
CADMIUM (CD) DISS	<0.004	<0.001	<0.004	<0.001	<0.002	<0.003	<0.001	<0.004	0.0027	<0.001
CHROMIUM (CR) DISS							0.002			<0.003
COBALT (CO) DISS							<0.002			<0.001
COPPER (CU) DISS	<0.004	<0.050	0.005	<0.050	0.020	0.036	0.003	0.012	<0.050	<0.004
IRON (FE) DISS		.671		0.780			0.049		.152	0.009
LEAD (PB) DISS	<0.030	0.039	<0.030	<0.005	0.020	0.030	<0.037	<0.030	0.0088	<0.016
MANGANESE (MN) DISS							<0.001			0.000
MOLYBDENUM (MO) DISS							0.009			<0.002
NICKEL (NI) DISS							0.004			<0.003
VANADIUM (V) DISS							0.002			<0.006
ZINC (ZN) DISS					0.28	0.045	0.012			0.020
OTHER PARAMETERS										
SILICA (SI)							11.00			9.45

ALL QUANTITIES IN MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED
BLANK LINE INDICATES PARAMETER NOT TESTED

0081245

ASARCO GROUNDWATER QUALITY

SAMPLING SITE	CANNON	CANNON	CARLSON	CASEY	COVEY	CRAIG	CRAIG	DARTMAN-2	DARTMAN-2	DAVIDSON
SAMPLE DATE	10/17/83	10/17/83	06/21/83	01/26/83	06/16/83	10/17/83	10/17/83	10/17/83	10/17/83	03/14/83
LOCATION	10N02W	10N02W	10N03W	10N02W	10N03W	10N02W	10N02W	10N03W	10N03W	09N02W
LOCATION	18DDCD	18DDCD	24CCAA	31BAAB	24DADB	30DBBB	30DBBB	25ACDC	25ACDC	06CCAC
LAB	ASARCO	EPA		ASARCO		ASARCO	EPA	ASARCO	EPA	ASARCO
SAMPLED BY	ASARCO	USGS	USGS	ASARCO	USGS	ASARCO	USGS	ASARCO	USGS	ASARCO
PHYSICAL PARAMETERS										
WATER TEMPERATURE (C)	10.0		9.5		10.0	10.5		9.0		
SPEC. COND. (UMHOS/CM) LAB			280		345	252		185		
PH LAB			7.0		7.0	7.27		6.98		
DEPTH TO SWL BELOW MP (FT)			33.92		36.65					
COMMON IONS										
CALCIUM (CA)		39	34.6		44.1		37		26	
MAGNESIUM (MG)		2.4	7.6		9.7		3.6		2.1	
SODIUM (NA)		23					25		13	
POTASSIUM (K)		9.0					8.9		6.7	
SULFATE (SO4)							50		41	
CHLORIDE (CL)							12		3.0	
TRACE ELEMENTS										
ALUMINUM (AL) DISS			0.059		0.061					
ANTIMONY (SB) DISS			0.062		0.072					
ARSENIC (AS) DISS	0.007	<0.010		0.005		<0.005	<0.010	0.006	<0.010	<0.004
BERYLLIUM (BE) DISS			<0.001		0.001					
BORON (B) DISS			0.008		0.009					
CADMIUM (CD) DISS	<0.004	<0.001	0.004	<0.002	0.007	<0.004	<0.001	<0.004	0.0052	<0.003
CHROMIUM (CR) DISS			0.008		0.009					
COBALT (CO) DISS			0.014		0.015					
COPPER (CU) DISS	<0.004	<0.050	0.130	0.050	0.009	0.038	0.051	<0.004	<0.050	<0.008
IRON (FE) DISS		.194	0.665		0.199		0.311		0.374	
LEAD (PB) DISS	<0.030	0.0067	<0.001	0.020	0.014	<0.030	<0.005	<0.030	0.027	0.050
MANGANESE (MN) DISS			0.003		0.003					
MOLYBDENUM (MO) DISS			0.014		0.014					
NICKEL (NI) DISS			0.017		0.017					
VANADIUM (V) DISS			<0.001		0.012					
ZINC (ZN) DISS			0.028	0.067	0.013					0.17
OTHER PARAMETERS										
SILICA (SI)			10.57		10.40					

ALL QUANTITIES IN MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED
BLANK LINE INDICATES PARAMETER NOT TESTED

001246

ASARCO GROUNDWATER QUALITY

SAMPLING SITE	DOVER	DOVER	DOVER	DUEL	DYSON	E. HELENA-1	E. HELENA-1	E. HELENA-2	E. HELENA-2	E. HELENA-2
SAMPLE DATE	06/22/83	10/17/83	10/17/83	01/24/83	06/20/83	10/17/83	10/17/83	06/20/83	10/17/83	10/17/83
LOCATION	09N03W	09N03W	09N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W
LOCATION	02CDBA	02CDBA	02CDBA	25DBDC	24BBBC	14DDDD	14DDDD	24BCBB	24BCBB	24BCBB
LAB		ASARCO	EPA	ASARCO		ASARCO	EPA		ASARCO	EPA
SAMPLED BY	USGS	ASARCO	USGS	ASARCO	USGS	ASARCO	USGS	USGS	ASARCO	USGS
PHYSICAL PARAMETERS										
WATER TEMPERATURE (C)	13.5	12.5			11.0	11.5		9.0	9.0	
SPEC. COND. (UMHOS/CM) LAB	409	385				26.5		325	273	
PH LAB	7.5	7.49			7.4	6.97		7.1	6.82	
DEPTH TO SWL BELOW MP (FT)	149.61				36.70			47.7		
COMMON IONS										
CALCIUM (CA)	25.5		20		48.4		30	42.6		35
MAGNESIUM (MG)	5.9		7.8		11.1		2.6	9.6		2.7
SODIUM (NA)			52				11			14
POTASSIUM (K)			5.3				7.3			8.6
SULFATE (SO4)			31				110			54
CHLORIDE (CL)			15				2.0			2.0
TRACE ELEMENTS										
ALUMINUM (AL) DISS	<0.002				0.060			0.065		
ANTIMONY (SB) DISS	<0.005				0.016			0.056		
ARSENIC (AS) DISS		0.019	0.012	<0.004		0.009	<0.010		<0.005	<0.010
BERYLLIUM (BE) DISS	<0.002				<0.002			<0.001		
BORON (B) DISS	0.009				0.053			0.004		
CADMIUM (CD) DISS	0.000	<0.004	0.0029	<0.002	0.006	<0.004	0.0084	0.002	<0.004	0.0024
CHROMIUM (CR) DISS	0.000				0.004			0.008		
COBALT (CO) DISS	<0.001				0.010			0.011		
COPPER (CU) DISS	<0.002	0.007	<0.050	0.020	0.006	<0.004	<0.050	0.006	0.013	<0.050
IRON (FE) DISS	0.017		0.239		3.615		0.142	0.016		0.239
LEAD (PB) DISS	<0.033	<0.030	0.038	0.020	<0.012	<0.030	0.012	<0.021	<0.030	0.0098
MANGANESE (MN) DISS	0.005				0.112			0.000		
MOLYBDENUM (MO) DISS	0.016				0.016			0.017		
NICKEL (NI) DISS	<0.015				0.011			0.011		
VANADIUM (V) DISS	0.002				0.011			0.007		
ZINC (ZN) DISS	0.723			0.020	0.028			<0.001		
OTHER PARAMETERS										
SILICA (SI)	18.55				10.48			10.84		

ALL QUANTITIES IN MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED
BLANK LINE INDICATES PARAMETER NOT TESTED

ASARCO GROUNDWATER QUALITY

SAMPLING SITE	EASTGATE	EASTGATE	ESTRIN	GLASOE	HELFERT	HOFF	HOFF	HOFF	HOLMES	HULST
SAMPLE DATE	10/17/83	10/17/83	06/20/83	03/20/83	01/26/83	03/07/83	10/17/83	10/17/83	03/20/83	01/27/83
LOCATION	10N02W	10N02W	10N02W	10N02W	10N02W	10N03W	10N03W	10N03W	10N03W	10N03W
LOCATION	29CBDD	29CBDD	31ABAA	30DCBB	31BBBB	25CACC	25CACC	25CACC	24CCBA	36BBBB
LAB	ASARCO	EPA		ASARCO	ASARCO	ASARCO	ASARCO	EPA	ASARCO	ASARCO
SAMPLED BY	ASARCO	USGS	USGS	ASARCO	ASARCO	ASARCO	ASARCO	USGS	ASARCO	ASARCO
PHYSICAL PARAMETERS										
WATER TEMPERATURE (C)	11.0		11.5				10.5			
SPEC. COND. (UMHOS/CM) LAB	492		502				565			
PH LAB	7.64		7.3				7.09			
DEPTH TO SWL BELOW MP (FT)			58.37							
COMMON IONS										
CALCIUM (CA)		48	51.7					82		
MAGNESIUM (MG)		3.1	13.4					3.9		
SODIUM (NA)		34						33		
POTASSIUM (K)		14						25		
SULFATE (SO4)		99								
CHLORIDE (CL)		14								
TRACE ELEMENTS										
ALUMINUM (AL) DISS			0.008							
ANTIMONY (SB) DISS			0.023							
ARSENIC (AS) DISS	<0.005	<0.010		<0.004	<0.004	<0.004	<0.005	<0.010	<0.004	0.019
BERYLLIUM (BE) DISS			<0.002							
BORON (B) DISS			0.013							
CADMIUM (CD) DISS	<0.004	0.0078	0.001	<0.003	<0.002	<0.003	<0.004	<0.001	<0.003	<0.002
CHROMIUM (CR) DISS			<0.002							
COBALT (CO) DISS			<0.001							
COPPER (CU) DISS	<0.004	<0.050	0.003	0.033	0.033	0.035	0.022	<0.050	0.023	0.020
IRON (FE) DISS		0.152	0.187					0.239		
LEAD (PB) DISS	<0.030	0.013	<0.060	0.030	0.020	0.12	<0.030	<0.005	0.020	0.020
MANGANESE (MN) DISS			0.004							
MOLYBDENUM (MO) DISS			0.010							
NICKEL (NI) DISS			<0.001							
VANADIUM (V) DISS			0.000							
ZINC (ZN) DISS			0.085	0.15	0.020	0.012			0.16	0.020
OTHER PARAMETERS										
SILICA (SI)			14.12							

ALL QUANTITIES IN MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED
BLANK LINE INDICATES PARAMETER NOT TESTED

ASARCO GROUNDWATER QUALITY

SAMPLING SITE	JACKSON	JEAN	JENSEN A-1	JENSEN A-1	JOHNSON-2	JOHNSON-2	JONES	KAISER	KAISER	KAUFFMAN
SAMPLE DATE	06/20/83	01/25/83	10/17/83	10/17/83	01/27/83	06/23/83	01/24/83	10/17/83	10/17/83	06/17/83
LOCATION	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	09N02W	09N03W	09N03W	10N03W
LOCATION	24ACCC	29DADD	25	25	26CCCA	26CCCA	06CCCA	13BDBB	13BDBB	26CAAC
LAB		ASARCO	ASARCO	EPA	ASARCO		ASARCO	ASARCO	EPA	
SAMPLED BY	USGS	ASARCO	ASARCO	USGS	ASARCO	USGS	ASARCO	ASARCO	USGS	USGS
PHYSICAL PARAMETERS										
WATER TEMPERATURE (C)	10.5		11.0			12.5		12.0		12.0
SPEC. COND. (UMHOS/CM) LAB	363		380			705		490		518
PH LAB	7.1		7.15			7.5		7.52		7.6
DEPTH TO SWL BELOW MP (FT)	39.14					9.20				54.30
COMMON IONS										
CALCIUM (CA)	45.1			80		53.6			59	43.9
MAGNESIUM (MG)	10.3			3.7		44.3			2.5	21.2
SODIUM (NA)				7.8					8.2	
POTASSIUM (K)				12					16	
SULFATE (SO4)									110	
CHLORIDE (CL)									3.0	
TRACE ELEMENTS										
ALUMINUM (AL) DISS	0.027					0.093				0.071
ANTIMONY (SB) DISS	0.038					0.098				0.080
ARSENIC (AS) DISS		0.006	0.006	<0.010	0.016		0.004	0.029	<0.010	
BERYLLIUM (BE) DISS	<0.001					0.000				<0.001
BORON (B) DISS	0.012					0.028				0.079
CADMIUM (CD) DISS	<0.002	<0.002	<0.004	<0.001	<0.003	0.010	<0.002	<0.004	<0.001	0.008
CHROMIUM (CR) DISS	0.002					0.012				0.012
COBALT (CO) DISS	0.003					0.022				0.019
COPPER (CU) DISS	0.004	0.033	0.005	<0.050	0.020	0.025	0.033	<0.004	<0.050	0.004
IRON (FE) DISS	0.232			0.271		0.200			0.206	0.018
LEAD (PB) DISS	<0.013	0.020	<0.030	<0.005	0.020	<0.007	0.10	<0.030	<0.005	<0.027
MANGANESE (MN) DISS	0.004					0.003				0.002
MOLYBDENUM (MO) DISS	0.008					0.027				0.031
NICKEL (NI) DISS	0.001					0.032				0.23
VANADIUM (V) DISS	<0.003					0.023				0.022
ZINC (ZN) DISS	0.075	0.15			0.20	0.161	0.13			0.011
OTHER PARAMETERS										
SILICA (SI)	11.75					7.04				31.03

ALL QUANTITIES IN MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED
BLANK LINE INDICATES PARAMETER NOT TESTED

0081249

ASARCO GROUNDWATER QUALITY

SAMPLING SITE	KLEFFNER SPR	KLEFFNER SPR	KLEFFNER WELL	LA CASA GRANDE	LA CASA GRANDE	LAMPING C	LAMPING C	LAMPING C	LAMPING D-1	LAMPING R
SAMPLE DATE	01/24/83	06/22/83	01/24/83	10/17/83	10/17/83	06/17/83	10/17/83	10/17/83	06/17/83	01/24/83
LOCATION	09N02W	09N02W	09N02W	10N02W	10N02W	10N03W	10N03W	10N03W	10N03W	10N03W
LOCATION	06BCCA	06BCCA	06BCCA	32AADA	30BBBD	25CBBA	25CBBA	25CBBA	26DBBA	25CADC
LAB	ASARCO		ASARCO	ASARCO	EPA		ASARCO	EPA		ASARCO
SAMPLED BY	ASARCO	USGS	ASARCO	ASARCO	USGS	USGS	ASARCO	USGS	USGS	ASARCO
PHYSICAL PARAMETERS										
WATER TEMPERATURE (C)		11.0		10.0		9.5	11.0		11.0	
SPEC. COND. (UMHOS/CM) LAB		429		335	380	600	505		433	
PH LAB		7.9		7.23	7.05	7.4	7.54		7.3	
DEPTH TO SWL BELOW MP (FT)						12.20			37.60	
COMMON IONS										
CALCIUM (CA)		32.4			39	56.0		43	42.2	
MAGNESIUM (MG)		9.1			2.5	29.9		3.3	9.6	
SODIUM (NA)					20			15		
POTASSIUM (K)					10			29		
SULFATE (SO4)					56			82		
CHLORIDE (CL)					3.0			10		
TRACE ELEMENTS										
ALUMINUM (AL) DISS		0.135				0.157			0.011	
ANTIMONY (SB) DISS		0.104				0.079			<0.013	
ARSENIC (AS) DISS	0.021		0.018		<0.010		0.017	<0.010		0.007
BERYLLIUM (BE) DISS		0.002				<0.001			0.000	
BORON (B) DISS		0.067				0.108			0.030	
CADMIUM (CD) DISS	<0.002	0.011	<0.002		0.0049	0.006	<0.004	0.0091	0.002	<0.002
CHROMIUM (CR) DISS		0.015				0.007			0.001	
COBALT (CO) DISS		0.025				0.016			0.002	
COPPER (CU) DISS	0.020	0.016	<0.020		<0.050	0.012	<0.004	<0.050	0.002	0.10
IRON (FE) DISS		0.251			0.277	0.141		0.564	0.027	
LEAD (PB) DISS	0.020	0.028	0.020		0.012	0.001	<0.030	0.041	<0.023	0.033
MANGANESE (MN) DISS		0.017				0.004			0.003	
MOLYBDENUM (MO) DISS		0.029				0.026			0.014	
NICKEL (NI) DISS		0.035				0.018			0.012	
VANADIUM (V) DISS		0.018				0.031			0.007	
ZINC (ZN) DISS	0.033	0.040	0.033			0.011			0.006	0.020
OTHER PARAMETERS										
SILICA (SI)						18.99			29.32	

