UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105

January 16, 2004

Art Gravenstein
Nevada Division of Environmental Protection
Bureau of Corrective Actions
333 W. Nye Lane
Carson City, Nevada 89706

RE: December 17, 2003 Site Visit Summary and Phased Approach to Evaluating Technically Enhanced Naturally Occurring Radionuclides (TENORM) at the Anaconda Copper Mine Site, Yerington, Nevada

Dear Mr. Gravenstein:

This letter provides (1) a summary of the U.S. Environmental Protection Agency's (EPA's) Semi-Quantitative Gamma Ray Walkover Survey of Unlined Evaporation Ponds 1 and 1A at the Anaconda Copper Mine Site (Site), Yerington, Nevada (see attachment) which was conducted as part of the December 17, 2003 site visit (2) EPA's recommendations in regards to a phased approach to evaluating TENORM at the Site, and (3) EPA's recommendations for an Ambient Levels Work Plan.

1. Semi-Quantitative Gamma Ray Walkover Survey of Unlined Evaporation Ponds 1 and 1A at the Site

Background

A gamma ray walkover of the Unlined Evaporation Ponds 1 and 1A to evaluate the potential of radionuclides in the surface sediments of the ponds was initially proposed by EPA (September 4, 2003). However at that time, Nevada Division of Environmental Protection (NDEP) proposed combining the investigation of radionuclides on the surface of the Unlined Evaporation Ponds 1 and 1A with a prior proposal to collect surface samples of potential source areas of fugitive dust in the Sulfide Tailings Ponds areas. NDEP proposed the collection of biased surface samples with analyses for metals and radionuclides. Although EPA felt that a walkover gamma ray survey would provide in a more representative and cost effective data set, however to better assess NDEP's approach agreed to visit the site and potential locations with NDEP and the Bureau of Land Management (BLM). The results of the site visit and discussion would then be included as a work plan to be prepared by NDEP's removal contractor, SRK Consulting (SRK), for both areas; the Unlined Evaporation Ponds and the Sulfide Tailings Ponds. That work plan would then be submitted to the Yerington Technical Work Group for an expedited review and then implemented as soon as possible.

During the Unlined Evaporation Pond 1A portion of the December 17, 2003 site walk, NDEP

stated that they had reconsidered and agreed to direct SRK to prepare a work plan to conduct a surface gamma ray walkover over the evaporation ponds 1 and 1A. As noted before the preparation of the work plan and it's implementation will be paid for by NDEP who will be subsequently reimbursed by Atlantic Richfield Company (ARC).

That work plan was submitted by NDEP on January 12, 2004 with review comments due on January 14, 2004. Field work was proposed to begin the week of January 19th.

Conclusions

As is listed in the attached summary of the December 17, 2003 gamma ray walkover survey we concluded the following:

$ Radiation anomalies occur on the surface of Unlined Evaporation Ponds 1 and 1A. The most anomalous areas are found in the central and western portions of Unlined Evaporation Pond 1

$ The distribution of the anomalies indicate that the distribution of radionuclides in the surficial sediments in the ponds are not homogeneous but heterogeneous

$ The distribution of the anomalies and identified radionuclides indicates secondary transport of radionuclides into the low lying areas of the ponds, potential by wind and water erosion

$ The gamma ray spectra for the three potential reference locations correlate reasonably well over three different geologic locales

$ The anomalous areas in Pond 1 exhibit values of up to 2X background on gross gamma counts, while comparison of the gamma spectra from the three reference locations indicates up to 3X background for radium, with additional anomalous areas of thorium and potassium 40

Recommendations

The preliminary conclusions from the December 17, 2003 gamma ray walkover survey support the following recommendations from EPA to NDEP.

1. SRK, as noted above submitted a work plan for a gamma ray walkover of the Unlined Evaporation Ponds 1 and 1A, a review schedule was established by NDEP using an accelerated review process. Field work is proposed to begin the week of January 19th , although review comments will need to resolved.

2. Concurrently the three proposed reference locations should be sampled and analyzed using gamma spectroscopy to determine uranium 238, radium 226, and thorium 232 to evaluate what the 3X background values detected in the Unlined Evaporation Pond 1. Other reference locations may be appropriate as well for the determination of ambient levels however these three will provide an initial data set for comparison which could be used with others as part of an ambient levels determination work plan for the site.