ALL QUANTITIES IN MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED
BLANK LINE INDICATES PARAMETER NOT TESTED

ASARCO GROUNDWATER QUALITY

SAMPLING SITE	LOGAN	MANION	MANION	MANION	MARCNKWSKI	MARONIK	MCDONALD	MOCKEL	MOCKEL	MOCKEL
SAMPLE DATE	01/25/83	01/24/83	03/07/83	10/17/83	01/26/83	01/27/83	06/20/83	06/20/83	10/18/83	10/17/83
LOCATION	10N02W	10N03W	10N03W	10N03W	09N03W	09N02W	10N02W	10N02W	10N02W	10N02W
LOCATION	18CBDC	25CACC	25CACC	25CACC	01ABAB	07BADC	30CDCA1	30CDDA	30CDDA	30CDDA
LAB	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO			ASARCO	EPA
SAMPLED BY	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	USGS	USGS	ASARCO	USGS
PHYSICAL PARAMETERS										
WATER TEMPERATURE (C)				11.5			11.5	11.0	10.5	
SPEC. COND. (UMHOS/CM) LAB				785			371	520	363	
PH LAB				6.11			7.3	7.3	7.15	
DEPTH TO SWL BELOW MP (FT)							75.88	56.50		
COMMON IONS										
CALCIUM (CA)							45.4	65.4		54
MAGNESIUM (MG)							9.2	13.8		3.4
SODIUM (NA)										29
POTASSIUM (K)										14
SULFATE (SO4)										120
CHLORIDE (CL)										13
TRACE ELEMENTS										
ALUMINUM (AL) DISS							0.133	0.207		
ANTIMONY (SB) DISS							0.064	0.098		
ARSENIC (AS) DISS	0.005	<0.004	<0.004	<0.005	0.017	<0.004			<0.005	<0.010
BERYLLIUM (BE) DISS							0.002	0.002		
BORON (B) DISS							0.001	0.020		
CADMIUM (CD) DISS	<0.002	<0.002	<0.003	<0.004	<0.002	<0.002	0.010	0.015	<0.004	<0.001
CHROMIUM (CR) DISS							0.017	0.017		
COBALT (CO) DISS							0.029	0.028		
COPPER (CU) DISS	0.020	0.020	<0.008	0.18	0.020	0.033	0.016	0.033	0.013	<0.050
IRON (FE) DISS							0.148			0.464
LEAD (PB) DISS	0.020	0.050	0.070	<0.030	0.020	0.020	0.039	0.007	<0.030	0.0081
MANGANESE (MN) DISS							0.004	0.371		
MOLYBDENUM (MO) DISS							0.029	0.032		
NICKEL (NI) DISS							0.041	0.046		
VANADIUM (V) DISS							0.013	0.024		
ZINC (ZN) DISS	0.083	0.033	0.015		0.10	0.020	0.041	0.007		
OTHER PARAMETERS										
SILICA (SI)							9.98	11.47		

ALL QUANTITIES IN MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED
BLANK LINE INDICATES PARAMETER NOT TESTED

00812251

ASARCO GROUNDWATER QUALITY

SAMPLING SITE	MORELLO	MOUGEOT	MUCH	NO NAME (#1)	NO NAME (#1)	NO NAME (#1)	OLSON	OLSON	SIMAC	SIMAC
SAMPLE DATE	01/28/83	03/21/83	01/27/83	06/21/83	10/17/83	10/17/83	10/17/83	10/17/83	03/07/83	06/20/83
LOCATION	10N02W	10N03W		10N02W	10N02W	10N02W	10N03W	10N03W	10N03W	10N03W
LOCATION	19BBCB	25BDBB		32AADA	32AADA	32AADA	28DDAD	28DDAD	25BBCC	25BBCC
LAB	ASARCO	ASARCO	ASARCO		ASARCO	EPA	ASARCO	EPA	ASARCO	
SAMPLED BY	ASARCO	ASARCO	ASARCO	USGS	ASARCO	USGS	ASARCO	USGS	ASARCO	USGS
PHYSICAL PARAMETERS										
WATER TEMPERATURE (C)				11.0			9.5			11.0
SPEC. COND. (UMHOS/CM) LAB				578						1200
PH LAB				7.7						6.8
DEPTH TO SWL BELOW MP (FT)				84.68						25.05
COMMON IONS										
CALCIUM (CA)				52.9		46		56		
MAGNESIUM (MG)				14.6		2.9		4.8		38.3
SODIUM (NA)						42		38		
POTASSIUM (K)						14		56		
SULFATE (SO4)						110		120		
CHLORIDE (CL)						16		34		
TRACE ELEMENTS										
ALUMINUM (AL) DISS				<0.002						0.061
ANTIMONY (SB) DISS				0.020						0.105
ARSENIC (AS) DISS	<0.004	0.008	0.004		0.008	<0.010	0.009	<0.010	<0.004	
BERYLLIUM (BE) DISS				<0.002						0.001
BORON (B) DISS				0.049						0.112
CADMIUM (CD) DISS	<0.003	<0.003	<0.002	0.000	<0.004	<0.001	<0.004	<0.001	<0.003	0.016
CHROMIUM (CR) DISS				0.000						0.009
COBALT (CO) DISS				<0.003						0.025
COPPER (CU) DISS	0.10	0.013	0.020	0.000	0.007	<0.050	0.005	<0.050	<0.008	0.010
IRON (FE) DISS				0.059		0.264		0.135		0.456
LEAD (PB) DISS	0.050	0.020	0.020	<0.032	0.030	<0.005	<0.030	0.0069	0.050	<0.046
MANGANESE (MN) DISS				0.002						0.010
MOLYBDENUM (MO) DISS				<0.001						0.027
NICKEL (NI) DISS				<0.013						0.024
VANADIUM (V) DISS				0.004						0.005
ZINC (ZN) DISS	0.020	0.040	0.020	<0.001					0.10	0.056
OTHER PARAMETERS										
SILICA (SI)				10.56						13.11

ALL QUANTITIES IN MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED
BLANK LINE INDICATES PARAMETER NOT TESTED

00812252

ASARCO GROUNDWATER QUALITY

SAMPLING SITE	ST. CLAIR	STEWART	TILLO	WHITE	WHITE	ZINNECKER
SAMPLE DATE	01/25/83	01/25/83	06/14/83	03/21/83	06/20/83	06/21/83
LOCATION	10N03W	10N02W	10N02W	10N03W	10N03W	10N03W
LOCATION	24BCBB	31ABAC	19ACAB	24ACBB	24ACBB	27CADB
LAB	ASARCO	ASARCO		ASARCO		
SAMPLED BY	ASARCO	ASARCO	USGS	ASARCO	USGS	USGS
PHYSICAL PARAMETERS						
WATER TEMPERATURE (C)			12.0		10.5	11.0
SPEC. COND. (UMHOS/CM) LAB			410		388	605
PH LAB			7.4		6.8	7.8
DEPTH TO SWL BELOW MP (FT)			63.11		38.72	
COMMON IONS						
CALCIUM (CA)			45.0		47.6	31.1
MAGNESIUM (MG)			8.9		10.9	37.7
TRACE ELEMENTS						
ALUMINUM (AL) DISS			0.089		0.036	0.045
ANTIMONY (SB) DISS			0.039		0.025	0.029
ARSENIC (AS) DISS	<0.004	<0.004		<0.004		
BERYLLIUM (BE) DISS			0.003		<0.001	0.000
BORON (B) DISS			0.048		0.004	0.019
CADMIUM (CD) DISS	<0.002	<0.002	0.010	<0.003	0.001	0.006
CHROMIUM (CR) DISS			0.014		<0.002	0.001
COBALT (CO) DISS			0.023		<0.002	0.015
COPPER (CU) DISS	0.050	0.020	0.032	<0.008	0.003	0.010
IRON (FE) DISS			0.160		0.137	0.017
LEAD (PB) DISS	0.020	0.020	<0.013	0.020	<0.003	<0.31
MANGANESE (MN) DISS			0.004		0.002	0.003
MOLYBDENUM (MO) DISS			0.028		0.003	0.013
NICKEL (NI) DISS			0.028		0.007	0.010
VANADIUM (V) DISS			0.020		0.006	0.014
ZINC (ZN) DISS	0.020	0.050	0.014	0.085	0.025	0.001
OTHER PARAMETERS						
SILICA (SI)			9.45		10.82	4.79

ALL QUANTITIES IN MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED
BLANK LINE INDICATES PARAMETER NOT TESTED

SUMMARY OF SURFACE WATER QUALITY SAMPLING - ASARCO - EAST HELENA

SAMPLING SITE	SEEP-1	SEEP-1	SEEP-1	SEEP-1	SEEP-1	SEEP-1	SEEP-1	SEEP-1	SEEP-1	SEEP-1
SAMPLE DATE	06/11/80	07/16/80	10/02/80	11/19/80	12/17/80	03/23/81	04/27/81	07/03/81	06/20/83	07/29/83
DESCRIPTION	N OF MID OF	N OF MID OF	N OF MID OF	N OF MID OF	N OF MID OF	N OF MID OF	N OF MID OF	N OF MID OF	N OF MID OF	N OF MID OF
DESCRIPTION	SLAG PILE	SLAG PILE	SLAG PILE	SLAG PILE	SLAG PILE	SLAG PILE	SLAG PILE	SLAG PILE	SLAG PILE	SLAG PILE
LAB	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO
PHYSICAL PARAMETERS										
WATER TEMPERATURE (C)	13	28	12	6.2	5.0	8.0	20	18		
SPEC. COND. (UMHOS/CM) LAB	1400	1750	2100	1400	1000	1050	1400	1000		
PH LAB	7.6	8.8	8.2	7.2	7.9	8.5	8.5	8.4		
TOTAL DISS. SOLIDS MEAS.	1570	1530	2074	1710	1247	1217	1330			
TRACE ELEMENTS										
ARSENIC (AS) TOTAL	40		15	33	43	32	28	20	4.3	14
ARSENIC (AS) DISS	40	0.040	15	27	28	30	23		4.0	14
CADMIUM (CD) TOTAL	0.007		0.001	0.003	<0.002	0.008	0.003	<0.002	<0.004	0.003
CADMIUM (CD) DISS	<0.003	0.003	<0.001	0.002	<0.002	0.003	0.003		<0.004	0.003
COPPER (CU) TOTAL									0.035	0.058
COPPER (CU) DISS									0.025	0.038
LEAD (PB) TOTAL	0.47		0.040	0.17	0.080	0.13	0.10	0.050	0.050	0.080
LEAD (PB) DISS	0.050	0.070	0.010	0.17	0.050	0.050	0.050		0.030	0.080
MERCURY (HG) TOTAL	0.001		<0.001	<0.001	<0.001	<0.001	0.001			
SELENIUM (SE) TOTAL	0.19		<0.004	0.14	0.016	0.095	0.11			
ZINC (ZN) TOTAL	0.35		0.050	0.10	0.12	0.22	0.12	0.030	0.050	0.033
ZINC (ZN) DISS	0.080	0.15	0.040	0.080	0.10	0.12	0.080		0.030	0.033

ALL QUANTITIES IN MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED
BLANK LINE INDICATES PARAMETER NOT TESTED

SUMMARY OF SURFACE WATER QUALITY SAMPLING - ASARCO - EAST HELENA

SAMPLING SITE	SEEP-2
SAMPLE DATE	06/11/80
DESCRIPTIONN	OF NE EDGE
DESCRIPTION	SLAG PILE
PHYSICAL PARAMETERS	
WATER TEMPERATURE (C)	14
SPEC. COND. (UMHOS/CM) LAB	1790
PH LAB	9.9
TOTAL DISS. SOLIDS MEAS.	1665
TRACE ELEMENTS	
ARSENIC (AS) TOTAL	29
ARSENIC (AS) DISS	29
CADMIUM (CD) TOTAL	0.007
CADMIUM (CD) DISS	<0.003
LEAD (PB) TOTAL	0.28
LEAD (PB) DISS	0.070
MERCURY (HG) TOTAL	0.001
SELENIUM (SE) TOTAL	0.22
ZINC (ZN) TOTAL	0.22
ZINC (ZN) DISS	0.050

ALL QUANTITIES IN MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED
BLANK LINE INDICATES PARAMETER NOT TESTED

APPENDIX 2

ASARCO PLANT AREA SURFACE WATER QUALITY DATA

SUMMARY OF SURFACE WATER QUALITY SAMPLING - ASARCO - EAST HELENA

SAMPLING SITE	PPC-1	PPC-1	PPC-1	PPC-1	PPC-1	PPC-1	PPC-1	PPC-1	PPC-1	PPC-1
SAMPLE DATE	05/07/80	06/10/80	07/16/80	08/13/80	10/02/80	11/19/80	12/16/80	01/15/81	03/23/81	04/27/81
LOCATION	09N03W	09N03W	09N03W	09N03W	09N03W	09N03W	09N03W	09N03W	09N03W	09N03W
LOCATION	23CAA	23CAA	23CAA	23CAA	23CAA	23CAA	23CAA	23CAA	23CAA	23CAA
DESCRIPTION	AT GAGING	AT GAGING	AT GAGING	AT GAGING	AT GAGING	AT GAGING	AT GAGING	AT GAGING	AT GAGING	AT GAGING
DESCRIPTION	STATION	STATION	STATION	STATION	STATION	STATION	STATION	STATION	STATION	STATION
LAB	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO
PHYSICAL PARAMETERS										
WATER TEMPERATURE (C)		11	13	12	6.0	1.0	2.5		7.0	7.0
SPEC. COND. (UMHOS/CM) LAB		117	193	245	270	175	160		215	128
PH LAB	6.6	7.2	7.2	7.4	7.8	7.8	7.1		7.3	7.4
TOTAL DISS. SOLIDS MEAS.	91	194	334	351		328	252	450	287	182
TRACE ELEMENTS										
ARSENIC (AS) TOTAL	0.033	0.008		0.014	0.22	0.022	0.008	0.014	0.010	0.020
ARSENIC (AS) DISS	0.019	0.006	0.012	0.13		0.019	0.006	0.007	0.007	<0.004
CADMIUM (CD) TOTAL	0.004	<0.003		0.003	<0.001	0.010	<0.002	0.003	<0.002	0.002
CADMIUM (CD) DISS	0.002	<0.003	0.003	<0.001		0.002	<0.002	0.003	<0.002	0.002
LEAD (PB) TOTAL	0.10	0.050		0.050	<0.010	0.83	0.050	0.080	0.030	0.050
LEAD (PB) DISS	0.020	0.030	0.030	<0.010		0.22	0.020	0.030	0.030	0.020
MERCURY (HG) TOTAL	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
SELENIUM (SE) TOTAL	<0.004	<0.010		<0.004		<0.004	<0.010	0.026	0.007	<0.004
ZINC (ZN) TOTAL	0.48	0.28		0.65	0.51	1.5	0.32	0.42	0.33	0.40
ZINC (ZN) DISS	0.12	0.30	0.48	0.45		0.53	0.26	0.28	0.28	0.20

ALL QUANTITIES IN MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED
BLANK LINE INDICATES PARAMETER NOT TESTED

00812257

SUMMARY OF SURFACE WATER QUALITY SAMPLING - ASARCO - EAST HELENA

SAMPLING SITE	PPC-1	PPC-1	PPC-1	PPC-1	PPC-1	PPC-1	PPC-1	PPC-1	PPC-1	PPC-1
SAMPLE DATE	07/03/81	11/30/82	12/31/82	02/18/83	02/25/83	04/18/83	04/25/83	06/20/83	07/29/83	08/31/83
LOCATION	09N03W	09N03W	09N03W	09N03W	09N03W	09N03W	09N03W	09N03W	09N03W	09N03W
LOCATION	23CAA	23CAA	23CAA	23CAA	23CAA	23CAA	23CAA	23CAA	23CAA	23CAA
DESCRIPTION	AT GAGING	AT GAGING	AT GAGING	AT GAGING	AT GAGING	AT GAGING	AT GAGING	AT GAGING	AT GAGING	AT GAGING
DESCRIPTION	STATION	STATION	STATION	STATION	STATION	STATION	STATION	STATION	STATION	STATION
LAB	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO
PHYSICAL PARAMETERS										
WATER TEMPERATURE (C)	19									
SPEC. COND. (UMHOS/CM) LAB	180									
PH LAB	8.0									
TOTAL DISS. SOLIDS MEAS.	285									
TRACE ELEMENTS										
ARSENIC (AS) TOTAL	0.017	0.011	0.015	0.049	0.017	0.012	0.010	0.052	0.007	0.014
ARSENIC (AS) DISS	0.016									
CADMIUM (CD) TOTAL	0.002	<0.004	<0.003	<0.004	<0.004	<0.003	<0.004	<0.004	<0.003	<0.004
CADMIUM (CD) DISS	0.002									
COPPER (CU) TOTAL		0.017	0.010	0.008	0.008	0.015	0.027	0.047	0.012	0.013
LEAD (PB) TOTAL	0.030	0.030	0.030	0.050	0.030	0.030	0.050	0.12	0.020	<0.030
LEAD (PB) DISS	0.030									
MERCURY (HG) TOTAL	<0.001									
SELENIUM (SE) TOTAL	<0.004									
ZINC (ZN) TOTAL	0.27	0.27	0.42	0.17	0.17	0.18	0.15	0.30	0.080	0.080
ZINC (ZN) DISS	0.18									

ALL QUANTITIES IN MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED
BLANK LINE INDICATES PARAMETER NOT TESTED

SUMMARY OF SURFACE WATER QUALITY SAMPLING - ASARCO - EAST HELENA

SAMPLING SITE	PPC-1	PPC-1A	PPC-1A	PPC-1A	PPC-2	PPC-2	PPC-2	PPC-2	PPC-2	PPC-2
SAMPLE DATE	09/29/83	11/30/79	05/15/80	05/26/81	05/07/80	06/10/80	07/16/80	08/13/80	10/02/80	11/19/80
LOCATION	09N03W	09N03W	09N03W	09N03W	09N02W	09N02W	09N02W	09N02W	09N02W	09N02W
LOCATION	23CAA	13BAD	13BAD	13BAD	07BCC	07BCC	07BCC	07BCC	07BCC	07BCC
DESCRIPTION	AT GAGING	ABV KAISER	ABV KAISER	ABV KAISER	BLW KAISER	BLW KAISER	BLW KAISER	BLW KAISER	BLW KAISER	BLW KAISER
DESCRIPTION	STATION	PLANT	PLANT	PLANT	PLANT	PLANT	PLANT	PLANT	PLANT	PLANT
LAB	ASARCO	WQB	WQB	WQB	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO
PHYSICAL PARAMETERS										
FLOW (CFS)		13.9	141.7							
WATER TEMPERATURE (C)		0.0	8.0			11	13	12	6.0	-0.50
SPEC. COND. (UMHOS/CM) LAB		371.2	178.0	220.0		117	215	258	290	185
PH FIELD		7.95								
PH LAB		7.99	9.30	7.53	6.8	7.2	7.5	7.4	7.8	7.6
TURBIDITY (NTU) LAB		1.0	8.0							
TOTAL SUSP. SOLIDS		7.3	56.2							
TOTAL DISS. SOLIDS MEAS.		272.8			92	192	331	345	348	63
SODIUM ADSORPTION RATIO		0.7								
COMMON IONS										
TOTAL HARDNESS AS CACO3		139	57	97						
CALCIUM (CA)		39.5	18.7	28.0						
MAGNESIUM (MG)		9.9	2.6	6.5						
SODIUM (NA)		18.1								
POTASSIUM (K)		2.3								
ALKALINITY AS CACO3 (LAB)		102	37	44						
BICARBONATE (HCO3) (LAB)		124.4	45.1	53.7						
CARBONATE AS CO3 (LAB)		0.0	0.0	0.0						
SULFATE (SO4)		74.0	38.2	51.0						
CHLORIDE (CL)		3.7								
FLUORIDE (F)		0.50								
NUTRIENTS										
AMMONIA (NH4-N)		0.02	<0.01							
NITRATE + NITRITE AS N		0.34	0.15							
KJELDAHL NITROGEN AS N (TOTAL)		0.17	0.73							
ORTHO-PHOSPHATE (PO4-P)		0.012	0.057							
PHOSPHORUS (P) TOTAL		0.02	0.083							
CATION AND ANION BALANCE										
TOTAL CATIONS (MEQ/L)		3.632	1.147	1.932						
TOTAL ANIONS (MEQ/L)		3.736	1.551	1.942						
PERCENT DIFFERENCE		-	-	-						
TRACE ELEMENTS										
ARSENIC (AS) TOTAL	0.009				0.12	0.012			0.093	0.029

ALL QUANTITIES IN MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED
BLANK LINE INDICATES PARAMETER NOT TESTED

SUMMARY OF SURFACE WATER QUALITY SAMPLING - ASARCO - EAST HELENA

SAMPLING SITE	PPC-1	PPC-1A	PPC-1A	PPC-1A	PPC-2	PPC-2	PPC-2	PPC-2	PPC-2	PPC-2
SAMPLE DATE	09/29/83	11/30/79	05/15/80	05/26/81	05/07/80	06/10/80	07/16/80	08/13/80	10/02/80	11/19/80
TRACE ELEMENTS										
ARSENIC (AS) DISS			0.004	0.007	0.024	<0.006	0.012	0.014	0.019	0.015
ARSENIC (AS) TOTAL REC.		0.006	0.014	0.78						
CADMIUM (CD) TOTAL	<0.004				0.004	<0.003			<0.001	0.005
CADMIUM (CD) DISS				<0.005	0.002	<0.003	0.002	0.005	<0.001	0.002
CADMIUM (CD) TOTAL REC.				0.005						
COPPER (CU) TOTAL	0.006									
COPPER (CU) DISS			<0.01	0.01						
COPPER (CU) TOTAL REC.		<0.01	0.01	0.07						
IRON (FE) DISS			0.18	0.03						
IRON (FE) TOTAL REC.		0.12	1.70	1.5						
LEAD (PB) TOTAL	<0.030				0.14	0.030			0.010	0.030
LEAD (PB) DISS			<0.05	<0.05	0.040	0.030	0.030	0.030	0.030	0.050
LEAD (PB) TOTAL REC.		<0.05	<0.05	0.41						
MANGANESE (MN) DISS			0.47	0.15						
MANGANESE (MN) TOTAL REC.		0.10	0.65	0.88						
MERCURY (HG) TOTAL					<0.001	<0.001				<0.001
MERCURY (HG) DISS									<0.001	
MERCURY (HG) TOTAL REC.		<0.0002								
SELENIUM (SE) TOTAL					0.005	<0.004				<0.004
SELENIUM (SE) DISS									<0.004	
ZINC (ZN) TOTAL	0.13				0.72	0.25			0.44	0.93
ZINC (ZN) DISS			0.36	0.07	0.16	0.23	0.33	0.53	0.39	0.55
ZINC (ZN) TOTAL REC.		0.15	0.57	0.66						
LOADINGS										
ARSENIC (LBS/DAY)		0	11							

ALL QUANTITIES IN MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED
BLANK LINE INDICATES PARAMETER NOT TESTED

0081260

SUMMARY OF SURFACE WATER QUALITY SAMPLING - ASARCO - EAST HELENA

SAMPLING SITE	PPC-2	PPC-2	PPC-2	PPC-2	PPC-2	PPC-2	PPC-2	PPC-2	PPC-2	PPC-2
SAMPLE DATE	12/16/80	01/15/81	03/23/81	04/27/81	07/03/81	07/20/81	11/30/82	12/31/82	02/18/83	02/25/83
LOCATION	09N02W	09N02W	09N02W	09N02W	09N02W	09N02W	09N02W	09N02W	09N02W	09N02W
LOCATION	07BCC	07BCC	07BCC	07BCC	07BCC	07BCC	07BCC	07BCC	07BCC	07BCC
DESCRIPTION	BLW KAISER	BLW KAISER	BLW KAISER	BLW KAISER	BLW KAISER	BLW KAISER	BLW KAISER	BLW KAISER	BLW KAISER	BLW KAISER
DESCRIPTION	PLANT	PLANT	PLANT	PLANT	PLANT	PLANT	PLANT	PLANT	PLANT	PLANT
LAB	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	WQB	ASARCO	ASARCO	ASARCO	ASARCO
PHYSICAL PARAMETERS										
WATER TEMPERATURE (C)	2.6		6.5	7.8	19					
SPEC. COND. (UMHOS/CM) LAB	170		220	132	270					
PH LAB	7.8		7.6	7.4	7.9					
TOTAL DISS. SOLIDS MEAS.	267	275	300	201	389					
TRACE ELEMENTS										
ARSENIC (AS) TOTAL	0.011	0.030	0.022	0.018	0.019		0.012	0.012	0.11	0.009
ARSENIC (AS) DISS	0.008	0.017	0.006	<0.004	0.009					
ARSENIC (AS) TOTAL REC.						0.003				
CADMIUM (CD) TOTAL	<0.002	0.005	<0.002	<0.002	<0.002		<0.004	<0.003	0.005	<0.004
CADMIUM (CD) DISS	<0.002	0.005	<0.002	<0.002	<0.002					
CADMIUM (CD) TOTAL REC.						<0.005				
COPPER (CU) TOTAL							<0.008	<0.008	0.008	0.005
LEAD (PB) TOTAL	0.030	0.15	0.030	0.070	0.030		0.050	0.020	0.030	0.030
LEAD (PB) DISS	0.030	0.050	0.020	0.020	0.020					
LEAD (PB) TOTAL REC.						<0.05				
MERCURY (HG) TOTAL	<0.001	<0.001	<0.001	<0.001	<0.001					
SELENIUM (SE) TOTAL	<0.010	0.011	0.007	<0.004	<0.004					
ZINC (ZN) TOTAL	0.33	0.43	0.30	0.40	0.27		0.13	0.15	0.18	0.12
ZINC (ZN) DISS	0.28	0.25	0.23	0.18	0.15					

ALL QUANTITIES IN MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED
BLANK LINE INDICATES PARAMETER NOT TESTED

00812261

SUMMARY OF SURFACE WATER QUALITY SAMPLING - ASARCO - EAST HELENA

SAMPLING SITE	PPC-2	PPC-2	PPC-2	PPC-2	PPC-2	PPC-2	PPC-3	PPC-3	PPC-3	PPC-3
SAMPLE DATE	04/18/83	04/25/83	06/20/83	07/29/83	08/31/83	09/29/83	04/07/78	04/15/78	04/29/78	05/13/78
LOCATION	09N02W	09N02W	09N02W	09N02W	09N02W	09N02W	09N02W	09N02W	09N02W	09N02W
LOCATION	07BCC	07BCC	07BCC	07BCC	07BCC	07BCC	06BCB	06BCB	06BCB	06BCB
DESCRIPTION	BLW KAISER	BLW KAISER	BLW KAISER	BLW KAISER	BLW KAISER	BLW KAISER	AT KLEFFNER	AT KLEFFNER	AT KLEFFNER	AT KLEFFNER
DESCRIPTION	PLANT	PLANT	PLANT	PLANT	PLANT	PLANT	RANCH	RANCH	RANCH	RANCH
LAB	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO
TRACE ELEMENTS										
ARSENIC (AS) TOTAL	0.008	0.008	0.049	0.009	0.014	0.009	0.008	0.008	0.009	0.024
CADMIUM (CD) TOTAL	<0.003	<0.004	<0.004	<0.003	<0.004	<0.004	0.003	0.003	0.005	0.005
COPPER (CU) TOTAL	0.010	0.013	0.037	0.008	0.013	0.008				
LEAD (PB) TOTAL	<0.020	0.050	0.13	0.020	0.030	0.030	0.050	0.050	0.050	0.080
ZINC (ZN) TOTAL	0.15	0.12	0.35	0.075	0.10	0.10				

ALL QUANTITIES IN MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED
BLANK LINE INDICATES PARAMETER NOT TESTED

SUMMARY OF SURFACE WATER QUALITY SAMPLING - ASARCO - EAST HELENA

SAMPLING SITE	PPC-3	PPC-3	PPC-3	PPC-3	PPC-3	PPC-3	PPC-3	PPC-3	PPC-3	PPC-3
SAMPLE DATE	05/27/78	06/09/78	07/07/78	07/21/78	08/04/78	08/18/78	09/01/78	09/15/78	09/29/78	10/13/78
LOCATION	09N02W	09N02W	09N02W	09N02W	09N02W	09N02W	09N02W	09N02W	09N02W	09N02W
LOCATION	06BCB	06BCB	06BCB	06BCB	06BCB	06BCB	06BCB	06BCB	06BCB	06BCB
DESCRIPTION	AT KLEFFNER	AT KLEFFNER	AT KLEFFNER	AT KLEFFNER	AT KLEFFNER	AT KLEFFNER	AT KLEFFNER	AT KLEFFNER	AT KLEFFNER	AT KLEFFNER
DESCRIPTION	RANCH	RANCH	RANCH	RANCH	RANCH	RANCH	RANCH	RANCH	RANCH	RANCH
LAB	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO
TRACE ELEMENTS										
ARSENIC (AS) TOTAL	0.013	0.011	<0.004	<0.004	0.011	0.012	0.006	0.010	0.007	<0.004
CADMIUM (CD) TOTAL	<0.002	0.002	0.005	<0.002	<0.002	0.002	0.003	0.003	0.003	<0.002
LEAD (PB) TOTAL	0.080	0.050	0.030	0.030	0.017	0.070	0.12	0.050	0.050	0.020

ALL QUANTITIES IN MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED
BLANK LINE INDICATES PARAMETER NOT TESTED

SUMMARY OF SURFACE WATER QUALITY SAMPLING - ASARCO - EAST HELENA

SAMPLING SITE	PPC-3	PPC-3	PPC-3	PPC-3	PPC-3	PPC-3	PPC-3	PPC-3	PPC-3	PPC-3
SAMPLE DATE	10/27/78	11/24/78	12/08/78	01/04/79	01/19/79	02/01/79	02/20/79	03/16/79	04/06/79	04/20/79
LOCATION	09N02W	09N02W	09N02W	09N02W	09N02W	09N02W	09N02W	09N02W	09N02W	09N02W
LOCATION	06BCB	06BCB	06BCB	06BCB	06BCB	06BCB	06BCB	06BCB	06BCB	06BCB
DESCRIPTION	AT KLEFFNER	AT KLEFFNER	AT KLEFFNER	AT KLEFFNER	AT KLEFFNER	AT KLEFFNER	AT KLEFFNER	AT KLEFFNER	AT KLEFFNER	AT KLEFFNER
DESCRIPTION	RANCH	RANCH	RANCH	RANCH	RANCH	RANCH	RANCH	RANCH	RANCH	RANCH
LAB	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO
TRACE ELEMENTS										
ARSENIC (AS) TOTAL	0.008	0.020	0.011	0.013	0.006	<0.008	0.006	0.008	0.009	0.012
CADMIUM (CD) TOTAL	0.003	0.012	0.008	<0.002	<0.002	<0.002	0.005	0.002	<0.003	0.003
LEAD (PB) TOTAL	0.080	0.31	0.28	0.020	0.020	<0.020	0.050	0.020	<0.025	0.050

ALL QUANTITIES IN MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED
BLANK LINE INDICATES PARAMETER NOT TESTED

SUMMARY OF SURFACE WATER QUALITY SAMPLING - ASARCO - EAST HELENA

SAMPLING SITE	PPC-3	PPC-3	PPC-3	PPC-3	PPC-3	PPC-3	PPC-3	PPC-3	PPC-3	PPC-3
SAMPLE DATE	05/16/79	07/20/79	08/03/79	08/17/79	09/17/79	10/05/79	10/15/79	10/19/79	11/02/79	11/30/79
LOCATION	09N02W	09N02W	09N02W	09N02W	09N02W	09N02W	09N02W	09N02W	09N02W	09N02W
LOCATION	06BCB	06BCB	06BCB	06BCB	06BCB	06BCB	06BCB	06BCB	06BCB	06BCB
DESCRIPTION	AT KLEFFNER	AT KLEFFNER	AT KLEFFNER	AT KLEFFNER	AT KLEFFNER	AT KLEFFNER	AT KLEFFNER	AT KLEFFNER	AT KLEFFNER	AT KLEFFNER
DESCRIPTION	RANCH	RANCH	RANCH	RANCH	RANCH	RANCH	RANCH	RANCH	RANCH	RANCH
LAB	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO
TRACE ELEMENTS										
ARSENIC (AS) TOTAL	0.022	0.060	0.004	0.008	0.009	0.011	0.054	0.008	0.008	0.008
CADMIUM (CD) TOTAL	0.003	0.003	<0.001	<0.002	<0.002	<0.002	0.005	<0.002	<0.002	0.002
LEAD (PB) TOTAL	0.080	0.030	0.030	0.030	0.030	0.030	0.070	<0.020	<0.020	0.030

ALL QUANTITIES IN MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED
BLANK LINE INDICATES PARAMETER NOT TESTED

SUMMARY OF SURFACE WATER QUALITY SAMPLING - ASARCO - EAST HELENA

SAMPLING SITE	PPC-3	PPC-3	PPC-3	PPC-3	PPC-3	PPC-3	PPC-3	PPC-3	PPC-3	PPC-3
SAMPLE DATE	12/14/79	12/18/79	01/25/80	02/08/80	02/22/80	03/02/80	03/07/80	04/07/80	04/18/80	05/07/80
LOCATION	09N02W	09N02W	09N02W	09N02W	09N02W	09N02W	09N02W	09N02W	09N02W	09N02W
LOCATION	06BCB	06BCB	06BCB	06BCB	06BCB	06BCB	06BCB	06BCB	06BCB	06BCB
DESCRIPTION	AT KLEFFNER	AT KLEFFNER	AT KLEFFNER	AT KLEFFNER	AT KLEFFNER	AT KLEFFNER	AT KLEFFNER	AT KLEFFNER	AT KLEFFNER	AT KLEFFNER
DESCRIPTION	RANCH	RANCH	RANCH	RANCH	RANCH	RANCH	RANCH	RANCH	RANCH	RANCH
LAB	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO
PHYSICAL PARAMETERS										
PH LAB										7.0
TOTAL DISS. SOLIDS MEAS.										109
TRACE ELEMENTS										
ARSENIC (AS) TOTAL	0.010	0.006	<0.005	0.011	0.009	0.007	0.010	<0.006	0.007	0.092
ARSENIC (AS) DISS										0.016
CADMIUM (CD) TOTAL	0.002	<0.002	0.003	<0.002	0.002	0.002	<0.002	<0.002	<0.002	0.002
CADMIUM (CD) DISS										0.002
LEAD (PB) TOTAL	0.030	0.030	0.030	0.050	0.030	0.020	0.030	0.020	0.050	0.12
LEAD (PB) DISS										0.040
MERCURY (HG) TOTAL								<0.001	<0.001	<0.001
SELENIUM (SE) TOTAL										<0.004
ZINC (ZN) TOTAL			0.070	0.20	0.62	0.20	0.18	0.12	0.30	0.52
ZINC (ZN) DISS										0.12

ALL QUANTITIES IN MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED
BLANK LINE INDICATES PARAMETER NOT TESTED

0081266

SUMMARY OF SURFACE WATER QUALITY SAMPLING - ASARCO - EAST HELENA

SAMPLING SITE	PPC-3	PPC-3	PPC-3	PPC-3	PPC-3	PPC-3	PPC-3	PPC-3	PPC-3	PPC-3
SAMPLE DATE	06/10/80	07/16/80	08/13/80	10/02/80	11/19/80	12/16/80	01/15/81	03/23/81	04/27/81	07/03/81
LOCATION	09N02W	09N02W	09N02W	09N02W	09N02W	09N02W	09N02W	09N02W	09N02W	09N02W
LOCATION	06BCB	06BCB	06BCB	06BCB	06BCB	06BCB	06BCB	06BCB	06BCB	06BCB
DESCRIPTION	AT KLEFFNER	AT KLEFFNER	AT KLEFFNER	AT KLEFFNER	AT KLEFFNER	AT KLEFFNER	AT KLEFFNER	AT KLEFFNER	AT KLEFFNER	AT KLEFFNER
DESCRIPTION	RANCH	RANCH	RANCH	RANCH	RANCH	RANCH	RANCH	RANCH	RANCH	RANCH
LAB	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO
PHYSICAL PARAMETERS										
WATER TEMPERATURE (C)	12	13	13	6.5	0.0	2.9		7.0	6.0	18
SPEC. COND. (UMHOS/CM) LAB	106	205	250	278	160	168		212	120	255
PH LAB	7.2	7.8	7.5	7.8	7.7	7.5		7.5	7.3	7.8
TOTAL DISS. SOLIDS MEAS.	200	332	330	354	326	240	273	299	187	292
TRACE ELEMENTS										
ARSENIC (AS) TOTAL	0.012			0.040	0.009	0.010	0.17	0.017	0.014	0.016
ARSENIC (AS) DISS	0.012	<0.006	0.008	0.028	0.015	0.010	0.009	0.007	0.007	0.016
CADMIUM (CD) TOTAL	<0.003			<0.001	<0.002	<0.002	0.005	<0.002	0.003	<0.002
CADMIUM (CD) DISS	<0.003	0.002	<0.002	<0.001	0.002	<0.002	0.005	<0.002	0.003	<0.002
LEAD (PB) TOTAL	0.030			<0.010	0.020	0.10	0.12	0.030	0.050	0.050
LEAD (PB) DISS	0.020	0.030	0.020	<0.010	0.030	0.030	0.070	0.020	0.020	0.020
MERCURY (HG) TOTAL	<0.001				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
MERCURY (HG) DISS				<0.001						
SELENIUM (SE) TOTAL	<0.004				<0.004	<0.010	<0.004	<0.004	<0.004	<0.004
SELENIUM (SE) DISS				<0.004						
ZINC (ZN) TOTAL	0.18			0.35	0.48	0.30	0.40	0.27	0.30	0.20
ZINC (ZN) DISS	0.18	0.27	0.38	0.28	0.47	0.22	0.23	0.22	0.15	0.10

ALL QUANTITIES IN MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED
BLANK LINE INDICATES PARAMETER NOT TESTED

0081267

SUMMARY OF SURFACE WATER QUALITY SAMPLING - ASARCO - EAST HELENA

SAMPLING SITE	PPC-3	PPC-3	PPC-3	PPC-3	PPC-3	PPC-3	PPC-3	PPC-3	PPC-3	PPC-3
SAMPLE DATE	10/14/82	11/20/82	11/30/82	12/31/82	02/18/83	02/25/83	04/18/83	04/25/83	06/20/83	07/29/83
LOCATION	09N02W	09N02W	09N02W	09N02W	09N02W	09N02W	09N02W	09N02W	09N02W	09N02W
LOCATION	06BCB	06BCB	06BCB	06BCB	06BCB	06BCB	06BCB	06BCB	06BCB	06BCB
DESCRIPTION	AT KLEFFNER	AT KLEFFNER	AT KLEFFNER	AT KLEFFNER	AT KLEFFNER	AT KLEFFNER	AT KLEFFNER	AT KLEFFNER	AT KLEFFNER	AT KLEFFNER
DESCRIPTION	RANCH	RANCH	RANCH	RANCH	RANCH	RANCH	RANCH	RANCH	RANCH	RANCH
LAB	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO
TRACE ELEMENTS										
ARSENIC (AS) TOTAL	0.017	0.009	0.008	0.010	0.008	0.018	0.003	0.011	0.016	0.29
CADMIUM (CD) TOTAL	<0.003	<0.003	<0.004	<0.003	<0.004	<0.004	<0.003	<0.004	<0.004	<0.003
COPPER (CU) TOTAL	0.012	0.008	0.008	<0.008	0.005	0.007	0.007	0.012	0.020	0.015
LEAD (PB) TOTAL	0.030	<0.020	0.030	0.020	0.030	0.050	<0.020	0.050	0.080	0.020
MERCURY (HG) TOTAL			<0.50							
MERCURY (HG) DISS			<0.50							
ZINC (ZN) TOTAL	0.18	0.15	0.10	0.12	0.13	0.080	0.12	0.10	0.17	0.053

ALL QUANTITIES IN MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED
BLANK LINE INDICATES PARAMETER NOT TESTED

SUMMARY OF SURFACE WATER QUALITY SAMPLING - ASARCO - EAST HELENA

SAMPLING SITE	PPC-3	PPC-3	PPC-4	PPC-4	PPC-4	PPC-4	PPC-4	PPC-4	PPC-4	PPC-4
SAMPLE DATE	08/31/83	09/29/83	05/07/80	06/10/80	07/16/80	08/13/80	10/02/80	11/19/80	12/16/80	01/15/81
LOCATION	09N02W	09N02W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W
LOCATION	06BCB	06BCB	36DAD	36DAD	36DAD	36DAD	36DAD	36DAD	36DAD	36DAD
DESCRIPTION	AT KLEFFNER	AT KLEFFNER	AT	AT	AT	AT	AT	AT	AT	AT
DESCRIPTION	RANCH	RANCH	DIVERSION	DIVERSION	DIVERSION	DIVERSION	DIVERSION	DIVERSION	DIVERSION	DIVERSION
LAB	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO
PHYSICAL PARAMETERS										
WATER TEMPERATURE (C)				12	14	13	7.3	0.20	2.9	
SPEC. COND. (UMHOS/CM) LAB				110	182	252	282	178	169	
PH LAB			7.1	7.3	7.6	7.6	7.8	7.7	7.5	
TOTAL DISS. SOLIDS MEAS.			97	166	316	339	344	323	267	274
TRACE ELEMENTS										
ARSENIC (AS) TOTAL	0.040	0.007	0.037	0.017				0.12	0.013	0.026
ARSENIC (AS) DISS			0.017	0.008	<0.006	<0.005	0.007	0.007	0.010	0.017
CADMIUM (CD) TOTAL	<0.004	<0.004	0.004	<0.003			<0.001	<0.002	<0.002	0.005
CADMIUM (CD) DISS			0.002	<0.003	<0.002	<0.002	<0.001	0.002	<0.002	0.005
COPPER (CU) TOTAL	0.008	0.010								
LEAD (PB) TOTAL	<0.030	<0.030	0.12	0.030			0.010	0.020	0.050	0.12
LEAD (PB) DISS			0.020	0.020	0.030	0.020	<0.010	0.050	0.070	0.12
MERCURY (HG) TOTAL			<0.001	<0.001				<0.001	<0.001	<0.001
MERCURY (HG) DISS							<0.001			
SELENIUM (SE) TOTAL			<0.004	<0.010			0.009	<0.004	<0.010	0.006
SELENIUM (SE) DISS							<0.004			
ZINC (ZN) TOTAL	0.080	0.080	0.58	0.23			0.33	0.48	0.35	0.37
ZINC (ZN) DISS			0.14	0.17	0.23	0.38	0.28	0.43	0.23	0.27

ALL QUANTITIES IN MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED
BLANK LINE INDICATES PARAMETER NOT TESTED

0081269

SUMMARY OF SURFACE WATER QUALITY SAMPLING - ASARCO - EAST HELENA

SAMPLING SITE	PPC-4	PPC-4	PPC-4	PPC-4	PPC-4	PPC-4	PPC-4	PPC-4	PPC-4	PPC-4
SAMPLE DATE	03/23/81	04/27/81	07/03/81	01/19/82	03/25/82	11/30/82	12/31/82	02/18/83	02/25/83	04/18/83
LOCATION	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W
LOCATION	36DAD	36DAD	36DAD	36DAD	36DAD	36DAD	36DAD	36DAD	36DAD	36DAD
DESCRIPTION	AT	AT	AT	AT	AT	AT	AT	AT	AT	AT
DESCRIPTION	DIVERSION	DIVERSION	DIVERSION	DIVERSION	DIVERSION	DIVERSION	DIVERSION	DIVERSION	DIVERSION	DIVERSION
LAB	ASARCO	ASARCO	ASARCO	WQB	WQB	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO
PHYSICAL PARAMETERS										
FLOW (CFS)				30	26.5					
WATER TEMPERATURE (C)	6.9	6.0	18	0.5	1.0					
SPEC. COND. (UMHOS/CM) LAB	210	122	190	362.0	378.0					
PH LAB	7.3	7.2	7.6	7.80	8.11					
TOTAL SUSP. SOLIDS					32.7					
TOTAL DISS. SOLIDS MEAS.	280	183	306							
COMMON IONS										
TOTAL HARDNESS AS CACO3				143						
CALCIUM (CA)				36.8						
MAGNESIUM (MG)				12.4						
CATION AND ANION BALANCE										
TOTAL CATIONS (MEQ/L)				2.856						
TRACE ELEMENTS										
ARSENIC (AS) TOTAL	0.013	0.018	0.017			0.061	0.011	0.082	0.010	0.051
ARSENIC (AS) DISS	0.011	<0.004	0.017		0.005					
ARSENIC (AS) TOTAL REC.				0.008	0.012					
CADMIUM (CD) TOTAL	<0.002	0.002	<0.002			<0.004	<0.003	<0.004	<0.004	0.005
CADMIUM (CD) DISS	<0.002	0.002	<0.002							
COPPER (CU) TOTAL						0.008	<0.008	0.005	0.007	0.084
COPPER (CU) DISS					0.01					
COPPER (CU) TOTAL REC.				0.01	0.02					
IRON (FE) DISS					<0.01					
IRON (FE) TOTAL REC.				0.41	0.45					
LEAD (PB) TOTAL	0.030	0.050	0.030			0.030	0.030	0.030	<0.030	0.27
LEAD (PB) DISS	0.020	0.030	0.020		<0.05					
LEAD (PB) TOTAL REC.				<0.05	<0.05					
MERCURY (HG) TOTAL	<0.001	<0.001	<0.001							
SELENIUM (SE) TOTAL	<0.004	<0.004	<0.004							
ZINC (ZN) TOTAL	0.25	0.28	0.20			0.10	0.12	0.12	0.080	0.12
ZINC (ZN) DISS	0.20	0.17	0.12		0.10					
ZINC (ZN) TOTAL REC.				0.11	0.19					
LOADINGS										
ARSENIC (LBS/DAY)				1	2					

ALL QUANTITIES IN MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED
BLANK LINE INDICATES PARAMETER NOT TESTED

SUMMARY OF SURFACE WATER QUALITY SAMPLING - ASARCO - EAST HELENA

SAMPLING SITE	PPC-4	PPC-4	PPC-4	PPC-4	PPC-4	PPC-4A	PPC-4B	PPC-5	PPC-5	PPC-5
SAMPLE DATE	04/25/83	06/20/83	07/29/83	08/31/83	09/29/83	10/26/82	10/26/82	04/07/78	04/15/78	04/29/78
LOCATION	10N03W	10N03W	•	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W
LOCATION	36DAD	36DAD		36DAD	36DAD	36DAD	36ADD	36ADD	36ADD	36ADD
DESCRIPTION	AT	AT		AT	AT	BLW	NEAR	AT SMELTER	AT SMELTER	AT SMELTER
DESCRIPTION	DIVERSION	DIVERSION		DIVERSION	DIVERSION	DIVERSION	O2 PLANT	DAM	DAM	DAM
LAB	ASARCO	ASARCO		ASARCO	ASARCO	WQB	WQB	ASARCO	ASARCO	ASARCO
PHYSICAL PARAMETERS										
FLOW (CFS)						70.1				
WATER TEMPERATURE (C)						3.5				
SPEC. COND. (UMHOS/CM) LAB						275.0				
COMMON IONS										
TOTAL HARDNESS AS CACO3						109				
CALCIUM (CA)						32.3				
MAGNESIUM (MG)						7.0				
SULFATE (SO4)						60.0				
CATION AND ANION BALANCE										
TOTAL CATIONS (MEQ/L)						2.188				
TOTAL ANIONS (MEQ/L)						1.249				
PERCENT DIFFERENCE						-				
TRACE ELEMENTS										
ARSENIC (AS) TOTAL	0.008	0.086	.020	0.011	0.008			0.012	0.009	0.015
ARSENIC (AS) DISS						0.005				
ARSENIC (AS) TOTAL REC.						0.006	0.006			
CADMIUM (CD) TOTAL	<0.004	<0.004	<.003	<0.004	<0.004			0.005	0.005	0.003
COPPER (CU) TOTAL	0.012	0.025	<.008	0.007	0.006					
LEAD (PB) TOTAL	0.030	0.080	.020	<0.030	<0.030			0.070	0.080	0.12
ZINC (ZN) TOTAL	0.10	0.22	.047	0.070	0.080					
ZINC (ZN) DISS						0.16				
ZINC (ZN) TOTAL REC.						0.14				
LOADINGS										
ARSENIC (LBS/DAY)						2				

ALL QUANTITIES IN MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED
BLANK LINE INDICATES PARAMETER NOT TESTED

0081271

SUMMARY OF SURFACE WATER QUALITY SAMPLING - ASARCO - EAST HELENA

SAMPLING SITE	PPC-5	PPC-5	PPC-5	PPC-5	PPC-5	PPC-5	PPC-5	PPC-5	PPC-5	PPC-5
SAMPLE DATE	05/13/78	05/27/78	06/09/78	07/07/78	07/21/78	08/04/78	08/18/78	09/01/78	09/15/78	09/29/78
LOCATION	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W
LOCATION	36ADD	36ADD	36ADD	36ADD	36ADD	36ADD	36ADD	36ADD	36ADD	36ADD
DESCRIPTION	AT SMELTER	AT SMELTER	AT SMELTER	AT SMELTER	AT SMELTER	AT SMELTER	AT SMELTER	AT SMELTER	AT SMELTER	AT SMELTER
DESCRIPTION	DAM	DAM	DAM	DAM	DAM	DAM	DAM	DAM	DAM	DAM
LAB	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO
TRACE ELEMENTS										
ARSENIC (AS) TOTAL	0.020	0.013	0.016	0.005	0.009	0.013	0.008	0.13	0.008	0.005
CADMIUM (CD) TOTAL	0.007	0.003	0.005	0.005	0.005	<0.002	0.002	0.007	0.005	0.007
LEAD (PB) TOTAL	0.12	0.12	0.27	0.070	0.080	0.050	0.050	0.12	0.080	0.050

ALL QUANTITIES IN MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED
BLANK LINE INDICATES PARAMETER NOT TESTED

SUMMARY OF SURFACE WATER QUALITY SAMPLING - ASARCO - EAST HELENA

SAMPLING SITE	PPC-5	PPC-5	PPC-5	PPC-5	PPC-5	PPC-5	PPC-5	PPC-5	PPC-5	PPC-5
SAMPLE DATE	10/13/78	10/27/78	11/24/78	12/08/78	01/04/79	01/19/79	02/01/79	02/20/79	03/16/79	04/06/79
LOCATION	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W
LOCATION	36ADD	36ADD	36ADD	36ADD	36ADD	36ADD	36ADD	36ADD	36ADD	36ADD
DESCRIPTION	AT SMELTER	AT SMELTER	AT SMELTER	AT SMELTER	AT SMELTER	AT SMELTER	AT SMELTER	AT SMELTER	AT SMELTER	AT SMELTER
DESCRIPTION	DAM	DAM	DAM	DAM	DAM	DAM	DAM	DAM	DAM	DAM
LAB	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO
TRACE ELEMENTS										
ARSENIC (AS) TOTAL	0.008	0.011	0.034	0.018	0.004	0.005	<0.008	0.014	<0.028	0.008
CADMIUM (CD) TOTAL	0.004	0.008	0.038	0.008	<0.002	<0.002	<0.002	0.005	0.008	<0.003
LEAD (PB) TOTAL	0.040	0.10	0.53	0.25	0.030	0.020	0.030	0.18	<0.020	0.025

ALL QUANTITIES IN MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED
BLANK LINE INDICATES PARAMETER NOT TESTED

SUMMARY OF SURFACE WATER QUALITY SAMPLING - ASARCO - EAST HELENA

SAMPLING SITE	PPC-5	PPC-5	PPC-5	PPC-5	PPC-5	PPC-5	PPC-5	PPC-5	PPC-5	PPC-5
SAMPLE DATE	04/20/79	05/16/79	07/20/79	08/03/79	08/17/79	09/17/79	10/05/79	10/19/79	11/02/79	11/30/79
LOCATION	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W
LOCATION	36ADD	36ADD	36ADD	36ADD	36ADD	36ADD	36ADD	36ADD	36ADD	36ADD
DESCRIPTION	AT SMELTER	AT SMELTER	AT SMELTER	AT SMELTER	AT SMELTER	AT SMELTER	AT SMELTER	AT SMELTER	AT SMELTER	AT SMELTER
DESCRIPTION	DAM	DAM	DAM	DAM	DAM	DAM	DAM	DAM	DAM	DAM
LAB	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO
TRACE ELEMENTS										
ARSENIC (AS) TOTAL	0.014	0.027	0.020	0.009	0.037	0.009	0.015	0.009	0.009	0.010
CADMIUM (CD) TOTAL	0.005	0.007	0.003	<0.001	0.002	<0.002	<0.002	<0.002	<0.002	0.002
LEAD (PB) TOTAL	0.080	0.20	0.080	0.070	0.080	0.050	0.030	0.050	0.020	0.020

ALL QUANTITIES IN MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED
BLANK LINE INDICATES PARAMETER NOT TESTED

SUMMARY OF SURFACE WATER QUALITY SAMPLING - ASARCO - EAST HELENA

SAMPLING SITE	PPC-5	PPC-5	PPC-5	PPC-5	PPC-5	PPC-5	PPC-5	PPC-5	PPC-5	PPC-5
SAMPLE DATE	12/14/79	12/18/79	01/25/80	02/08/80	02/22/80	03/02/80	03/07/80	04/07/80	04/18/80	05/07/80
LOCATION	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W
LOCATION	36ADD	36ADD	36ADD	36ADD	36ADD	36ADD	36ADD	36ADD	36ADD	36ADD
DESCRIPTION	AT SMELTER	AT SMELTER	AT SMELTER	AT SMELTER	AT SMELTER	AT SMELTER	AT SMELTER	AT SMELTER	AT SMELTER	AT SMELTER
DESCRIPTION	DAM	DAM	DAM	DAM	DAM	DAM	DAM	DAM	DAM	DAM
LAB	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO
PHYSICAL PARAMETERS										
PH LAB										6.9
TOTAL DISS. SOLIDS MEAS.										97
TRACE ELEMENTS										
ARSENIC (AS) TOTAL	0.012	0.008	<0.005	0.010	0.011	0.010	0.009	0.008	0.025	0.035
ARSENIC (AS) DISS										0.013
CADMIUM (CD) TOTAL	0.002	0.002	0.002	<0.002	<0.002	<0.002	0.003	<0.002	0.002	0.006
CADMIUM (CD) DISS										0.002
LEAD (PB) TOTAL	0.030	0.030	0.030	0.030	0.050	0.030	0.030	0.050	0.050	0.12
LEAD (PB) DISS										0.020
MERCURY (HG) TOTAL								<0.001	<0.001	<0.001
SELENIUM (SE) TOTAL										<0.004
ZINC (ZN) TOTAL			0.070	0.15	0.23	0.13	0.13	0.13	0.28	0.48
ZINC (ZN) DISS										0.12

ALL QUANTITIES IN MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED
BLANK LINE INDICATES PARAMETER NOT TESTED

SUMMARY OF SURFACE WATER QUALITY SAMPLING - ASARCO - EAST HELENA

SAMPLING SITE	PPC-5	PPC-5	PPC-5	PPC-5	PPC-5	PPC-5	PPC-5	PPC-5	PPC-5	PPC-5
SAMPLE DATE	06/10/80	07/16/80	08/13/80	10/02/80	11/19/80	12/16/80	01/15/81	03/23/81	04/27/81	07/03/81
LOCATION	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W
LOCATION	36ADD	36ADD	36ADD	36ADD	36ADD	36ADD	36ADD	36ADD	36ADD	36ADD
DESCRIPTION	AT SMELTER	AT SMELTER	AT SMELTER	AT SMELTER	AT SMELTER	AT SMELTER	AT SMELTER	AT SMELTER	AT SMELTER	AT SMELTER
DESCRIPTION	DAM	DAM	DAM	DAM	DAM	DAM	DAM	DAM	DAM	DAM
LAB	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO
PHYSICAL PARAMETERS										
WATER TEMPERATURE (C)	12	15	13	8.0	0.20	2.1		7.2	7.8	18
SPEC. COND. (UMHOS/CM) LAB	112	211	254	268	178	165		220	130	235
PH LAB	7.4	7.8	7.7	7.8	7.7	7.2		7.3	7.5	8.0
TOTAL DISS. SOLIDS MEAS.	177	332	309	329	334	262	280	293	188	294
TRACE ELEMENTS										
ARSENIC (AS) TOTAL	0.016			0.061	0.49	0.024	0.033	0.014	0.016	0.092
ARSENIC (AS) DISS	0.016	0.009	0.009	0.057	0.032	0.017	0.017	0.014	0.006	0.084
CADMIUM (CD) TOTAL	<0.003			<0.001	<0.002	<0.002	0.005	<0.002	0.002	<0.002
CADMIUM (CD) DISS	<0.003	<0.002	<0.002	<0.001	<0.002	<0.002	0.005	<0.002	0.002	<0.002
LEAD (PB) TOTAL	0.030			0.030	0.020	0.12	0.17	0.030	0.050	0.030
LEAD (PB) DISS	0.020	0.050	0.020	<.010	0.030	0.030	0.080	0.020	0.020	0.030
MERCURY (HG) TOTAL	<0.001				<0.001	<0.001	<0.001	<0.005	<0.001	<0.001
MERCURY (HG) DISS				<0.001						
SELENIUM (SE) TOTAL	<0.010				<0.004	0.016	0.021	<0.004	<0.004	<0.004
SELENIUM (SE) DISS				<0.004						
ZINC (ZN) TOTAL	0.18			0.31	0.43	0.33	0.35	0.22	0.27	0.20
ZINC (ZN) DISS	0.17	0.20	0.38	0.24	0.40	0.23	0.20	0.15	0.15	0.12

ALL QUANTITIES IN MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED
BLANK LINE INDICATES PARAMETER NOT TESTED

0081276

SUMMARY OF SURFACE WATER QUALITY SAMPLING - ASARCO - EAST HELENA

SAMPLING SITE	PPC-5	PPC-5	PPC-5	PPC-5	PPC-5	PPC-5	PPC-5	PPC-5	PPC-5	PPC-5
SAMPLE DATE	03/25/82	03/25/82	10/26/82	10/26/82	11/30/82	12/31/82	02/18/83	02/25/83	04/18/83	04/25/83
LOCATION	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W
LOCATION	36ADD	36ADD	36ADD	36ADD	36ADD	36ADD	36ADD	36ADD	36ADD	36ADD
DESCRIPTION	AT SMELTER	AT SMELTER	AT SMELTER	AT SMELTER	AT SMELTER	AT SMELTER	AT SMELTER	AT SMELTER	AT SMELTER	AT SMELTER
DESCRIPTION	DAM	DAM	DAM	DAM	DAM	DAM	DAM	DAM	DAM	DAM
LAB	WQB	WQB	WQB	WQB	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO
REMARKS	WEST BANK	EAST BANK	WEST BANK	EAST BANK						
PHYSICAL PARAMETERS										
WATER TEMPERATURE (C)	4.0	2.0	4.0	3.0						
SPEC. COND. (UMHOS/CM) LAB	377.0	378.0								
PH LAB	8.00	7.95								
TRACE ELEMENTS										
ARSENIC (AS) TOTAL					0.020	0.088	0.065	0.048	0.066	0.044
ARSENIC (AS) TOTAL REC.	0.29	0.46	0.032	0.019						
CADMIUM (CD) TOTAL					<0.004	<0.003	<0.004	<0.004	<0.003	<0.004
COPPER (CU) TOTAL					0.008	0.017	0.007	0.008	0.007	0.008
LEAD (PB) TOTAL					0.030	0.070	0.020	0.030	<0.020	0.030
ZINC (ZN) TOTAL					0.10	0.20	0.10	0.10	0.10	0.10

ALL QUANTITIES IN MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED
BLANK LINE INDICATES PARAMETER NOT TESTED

0081277

SUMMARY OF SURFACE WATER QUALITY SAMPLING - ASARCO - EAST HELENA

SAMPLING SITE	PPC-5	PPC-5	PPC-5	PPC-5	PPC-6	PPC-6	PPC-6	PPC-6	PPC-6	PPC-6
SAMPLE DATE	06/20/83	07/29/83	08/31/83	09/29/83	05/07/80	06/10/80	07/16/80	08/13/80	10/02/80	11/19/80
LOCATION	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W
LOCATION	36ADD	36ADD	36ADD	36ADD	36AAA	36AAA	36AAA	36AAA	36AAA	36AAA
DESCRIPTION	AT SMELTER	AT SMELTER	AT SMELTER	AT SMELTER	ABV NORTH	ABV NORTH	ABV NORTH	ABV NORTH	ABV NORTH	ABV NORTH
DESCRIPTION	DAM	DAM	DAM	DAM	SEEP	SEEP	SEEP	SEEP	SEEP	SEEP
LAB	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO
PHYSICAL PARAMETERS										
WATER TEMPERATURE (C)						12	15	13	8.0	0.20
SPEC. COND. (UMHOS/CM) LAB						112	210	253	272	180
PH LAB					7.0	6.9	7.9	7.7	7.6	7.8
TOTAL DISS. SOLIDS MEAS.					95	179	318	340	353	341
TRACE ELEMENTS										
ARSENIC (AS) TOTAL	0.020	0.030	0.021	0.010	0.032	0.017			<0.007	0.024
ARSENIC (AS) DISS					0.012	0.012	0.009	0.022	<0.007	0.039
CADMIUM (CD) TOTAL	<0.004	0.005	<0.004	<0.004	0.006	<0.003			<0.001	<0.002
CADMIUM (CD) DISS					0.004	<0.003	0.002	<0.002	<0.001	<0.002
COPPER (CU) TOTAL	0.028	0.010	0.010	0.008						
LEAD (PB) TOTAL	0.10	0.080	<0.030	<0.030	0.12	0.050			0.010	0.030
LEAD (PB) DISS					0.020	0.030	0.020	0.030	<0.010	0.020
MERCURY (HG) TOTAL					<0.001	<0.001				<0.001
MERCURY (HG) DISS									<0.001	
SELENIUM (SE) TOTAL					<0.004	<0.010				<0.004
SELENIUM (SE) DISS									<0.004	
ZINC (ZN) TOTAL	0.22	0.065	0.070	0.080	0.48	0.20			0.27	0.42
ZINC (ZN) DISS					0.12	0.15	0.22	0.37	0.23	0.40

ALL QUANTITIES IN MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED
BLANK LINE INDICATES PARAMETER NOT TESTED

0081278

SUMMARY OF SURFACE WATER QUALITY SAMPLING - ASARCO - EAST HELENA

SAMPLING SITE	PPC-6	PPC-6	PPC-6	PPC-6	PPC-6	PPC-6	PPC-6	PPC-6	PPC-6	PPC-6
SAMPLE DATE	12/16/80	01/15/81	03/23/81	04/27/81	07/03/81	01/19/82	03/25/82	10/26/82	11/30/82	12/31/82
LOCATION	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W
LOCATION	36AAA	36AAA	36AAA	36AAA	36AAA	36AAA	36AAA	36AAA	36AAA	36AAA
DESCRIPTION	ABV NORTH	ABV NORTH	ABV NORTH	ABV NORTH	ABV NORTH	ABV NORTH	ABV NORTH	ABV NORTH	ABV NORTH	ABV NORTH
DESCRIPTION	SEEP	SEEP	SEEP	SEEP	SEEP	SEEP	SEEP	SEEP	SEEP	SEEP
LAB	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	WQB	WQB	WQB	ASARCO	ASARCO
PHYSICAL PARAMETERS										
FLOW (CFS)							7.0	64.8		
WATER TEMPERATURE (C)	2.3		7.3	9.0	18		3.0	4.5		
SPEC. COND. (UMHOS/CM) LAB	170		220	130	260	379.0	382.0	276.0		
PH LAB	7.2		7.5	7.3	7.9	7.76	8.16			
TOTAL SUSP. SOLIDS							18.7			
TOTAL DISS. SOLIDS MEAS.	274	271	299	186	333					
COMMON IONS										
CALCIUM (CA)								32		
MAGNESIUM (MG)								6.8		
SULFATE (SO4)								60.0		
CATION AND ANION BALANCE										
TOTAL CATIONS (MEQ/L)								0.721		
TOTAL ANIONS (MEQ/L)								1.249		
PERCENT DIFFERENCE								-		
TRACE ELEMENTS										
ARSENIC (AS) TOTAL	0.036	0.030	0.020	0.023	0.087				0.024	0.10
ARSENIC (AS) DISS	0.026	0.026	0.020	<0.004	0.074		0.37	0.033		
ARSENIC (AS) TOTAL REC.						0.72	0.40	0.034		
CADMIUM (CD) TOTAL	<0.002	0.005	<0.002	0.002	<0.002				<0.004	<0.003
CADMIUM (CD) DISS	<0.002	0.005	<0.002	0.002	<0.002					
COPPER (CU) TOTAL									0.008	0.020
COPPER (CU) DISS							0.01			
COPPER (CU) TOTAL REC.						0.01	0.02			
IRON (FE) DISS							0.02			
IRON (FE) TOTAL REC.						0.82	0.45			
LEAD (PB) TOTAL	0.050	0.25	0.050	0.070	0.050				0.030	0.080
LEAD (PB) DISS	0.020	0.050	0.050	0.030	0.030		<0.05			
LEAD (PB) TOTAL REC.						<0.05	<0.05			
MERCURY (HG) TOTAL	<0.001	<0.001	<0.001	<0.001	<0.001					
SELENIUM (SE) TOTAL	<0.010	<0.004	<0.004	<0.004	<0.004					
ZINC (ZN) TOTAL	0.23	0.40	0.20	0.32	0.23				0.10	0.28
ZINC (ZN) DISS	0.23	0.23	0.17	0.15	0.10		0.14	0.11		
ZINC (ZN) TOTAL REC.						0.17	0.22	0.20		

ALL QUANTITIES IN MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED
BLANK LINE INDICATES PARAMETER NOT TESTED

SUMMARY OF SURFACE WATER QUALITY SAMPLING - ASARCO - EAST HELENA

SAMPLING SITE	PPC-6	PPC-6	PPC-6	PPC-6	PPC-6	PPC-6	PPC-6	PPC-6	PPC-6	PPC-6
SAMPLE DATE	12/16/80	01/15/81	03/23/81	04/27/81	07/03/81	01/19/82	03/25/82	10/26/82	11/30/82	12/31/82
LOADINGS										
ARSENIC (LBS/DAY)							15	12		

ALL QUANTITIES IN MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED
BLANK LINE INDICATES PARAMETER NOT TESTED

SUMMARY OF SURFACE WATER QUALITY SAMPLING - ASARCO - EAST HELENA

SAMPLING SITE	PPC-6	PPC-6	PPC-6	PPC-6	PPC-6	PPC-6	PPC-6	PPC-6	PPC-7	PPC-7
SAMPLE DATE	02/18/83	02/25/83	04/18/83	04/25/83	06/20/83	07/29/83	08/31/83	09/29/83	05/07/80	06/10/83
LOCATION	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W
LOCATION	36AAA	36AAA	36AAA	36AAA	36AAA	36AAA	36AAA	36AAA	36AAB	36AAB
DESCRIPTION	ABV NORTH	ABV NORTH	ABV NORTH	ABV NORTH	ABV NORTH	ABV NORTH	ABV NORTH	ABV NORTH	BLW NORTH	BLW NORTH
DESCRIPTION	SEEP	SEEP	SEEP	SEEP	SEEP	SEEP	SEEP	SEEP	SEEP	SEEP
LAB	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO
PHYSICAL PARAMETERS										
WATER TEMPERATURE (C)										12
SPEC. COND. (UMHOS/CM) LAB										112
PH LAB									7.1	7.1
TOTAL DISS. SOLIDS MEAS.									105	185
TRACE ELEMENTS										
ARSENIC (AS) TOTAL	0.048	0.054	0.036	0.061	0.029	0.042	0.043	0.022	0.039	0.050
ARSENIC (AS) DISS									0.025	0.050
CADMIUM (CD) TOTAL	<0.004	<0.004	<0.003	<0.004	<0.004	<0.003	<0.004	<0.004	0.006	<0.003
CADMIUM (CD) DISS									0.004	<0.003
COPPER (CU) TOTAL	0.007	0.012	0.008	0.038	0.027	0.008	0.012	0.008		
LEAD (PB) TOTAL	0.030	0.070	0.030	0.050	0.10	0.020	<0.030	<0.030	0.10	0.020
LEAD (PB) DISS									0.020	0.020
MERCURY (HG) TOTAL									<0.001	<0.001
SELENIUM (SE) TOTAL									<0.004	<0.010
ZINC (ZN) TOTAL	0.13	0.13	0.10	0.13	0.22	0.072	0.10	0.080	0.48	0.20
ZINC (ZN) DISS									0.12	0.17

ALL QUANTITIES IN MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED
BLANK LINE INDICATES PARAMETER NOT TESTED

SUMMARY OF SURFACE WATER QUALITY SAMPLING - ASARCO - EAST HELENA

SAMPLING SITE	PPC-7	PPC-7	PPC-7	PPC-7	PPC-7	PPC-7	PPC-7	PPC-7	PPC-7	PPC-7
SAMPLE DATE	07/16/80	08/13/80	10/02/80	11/19/80	12/16/80	01/15/81	03/23/81	04/27/81	07/03/81	10/14/82
LOCATION	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W
LOCATION	36AAB	36AAB	36AAB	36AAB	36AAB	36AAB	36AAB	36AAB	36AAB	36AAB
DESCRIPTION	BLW NORTH	BLW NORTH	BLW NORTH	BLW NORTH	BLW NORTH	BLW NORTH	BLW NORTH	BLW NORTH	BLW NORTH	BLW NORTH
DESCRIPTION	SEEP	SEEP	SEEP	SEEP	SEEP	SEEP	SEEP	SEEP	SEEP	SEEP
LAB	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO
PHYSICAL PARAMETERS										
WATER TEMPERATURE (C)	15	13	9.0	0.80	2.2		7.5	9.8	18	
SPEC. COND. (UMHOS/CM) LAB	215	259	288	185	180		220	132	260	
PH LAB	7.9	7.8	7.6	7.9	7.7		7.3	7.4	8.1	
TOTAL DISS. SOLIDS MEAS.	299	333	357	279	139	258	308	226	315	
TRACE ELEMENTS										
ARSENIC (AS) TOTAL				0.029	0.091	0.053	0.032	0.021	0.16	0.038
ARSENIC (AS) DISS	0.036	0.022	0.14	0.12	0.087	0.048	0.032	0.008	0.13	
CADMIUM (CD) TOTAL				<0.002	<0.002	0.007	<0.002	0.003	<0.002	<0.003
CADMIUM (CD) DISS	0.002	<0.002	<0.001	0.002	<0.002	0.005	<0.002	0.002	<0.002	
COPPER (CU) TOTAL										0.013
LEAD (PB) TOTAL				0.030	0.070	0.15	0.030	0.050	0.050	0.020
LEAD (PB) DISS	0.050	0.030		0.030	0.030	0.050	0.030	0.020	0.020	
MERCURY (HG) TOTAL				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
MERCURY (HG) DISS			<0.001							
SELENIUM (SE) TOTAL				<0.004	<0.010	<0.004	<0.004	<0.004	<0.004	
SELENIUM (SE) DISS			<0.004							
ZINC (ZN) TOTAL				0.42	0.30	0.39	0.22	0.28	0.20	0.18
ZINC (ZN) DISS	0.22	0.37		0.40	0.20	0.23	0.15	0.18	0.13	

ALL QUANTITIES IN MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED
BLANK LINE INDICATES PARAMETER NOT TESTED

00812282

SUMMARY OF SURFACE WATER QUALITY SAMPLING - ASARCO - EAST HELENA

SAMPLING SITE	PPC-7	PPC-7	PPC-7	PPC-7	PPC-7	PPC-7	PPC-7	PPC-7	PPC-7	PPC-7
SAMPLE DATE	11/20/82	11/30/82	12/31/82	02/18/83	02/25/83	04/18/83	04/25/83	06/20/83	07/29/83	08/31/83
LOCATION	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W
LOCATION	36AAB	36AAB	36AAB	36AAB	36AAB	36AAB	36AAB	36AAB	36AAB	36AAB
DESCRIPTION	BLW NORTH	BLW NORTH	BLW NORTH	BLW NORTH	BLW NORTH	BLW NORTH	BLW NORTH	BLW NORTH	BLW NORTH	BLW NORTH
DESCRIPTION	SEEP	SEEP	SEEP	SEEP	SEEP	SEEP	SEEP	SEEP	SEEP	SEEP
LAB	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO
TRACE ELEMENTS										
ARSENIC (AS) TOTAL	0.056	0.029	0.098	0.047	0.053	0.060	0.071	0.038	0.066	0.056
CADMIUM (CD) TOTAL	<0.003	<0.004	<0.003	<0.004	<0.004	0.003	<0.004	<0.004	<0.003	<0.004
COPPER (CU) TOTAL	0.012	0.008	0.022	0.007	0.032	0.017	0.020	0.030	0.008	0.013
LEAD (PB) TOTAL	0.020	0.030	0.12	0.030	0.10	0.050	0.080	0.080	0.020	<0.030
ZINC (ZN) TOTAL	0.15	0.080	0.30	0.13	0.12	0.12	0.12	0.22	0.073	0.080

ALL QUANTITIES IN MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED
BLANK LINE INDICATES PARAMETER NOT TESTED

SUMMARY OF SURFACE WATER QUALITY SAMPLING - ASARCO - EAST HELENA

SAMPLING SITE	PPC-7	PPC-7A	PPC-7A	PPC-7A	PPC-7A	PPC-7A	PPC-8	PPC-8	PPC-8	PPC-8
SAMPLE DATE	09/29/83	11/30/79	12/27/79	01/23/80	05/15/80	07/20/81	11/30/79	12/14/79	12/28/79	01/25/80
LOCATION	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W
LOCATION	36AAB	31DCD	31DCD	31DCD	31DCD	31DCD	31DBD	31DBD	31DBD	31DBD
DESCRIPTION	BLW NORTH	S EDGE	S EDGE	S EDGE	S EDGE	S EDGE	N EDGE	N EDGE	N EDGE	N EDGE
DESCRIPTION	SEEP	E. HELENA	E. HELENA	E. HELENA	E. HELENA	E. HELENA	E. HELENA	E. HELENA	E. HELENA	E. HELENA
LAB	ASARCO	WQB	WQB	WQB	WQB	WQB	ASARCO	ASARCO	ASARCO	ASARCO
PHYSICAL PARAMETERS										
FLOW (CFS)		21.8	29.1	32.8	169.6					
WATER TEMPERATURE (C)		0.0	1.5	0.0	10.0					
SPEC. COND. (UMHOS/CM) LAB		354.6	335.0	322.6	178.0					
PH FIELD		7.95	7.71	8.01						
PH LAB		8.01	8.13	8.10	7.93					
TURBIDITY (NTU) LAB		1.5	1.2	2.1	6.4					
TOTAL SUSP. SOLIDS		13	6.5	7.1	33.2					
TOTAL DISS. SOLIDS MEAS.		265.8								
SODIUM ADSORPTION RATIO		0.6								
COMMON IONS										
TOTAL HARDNESS AS CACO3		140			59					
CALCIUM (CA)		39.5			19.4					
MAGNESIUM (MG)		10.0			2.6					
SODIUM (NA)		16.9								
POTASSIUM (K)		3.4								
ALKALINITY AS CACO3 (LAB)		104			37					
BICARBONATE (HCO3) (LAB)		126.9			45.1					
CARBONATE AS CO3 (LAB)		0.0			0.0					
SULFATE (SO4)		65.0			32.8					
CHLORIDE (CL)		3.4								
FLUORIDE (F)		0.46								
NUTRIENTS										
AMMONIA (NH4-N)		<0.01	0.02	0.02	<0.01					
NITRATE + NITRITE AS N		0.27	0.28	0.27	0.13					
KJELDAHL NITROGEN AS N (TOTAL)		0.17	0.20	0.07	0.34					
ORTHO-PHOSPHATE (PO4-P)		0.017	0.029	0.019	0.048					
PHOSPHORUS (P) TOTAL		0.03	0.02	0.02	0.067					
CATION AND ANION BALANCE										
TOTAL CATIONS (MEQ/L)		3.616			1.182					
TOTAL ANIONS (MEQ/L)		3.574	0.023	0.021	1.437					
PERCENT DIFFERENCE		-	-		-					
TRACE ELEMENTS										
ARSENIC (AS) TOTAL	0.038						0.27	0.22	0.40	0.21

ALL QUANTITIES IN MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED
BLANK LINE INDICATES PARAMETER NOT TESTED

00081284

SUMMARY OF SURFACE WATER QUALITY SAMPLING - ASARCO - EAST HELENA

SAMPLING SITE	PPC-7	PPC-7A	PPC-7A	PPC-7A	PPC-7A	PPC-7A	PPC-8	PPC-8	PPC-8	PPC-8
SAMPLE DATE	09/29/83	11/30/79	12/27/79	01/23/80	05/15/80	07/20/81	11/30/79	12/14/79	12/28/79	01/25/80
TRACE ELEMENTS										
ARSENIC (AS) DISS					0.024					
ARSENIC (AS) TOTAL REC.		0.03	0.10	0.008	0.031	0.18				
CADMIUM (CD) TOTAL	<0.004						0.005	0.003	0.003	<0.002
CADMIUM (CD) TOTAL REC.						<0.005				
COPPER (CU) TOTAL	0.008									
COPPER (CU) DISS					<0.01					
COPPER (CU) TOTAL REC.		<0.01	<0.01		0.01					
IRON (FE) DISS					0.28					
IRON (FE) TOTAL REC.		0.10	0.14		1.26					
LEAD (PB) TOTAL	<0.030						0.070	0.050	0.050	0.030
LEAD (PB) DISS					<0.05					
LEAD (PB) TOTAL REC.		<0.05	<0.05		<0.05	<0.05				
MANGANESE (MN) DISS					0.32					
MANGANESE (MN) TOTAL REC.		0.10	0.07		0.43					
MERCURY (HG) TOTAL REC.		<0.0002								
ZINC (ZN) TOTAL	0.080									0.050
ZINC (ZN) DISS					0.24					
ZINC (ZN) TOTAL REC.		0.11	0.11		0.39					
LOADINGS										
ARSENIC (LBS/DAY)		4	16	1	28					

ALL QUANTITIES IN MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED
BLANK LINE INDICATES PARAMETER NOT TESTED

SUMMARY OF SURFACE WATER QUALITY SAMPLING - ASARCO - EAST HELENA

SAMPLING SITE	PPC-8	PPC-8	PPC-8	PPC-8	PPC-8	PPC-8	PPC-8	PPC-8	PPC-8	PPC-8
SAMPLE DATE	02/08/80	02/22/80	03/02/80	03/07/80	04/07/80	04/18/80	05/07/80	06/10/80	07/16/80	08/13/80
LOCATION	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W
LOCATION	31DBD	31DBD	31DBD	31DBD	31DBD	31DBD	31DBD	31DBD	31DBD	31DBD
DESCRIPTION	N EDGE	N EDGE	N EDGE	N EDGE	N EDGE	N EDGE	N EDGE	N EDGE	N EDGE	N EDGE
DESCRIPTION	E. HELENA	E. HELENA	E. HELENA	E. HELENA	E. HELENA	E. HELENA	E. HELENA	E. HELENA	E. HELENA	E. HELENA
LAB	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO
PHYSICAL PARAMETERS										
WATER TEMPERATURE (C)								13	17	13
SPEC. COND. (UMHOS/CM) LAB								112	210	254
PH LAB							7.6	7.1	7.9	8.0
TOTAL DISS. SOLIDS MEAS.							93	177	303	333
TRACE ELEMENTS										
ARSENIC (AS) TOTAL	0.72	0.70	0.64	0.54	0.017	0.043	0.037	0.023		
ARSENIC (AS) DISS							0.016	0.019	0.026	0.037
CADMIUM (CD) TOTAL	<0.002	0.002	0.003	0.003	0.002	0.002	0.004	<0.003		
CADMIUM (CD) DISS							0.002	<0.003	0.002	0.003
LEAD (PB) TOTAL	0.050	0.030	0.030	0.050	0.030	0.080	0.10	0.050		
LEAD (PB) DISS							0.020	0.020	0.050	0.030
MERCURY (HG) TOTAL					<0.001	<0.001	<0.001	<0.001		
SELENIUM (SE) TOTAL							<0.004	<0.010		
ZINC (ZN) TOTAL	0.13	0.13	0.10	0.15	0.13	0.32	0.40	0.22		
ZINC (ZN) DISS							0.10	0.17	0.20	0.42

ALL QUANTITIES IN MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED
BLANK LINE INDICATES PARAMETER NOT TESTED

0081286

SUMMARY OF SURFACE WATER QUALITY SAMPLING - ASARCO - EAST HELENA

SAMPLING SITE	PPC-8	PPC-8	PPC-8	PPC-8	PPC-8	PPC-8	PPC-8	PPC-8	PPC-8	PPC-8
SAMPLE DATE	10/02/80	11/19/80	12/16/80	01/15/81	03/23/81	04/27/81	05/26/81	07/03/81	01/19/82	03/25/82
LOCATION	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W
LOCATION	31DBD	31DBD	31DBD	31DBD	31DBD	31DBD	31DBD	31DBD	31DBD	31DBD
DESCRIPTION	N EDGE	N EDGE	N EDGE	N EDGE	N EDGE	N EDGE	N EDGE	N EDGE	N EDGE	N EDGE
DESCRIPTION	E. HELENA	E. HELENA	E. HELENA	E. HELENA	E. HELENA	E. HELENA	E. HELENA	E. HELENA	E. HELENA	E. HELENA
LAB	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	WQB	ASARCO	WQB	WQB
PHYSICAL PARAMETERS										
WATER TEMPERATURE (C)	9.0	0.80	2.3		7.5	9.0		18		
SPEC. COND. (UMHOS/CM) LAB	270	180	171		222	128	206.0	260	378.0	
PH LAB	7.9	7.9	7.7		7.4	7.6	7.56	8.0	7.70	
TOTAL SUSP. SOLIDS										14.2
TOTAL DISS. SOLIDS MEAS.	338	329	262	409	300	272		356		
COMMON IONS										
TOTAL HARDNESS AS CACO3							92		146	
CALCIUM (CA)							25.8		38.1	
MAGNESIUM (MG)							6.6		12.4	
ALKALINITY AS CACO3 (LAB)							42			
BICARBONATE (HCO3) (LAB)							51.2			
CARBONATE AS CO3 (LAB)							0.0			
SULFATE (SO4)							47.5			
CATION AND ANION BALANCE										
TOTAL CATIONS (MEQ/L)							1.830		2.921	
TOTAL ANIONS (MEQ/L)							1.829			
PERCENT DIFFERENCE							-			
TRACE ELEMENTS										
ARSENIC (AS) TOTAL	0.20	0.032	0.059	0.048	0.021	0.020		0.11		
ARSENIC (AS) DISS	0.11	0.084	0.039	0.017	0.021	0.007	0.028	0.090		0.47
ARSENIC (AS) TOTAL REC.							0.12		0.64	0.48
CADMIUM (CD) TOTAL	<0.001	0.003	<0.002	0.007	<0.002	0.002		<0.002		
CADMIUM (CD) DISS	<0.001	0.003	<0.002	0.005	<0.002	0.002	<0.005	<0.002		
CADMIUM (CD) TOTAL REC.							0.02			
COPPER (CU) DISS							0.01			0.01
COPPER (CU) TOTAL REC.							0.14		0.01	0.02
IRON (FE) DISS							0.04			<0.01
IRON (FE) TOTAL REC.							6.4		0.62	0.38
LEAD (PB) TOTAL	0.030	0.030	0.030	0.050	0.050	0.050		0.050		
LEAD (PB) DISS	<0.010	0.050	0.030	0.050	0.030	0.020	<0.05	0.020		<0.05
LEAD (PB) TOTAL REC.							1.1		<0.05	<0.05
MANGANESE (MN) DISS							0.18			
MANGANESE (MN) TOTAL REC.							1.7			

ALL QUANTITIES IN MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED
BLANK LINE INDICATES PARAMETER NOT TESTED

0081287

SUMMARY OF SURFACE WATER QUALITY SAMPLING - ASARCO - EAST HELENA

SAMPLING SITE	PPC-8	PPC-8	PPC-8	PPC-8	PPC-8	PPC-8	PPC-8	PPC-8	PPC-8	PPC-8
SAMPLE DATE	10/02/80	11/19/80	12/16/80	01/15/81	03/23/81	04/27/81	05/26/81	07/03/81	01/19/82	03/25/82
TRACE ELEMENTS										
MERCURY (HG) TOTAL		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001		
MERCURY (HG) DISS	<0.001									
SELENIUM (SE) TOTAL		<0.004	<0.010	<0.004	<0.004	<0.004		<0.004		
SELENIUM (SE) DISS	<0.004									
ZINC (ZN) TOTAL	0.29	0.42	0.28	0.40	0.22	0.30		0.22		
ZINC (ZN) DISS	0.23	0.40	0.22	0.25	0.17	0.15	0.5	0.10		0.13
ZINC (ZN) TOTAL REC.							1.5		0.17	0.20

ALL QUANTITIES IN MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED
BLANK LINE INDICATES PARAMETER NOT TESTED

SUMMARY OF SURFACE WATER QUALITY SAMPLING - ASARCO - EAST HELENA

SAMPLING SITE	PPC-8	PPC-8	PPC-8	PPC-8	PPC-8	PPC-8	PPC-8	PPC-8	PPC-8	PPC-8
SAMPLE DATE	10/14/82	11/20/82	11/30/82	12/31/82	02/18/83	02/25/83	04/18/83	04/25/83	06/20/83	07/29/83
LOCATION	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W
LOCATION	31DBD	31DBD	31DBD	31DBD	31DBD	31DBD	31DBD	31DBD	31DBD	31DBD
DESCRIPTION	N EDGE	N EDGE	N EDGE	N EDGE	N EDGE	N EDGE	N EDGE	N EDGE	N EDGE	N EDGE
DESCRIPTION	E. HELENA	E. HELENA	E. HELENA	E. HELENA	E. HELENA	E. HELENA	E. HELENA	E. HELENA	E. HELENA	E. HELENA
LAB	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO
TRACE ELEMENTS										
ARSENIC (AS) TOTAL	0.027	0.040	0.028	0.085	0.036	0.073	0.058	0.060	0.030	0.17
CADMIUM (CD) TOTAL	<0.003	<0.003	<0.004	<0.003	<0.004	<0.004	<0.003	<0.004	<0.004	<0.003
COPPER (CU) TOTAL	0.015	0.012	0.008	0.010	0.007	0.032	0.020	0.010	0.035	0.022
LEAD (PB) TOTAL	0.030	0.020	0.030	0.030	0.030	0.070	0.13	0.030	0.10	0.020
ZINC (ZN) TOTAL	0.18	0.15	0.25	0.17	0.13	0.13	0.12	0.12	0.23	0.067

ALL QUANTITIES IN MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED
BLANK LINE INDICATES PARAMETER NOT TESTED

SUMMARY OF SURFACE WATER QUALITY SAMPLING - ASARCO - EAST HELENA

SAMPLING SITE	PPC-8	PPC-8	PPC-9	PPC-9	PPC-9	PPC-9	PPC-9	PPC-9	PPC-9	PPC-9
SAMPLE DATE	08/31/83	09/29/83	05/07/80	06/10/80	07/16/80	08/13/80	10/02/80	11/19/80	12/16/80	01/15/81
LOCATION	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W
LOCATION	31DBD	31DBD	31BDB	31BDB	31BDB	31BDB	31BDB	31BDB	31BDB	31BDB
DESCRIPTION	N EDGE	N EDGE	AT HWY 443	AT HWY 443	AT HWY 443	AT HWY 443	AT HWY 443	AT HWY 443	AT HWY 443	AT HWY 443
DESCRIPTION	E. HELENA	E. HELENA								
LAB	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO
PHYSICAL PARAMETERS										
WATER TEMPERATURE (C)				13	17	14	11	-0.50	2.5	
SPEC. COND. (UMHOS/CM) LAB				112	221	260	250	79	182	
PH LAB			7.4	7.3	7.9	8.1	7.9	7.0	7.0	
TOTAL DISS. SOLIDS MEAS.			83	178	326	334	334	153	275	276
TRACE ELEMENTS										
ARSENIC (AS) TOTAL	0.052	0.026	0.026	0.027			0.53	0.026	0.048	0.033
ARSENIC (AS) DISS			0.017	0.020	0.028	0.024	0.081	0.084	0.042	0.022
CADMIUM (CD) TOTAL	<0.004	<0.004	0.006	<0.003			<0.001	<0.002	<0.002	0.007
CADMIUM (CD) DISS			0.002	<0.003	0.003	<0.002	<0.001	0.003	<0.002	0.005
COPPER (CU) TOTAL	0.013	0.010								
LEAD (PB) TOTAL	0.030	0.030	0.10	0.030			0.030	0.030	0.050	0.12
LEAD (PB) DISS			0.020	0.020	0.050	0.020	<0.010	0.050	0.020	0.050
MERCURY (HG) TOTAL			<0.001	<0.001				<0.001	<0.001	<0.001
MERCURY (HG) DISS							<0.001			
SELENIUM (SE) TOTAL			<0.004	<0.010				<0.004	<0.010	0.006
SELENIUM (SE) DISS							<0.004			
ZINC (ZN) TOTAL	0.080	0.070	0.40	0.20			0.25	0.38	0.28	0.38
ZINC (ZN) DISS			0.32	0.15	0.18	0.28	0.19	0.42	0.23	0.22

ALL QUANTITIES IN MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED
BLANK LINE INDICATES PARAMETER NOT TESTED

SUMMARY OF SURFACE WATER QUALITY SAMPLING - ASARCO - EAST HELENA

SAMPLING SITE	PPC-9	PPC-9	PPC-9	PPC-9	PPC-9	PPC-9	PPC-9	PPC-9	PPC-9	PPC-9
SAMPLE DATE	03/23/81	04/27/81	07/03/81	08/07/81	10/26/82	11/30/82	12/31/82	02/18/83	02/25/83	04/18/83
LOCATION	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W
LOCATION	31BDB	31BDB	31BDB	31BDB	31BDB	31BDB	31BDB	31BDB	31BDB	31BDB
DESCRIPTION	AT HWY 443	AT HWY 443	AT HWY 443	AT HWY 443	AT HWY 443	AT HWY 443	AT HWY 443	AT HWY 443	AT HWY 443	AT HWY 443
LAB	ASARCO	ASARCO	ASARCO	WQB	WQB	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO
PHYSICAL PARAMETERS										
FLOW (CFS)					64.8					
WATER TEMPERATURE (C)	8.0	9.0	18		3.0					
SPEC. COND. (UMHOS/CM) LAB	226	124	260	363.0	317.0					
PH LAB	7.7	7.1	8.1							
TOTAL DISS. SOLIDS MEAS.	300	198	293							
COMMON IONS										
TOTAL HARDNESS AS CACO3					108					
CALCIUM (CA)					32.2					
MAGNESIUM (MG)					6.7					
SULFATE (SO4)					55.0					
CATION AND ANION BALANCE										
TOTAL CATIONS (MEQ/L)					2.158					
TOTAL ANIONS (MEQ/L)					1.145					
TRACE ELEMENTS										
ARSENIC (AS) TOTAL	0.020	0.023	0.11			0.028	0.11	0.070	0.069	0.043
ARSENIC (AS) DISS	0.017	0.016	0.090		0.034					
ARSENIC (AS) TOTAL REC.				0.24	0.037					
CADMIUM (CD) TOTAL	<0.002	0.002	<0.002			<0.004	<0.003	<0.004	<0.004	0.003
CADMIUM (CD) DISS	<0.002	0.002	<0.002							
COPPER (CU) TOTAL						0.017	0.008	0.008	0.015	0.010
COPPER (CU) TOTAL REC.				0.01						
LEAD (PB) TOTAL	0.050	0.070	0.050			0.030	0.030	0.020	0.050	0.030
LEAD (PB) DISS	0.020	0.020	0.020							
LEAD (PB) TOTAL REC.				<0.05						
MERCURY (HG) TOTAL	<0.001	<0.001	<0.001							
SELENIUM (SE) TOTAL	<0.004	<0.004	<0.004							
ZINC (ZN) TOTAL	0.23	0.30	0.20			0.12	0.13	0.13	0.12	0.10
ZINC (ZN) DISS	0.13	0.13	0.10		0.11					
ZINC (ZN) TOTAL REC.				0.18						
LOADINGS										
ARSENIC (LBS/DAY)					13					

ALL QUANTITIES IN MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED
BLANK LINE INDICATES PARAMETER NOT TESTED

SUMMARY OF SURFACE WATER QUALITY SAMPLING - ASARCO - EAST HELENA

SAMPLING SITE	PPC-9	PPC-9	PPC-9	PPC-9	PPC-9	PPC-10	PPC-10	PPC-10	PPC-10	PPC-10
SAMPLE DATE	04/25/83	06/20/83	07/29/83	08/31/83	09/29/83	05/07/80	06/10/80	07/16/80	08/13/80	10/02/80
LOCATION	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W
LOCATION	31BDB	31BDB	31BDB	31BDB	31BDB	09ADB	09ADB	09ADB	09ADB	09ADB
DESCRIPTION	AT HWY 443	AT HWY 443	AT HWY 443	AT HWY 443	AT HWY 443	ABV	ABV	ABV	ABV	ABV
DESCRIPTION						HELENA STP	HELENA STP	HELENA STP	HELENA STP	HELENA STP
LAB	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO
PHYSICAL PARAMETERS										
WATER TEMPERATURE (C)							14	17	15	12
SPEC. COND. (UMHOS/CM) LAB							112	223	266	255
PH LAB						7.6	7.3	8.2	8.3	8.0
TOTAL DISS. SOLIDS MEAS.						103	195	329	223	332
TRACE ELEMENTS										
ARSENIC (AS) TOTAL	0.053	0.033	0.068	0.054	0.026	0.043	0.023			0.14
ARSENIC (AS) DISS						0.015	0.021	0.030	0.028	0.071
CADMIUM (CD) TOTAL	<0.004	<0.004	<0.003	<0.004	<0.004	0.004	<0.003			0.004
CADMIUM (CD) DISS						0.004	<0.003	0.002	<0.002	0.004
COPPER (CU) TOTAL	0.013	0.037	0.010	0.010	0.008					
LEAD (PB) TOTAL	0.050	0.12	0.020	0.030	<0.030	0.12	0.050			0.040
LEAD (PB) DISS						0.020	0.030	0.030	0.030	0.040
MERCURY (HG) TOTAL						<0.001	<0.001			
MERCURY (HG) DISS										<0.001
SELENIUM (SE) TOTAL						<0.004	<0.010			
SELENIUM (SE) DISS										<0.004
ZINC (ZN) TOTAL	0.13	0.27	0.062	0.080	0.070	0.50	0.22			0.24
ZINC (ZN) DISS						0.12	0.15	0.15	0.18	0.17

ALL QUANTITIES IN MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED
BLANK LINE INDICATES PARAMETER NOT TESTED

SUMMARY OF SURFACE WATER QUALITY SAMPLING - ASARCO - EAST HELENA

SAMPLING SITE	PPC-10	PPC-10	PPC-10	PPC-10	PPC-10	PPC-10	PPC-10	PPC-10	PPC-10	PPC-10
SAMPLE DATE	11/19/80	12/16/80	01/15/81	03/23/81	04/27/81	07/03/81	11/30/82	12/31/82	02/18/83	02/25/83
LOCATION	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W
LOCATION	09ADB	09ADB	09ADB	09ADB	09ADB	09ADB	09ADB	09ADB	09ADB	09ADB
DESCRIPTION	ABV	ABV	ABV	ABV	ABV	ABV	ABV	ABV	ABV	ABV
DESCRIPTION	HELENA STP	HELENA STP	HELENA STP	HELENA STP	HELENA STP	HELENA STP	HELENA STP	HELENA STP	HELENA STP	HELENA STP
LAB	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO
PHYSICAL PARAMETERS										
WATER TEMPERATURE (C)	0.0	2.5		8.6	9.0	18				
SPEC. COND. (UMHOS/CM) LAB	169	170		230	130	260				
PH LAB	7.1	6.9		7.8	7.5	7.9				
TOTAL DISS. SOLIDS MEAS.	412	275	278	310	202	316				
TRACE ELEMENTS										
ARSENIC (AS) TOTAL	0.028	0.052	0.030	0.023	0.026	0.11	0.074	0.28	0.10	0.061
ARSENIC (AS) DISS	0.069	0.043	0.020	0.023	0.009	0.080				
CADMIUM (CD) TOTAL	<0.002	<0.002	0.007	<0.002	0.002	<0.002	<0.004	0.005	<0.004	<0.004
CADMIUM (CD) DISS	0.002	<0.002	0.005	<0.002	0.002	<0.002				
COPPER (CU) TOTAL							0.017	0.008	0.008	0.013
LEAD (PB) TOTAL	0.030	0.050	0.10	0.030	0.070	0.050	0.050	0.030	0.030	0.030
LEAD (PB) DISS	0.020	0.020	0.030	0.030	0.020	0.020				
MERCURY (HG) TOTAL	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001				
SELENIUM (SE) TOTAL	<0.004	<0.010	<0.004	<0.004	<0.004	0.004				
ZINC (ZN) TOTAL	0.23	0.30	0.35	0.20	0.33	0.18	0.17	0.13	0.13	0.13
ZINC (ZN) DISS	0.30	0.22	0.22	0.13	0.15	0.10				

ALL QUANTITIES IN MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED
BLANK LINE INDICATES PARAMETER NOT TESTED

SUMMARY OF SURFACE WATER QUALITY SAMPLING - ASARCO - EAST HELENA

SAMPLING SITE	PPC-10	PPC-10	PPC-10	PPC-10	PPC-10	PPC-10	PPC-11A	PPC-11A	PPC-11A	PPC-11A
SAMPLE DATE	04/18/83	04/25/83	06/20/83	07/29/83	08/31/83	09/29/83	04/07/78	04/15/78	04/29/78	05/13/78
LOCATION	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W
LOCATION	09ADB	09ADB	09ADB	09ADB	09ADB	09ADB	31DCD	31DCD	31DCD	31DCD
DESCRIPTION	ABV	ABV	ABV	ABV	ABV	ABV	E BANK	E BANK	E BANK	E BANK
DESCRIPTION	HELENA STP	HELENA STP	HELENA STP	HELENA STP	HELENA STP	HELENA STP	PACIFIC BR	PACIFIC BR	PACIFIC BR	PACIFIC BR
LAB	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO
TRACE ELEMENTS										
ARSENIC (AS) TOTAL	0.085	0.056	0.040	0.070	0.096	0.061	0.010	0.011	0.011	0.024
CADMIUM (CD) TOTAL	0.005	<0.004	<0.004	<0.003	<0.004	<0.004	0.005	0.007	0.005	0.007
COPPER (CU) TOTAL	0.010	0.017	0.042	0.010	0.012	0.006				
LEAD (PB) TOTAL	0.050	0.050	0.15	0.020	<0.030	<0.030	0.050	0.12	0.10	0.12
ZINC (ZN) TOTAL	0.083	0.13	0.32	0.057	0.070	0.080				

ALL QUANTITIES IN MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED
BLANK LINE INDICATES PARAMETER NOT TESTED

SUMMARY OF SURFACE WATER QUALITY SAMPLING - ASARCO - EAST HELENA

SAMPLING SITE	PPC-11A	PPC-11A	PPC-11A	PPC-11A	PPC-11A	PPC-11A	PPC-11A	PPC-11A	PPC-11A	PPC-11A
SAMPLE DATE	05/27/78	06/09/78	07/07/78	07/21/78	08/04/78	08/18/78	09/01/78	09/15/78	0/29/78	10/13/78
LOCATION	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W
LOCATION	31DCD	31DCD	31DCD	31DCD	31DCD	31DCD	31DCD	31DCD	31DCD	31DCD
DESCRIPTION	E BANK	E BANK	E BANK	E BANK	E BANK	E BANK	E BANK	E BANK	E BANK	E BANK
DESCRIPTION	PACIFIC BR	PACIFIC BR	PACIFIC BR	PACIFIC BR	PACIFIC BR	PACIFIC BR	PACIFIC BR	PACIFIC BR	PACIFIC BR	PACIFIC BR
LAB	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO
TRACE ELEMENTS										
ARSENIC (AS) TOTAL	0.023	0.019	0.004	<0.004	0.013	0.23	0.011	0.018	0.006	0.034
CADMIUM (CD) TOTAL	0.002	0.005	<0.002	0.002	<0.002	0.008	0.005	0.003	0.007	0.006
LEAD (PB) TOTAL	0.12	0.17	0.050	0.050	0.033	0.10	0.050	0.070	0.080	0.060

ALL QUANTITIES IN MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED
BLANK LINE INDICATES PARAMETER NOT TESTED

SUMMARY OF SURFACE WATER QUALITY SAMPLING - ASARCO - EAST HELENA

SAMPLING SITE	PPC-11A	PPC-11A	PPC-11A	PPC-11A	PPC-11A	PPC-11A	PPC-11A	PPC-11A	PPC-11A	PPC-11A
SAMPLE DATE	10/27/78	11/24/78	12/08/78	01/04/79	01/19/79	02/01/79	02/20/79	03/16/79	04/06/79	04/20/79
LOCATION	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W
LOCATION	31DCD	31DCD	31DCD	31DCD	31DCD	31DCD	31DCD	31DCD	31DCD	31DCD
DESCRIPTION	E BANK	E BANK	E BANK	E BANK	E BANK	E BANK	E BANK	E BANK	E BANK	E BANK
DESCRIPTION	PACIFIC BR	PACIFIC BR	PACIFIC BR	PACIFIC BR	PACIFIC BR	PACIFIC BR	PACIFIC BR	PACIFIC BR	PACIFIC BR	PACIFIC BR
LAB	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO
TRACE ELEMENTS										
ARSENIC (AS) TOTAL	0.035	0.038	0.15	0.013	0.012	0.009	0.007	<0.033	0.014	0.018
CADMIUM (CD) TOTAL	0.008	0.009	0.008	<0.002	0.002	<0.002	0.005	<0.010	<0.003	0.005
LEAD (PB) TOTAL	0.10	0.16	0.20	0.030	0.070	<0.020	0.050	0.020	0.025	0.070

ALL QUANTITIES IN MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED
BLANK LINE INDICATES PARAMETER NOT TESTED

SUMMARY OF SURFACE WATER QUALITY SAMPLING - ASARCO - EAST HELENA

SAMPLING SITE	PPC-11A	PPC-11A	PPC-11A	PPC-11A	PPC-11A	PPC-11A	PPC-11A	PPC-11A	PPC-11A	PPC-11A
SAMPLE DATE	05/16/79	07/20/79	08/03/79	08/17/79	09/17/79	10/05/79	10/15/79	10/19/79	11/02/79	11/30/79
LOCATION	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W
LOCATION	31DCD	31DCD	31DCD	31DCD	31DCD	31DCD	31DCD	31DCD	31DCD	31DCD
DESCRIPTION	E BANK	E BANK	E BANK	E BANK	E BANK	E BANK	E BANK	E BANK	E BANK	E BANK
DESCRIPTION	PACIFIC BR	PACIFIC BR	PACIFIC BR	PACIFIC BR	PACIFIC BR	PACIFIC BR	PACIFIC BR	PACIFIC BR	PACIFIC BR	PACIFIC BR
LAB	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO
TRACE ELEMENTS										
ARSENIC (AS) TOTAL	0.037	0.020	0.029	0.017	0.13	0.060	0.12	0.042	0.082	0.13
CADMIUM (CD) TOTAL	0.005	0.003	<0.001	0.002	<0.002	<0.002	0.008	<0.002	<0.002	0.003
LEAD (PB) TOTAL	0.17	0.10	0.040	0.050	0.030	0.050	0.10	0.050	0.020	0.070

ALL QUANTITIES IN MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED
BLANK LINE INDICATES PARAMETER NOT TESTED

SUMMARY OF SURFACE WATER QUALITY SAMPLING - ASARCO - EAST HELENA

SAMPLING SITE	PPC-11A	PPC-11A	PPC-11A	PPC-11A	PPC-11A	PPC-11A	PPC-11A	PPC-11A	PPC-11A	PPC-11B
SAMPLE DATE	12/14/79	12/28/79	01/25/80	02/08/80	02/22/80	03/02/80	03/07/80	04/07/80	04/18/80	01/25/80
LOCATION	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W	10N03W
LOCATION	31DCD	31DCD	31DCD	31DCD	31DCD	31DCD	31DCD	31DCD	31DCD	31DCD
DESCRIPTION	E BANK	E BANK	E BANK	E BANK	E BANK	E BANK	E BANK	E BANK	E BANK	W BANK
DESCRIPTION	PACIFIC BR	PACIFIC BR	PACIFIC BR	PACIFIC BR	PACIFIC BR	PACIFIC BR	PACIFIC BR	PACIFIC BR	PACIFIC BR	PACIFIC BR
LAB	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO	ASARCO
TRACE ELEMENTS										
ARSENIC (AS) TOTAL	0.043	0.10	0.12	0.30	0.38	0.74	0.43	0.019	0.043	0.36
CADMIUM (CD) TOTAL	0.002	0.002	0.002	<0.002	<0.002	0.003	0.003	<0.002	0.002	0.002
LEAD (PB) TOTAL	0.050	0.050	0.050	0.050	0.050	0.020	0.030	0.030	0.080	0.030
MERCURY (HG) TOTAL								<0.001	<0.001	
ZINC (ZN) TOTAL			.050	0.13	0.17	0.12	0.13	0.13	0.32	0.070

ALL QUANTITIES IN MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED
BLANK LINE INDICATES PARAMETER NOT TESTED

SUMMARY OF SURFACE WATER QUALITY SAMPLING - ASARCO - EAST HELENA

SAMPLING SITE	PPC-11B	PPC-11B	PPC-11B	PPC-11B
SAMPLE DATE	02/08/80	02/22/80	03/07/80	04/18/80
LOCATION	10N03W	10N03W	10N03W	10N03W
LOCATION	31DCD	31DCD	31DCD	31DCD
DESCRIPTION	W BANK	W BANK	W BANK	W BANK
DESCRIPTION	PACIFIC BR	PACIFIC BR	PACIFIC BR	PACIFIC BR
LAB	ASARCO	ASARCO	ASARCO	ASARCO
PHYSICAL PARAMETERS				
WATER TEMPERATURE (C)				
SPEC. COND. (UMHOS/CM) LAB				
PH LAB				
TOTAL DISS. SOLIDS MEAS.				
TRACE ELEMENTS				
ARSENIC (AS) TOTAL	0.93	1.0	1.1	0.033
ARSENIC (AS) DISS				
CADMIUM (CD) TOTAL	<0.002	<0.002	0.005	<0.002
CADMIUM (CD) DISS				
COPPER (CU) TOTAL				
COPPER (CU) DISS				
LEAD (PB) TOTAL	0.050	0.050	0.030	0.070
LEAD (PB) DISS				
MERCURY (HG) TOTAL				<0.001
SELENIUM (SE) TOTAL				
ZINC (ZN) TOTAL	0.13	0.15	0.13	0.28
ZINC (ZN) DISS				

ALL QUANTITIES IN MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED
BLANK LINE INDICATES PARAMETER NOT TESTED

APPENDIX 3

ASARCO PLANT PROCESS WATER QUALITY

PROCESS WATER QUALITY

SAMPLING SITE	LOWER LAKE	LOWER LAKE	LOWER LAKE	LOWER LAKE	LOWER LAKE	LOWER LAKE	LOWER LAKE	LOWER LAKE	LOWER LAKE
SAMPLE DATE	07/01/81	11/30/82	12/30/82	02/18/83	02/25/83	04/18/83	04/25/83	06/20/83	07/29/83
PHYSICAL PARAMETERS									
WATER TEMPERATURE (C)	45								
SPEC. COND. (UMHOS/CM) LAB	2200								
PH LAB	6.4								
TOTAL DISS. SOLIDS MEAS.	1019								
TRACE ELEMENTS									
ARSENIC (AS) TOTAL	83.	213	217	220	213	180	300	267	233
ARSENIC (AS) DISS	78	188	210	217	200	177	257	259	205
CADMIUM (CD) TOTAL	0.76	10	7.8	7.3	5.3	3.4	12	3.2	2.3
CADMIUM (CD) DISS	0.44	9.6	4.3	6.5	4.2	2.9	5.6	1.5	0.23
COPPER (CU) TOTAL		0.14	0.76	0.22	0.22	0.057	0.16	0.51	0.20
COPPER (CU) DISS		0.017	0.008	0.013	0.052	0.015	0.017	0.027	0.020
LEAD (PB) TOTAL	1.2	0.80	0.52	2.8	1.5	0.47	1.8	4.9	1.1
LEAD (PB) DISS	0.080	0.13	0.050	0.17	0.13	0.080	0.050	0.23	0.15
MERCURY (HG) TOTAL	0.010								
SELENIUM (SE) TOTAL	0.014								
ZINC (ZN) TOTAL	1.9	9.0	8.5	11	7.6	4.7	8.2	3.3	2.4
ZINC (ZN) DISS	0.98	8.5	5.2	9.3	6.6	4.2	4.5	1.4	0.35

ALL QUANTITIES IN MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED
BLANK LINE INDICATES PARAMETER NOT TESTED

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