2. Phased Approach to Evaluating Technically Enhanced Naturally Occurring Radionuclides (TENORM) at the Site

In earlier discussions in September 2003 as noted above several recommendations regarding an investigative approach to assess the potential risk at the Site from TENORM were forwarded to NDEP by EPA and BLM. Based on the preliminary results from the December 17, 2003 site visit and gamma ray walkover EPA would like to provide the following recommendations to NDEP on a phased approach for evaluating the Site's TENORM.

A. Recommended Screening Level Radiation Assessment

Surface gamma ray screening as follows:

I. Conduct gamma ray screening of the those areas potentially containing uranium. The initial review of potential areas with uranium indicates three possible areas (note the terms used are current identifiers) one of which is already proposed for the SRK work plan; the Unlined Evaporation Ponds 1 and 1A. Those areas plus the remaining two should be surface screened to address both exposure and fugitive dust issues as follows:

$ Unlined Finger Evaporation Ponds - approximately 64 ac. with dimensions of 1,666 by 1,666 ft

$ Calcines Ditch - approximately 7,280 linear feet

Areas 1, and 2 - Total area of approximately 65 ac. Screening would consist of surface gamma ray screening using a Bicron Field Instrument Detector for Low Energy Radiation (FIDLER) probe on a meter such as a Ludlum 2221 to run 1 minute counts. This probe is ideal for detecting low energy gamma emissions from uranium 238, radium 226, and thorium 232 and associated radioisotopes. If a Bicron FIDLER probe is not available then a 3" X 3" sodium iodide probe may be substituted. However, the 3" X 3" is the least sensitive probe that should be used for the walkover survey.

The walkover survey should be conducted using a minimum of 3 transects per pond, and confirmation sample collection for gamma spectroscopic analysis of detected anomalies (based on 2X site specific background), with particular attention paid to low lying areas where denser uranium could have concentrated. Area 2 survey could be a simply linear walkover survey using the same equipment.

II. Continue domestic well sampling for uranium and associated radionuclides

III. Conduct air monitoring for uranium and associated radionuclides in fugitive dust both onsite and off site

B. Recommended Site-wide Comprehensive Radiation Investigation

A Site-wide Comprehensive Radiation Investigation work plan should be prepared to

assess those areas not included in the screening level assessment. Such a plan should include the following:

I. Conduct gamma ray screening of the those areas potentially containing uranium. The initial review of potential areas with uranium indicates three additional potential areas (note the terms used are current identifiers) for surface screening to address both exposure and fugitive dust issues as follows:

$ Sulfide Tailings - approximately 2,295 ac. with dimensions of 9,998 by 5,416 ft (note this survey should be done even if a proposed interim remedy such as a temporary cap is proposed, also note that a portion of these tailings areas are incorporated in the January 12, 2004 SRK work plan)
$ Waste Rock Area North - approximately 98 ac. with dimensions of 2,916 by 1,458 ft
$ Waste Rock Area South - approximately 558 ac. with dimensions of 5,832 by 4,166 ft.

Total of approximately 2,951 ac. Screening may be aerial screening due large areas. (Note this assumes that those area of rock that have been leached such as the vat leach tailings have had most of the uranium leached out by acidic solutions)

II. Groundwater sampling for uranium and associated radionuclides (will need to evaluate secondary deposition of uranium in subsurface as noted in the 1976 study)

III. Surface water sampling of pit lake water for uranium and associated radionuclides

IV. Determination of those areas off site where uranium containing rock and tailings may have been used in construction, etc.

3. Recommendations for Ambient Levels Work Plan

An Ambient Levels Work Plan for the site should be prepared to determine ambient levels for metals and radionuclides. Potential sampling locations and proposed statistical methods to be used should be provided in the work plan for regulatory agencies review.

Summary and Conclusions

To appropriately assess the potential risk from TENORM and the Site requires a (1) an screening level assessment of the Site; (2) a comprehensive Site-wide Investigation; and (3) an associated ambient levels work plan. Of these three items portions of the first item is underway through NDEP's contractor SRK. Those portions not currently involved in that work should be included.

The last two items; the Site-wide Radiation Investigation and the ambient levels work plan should be added to the Scope of Work dated March 29, 2002 which is attached to October 24, 2002 Administrative Order on Consent AOC. between NDEP and ARC. Such a modification of the SOW or related work plans is allowed under Section V of that AOC. Such a modification would be consistent with the specific intent and purpose of

the SOW and necessary to identify appropriate response action(s) to the prior undiscovered potential for TENORM at the Site.

Sincerely,

James Sickles
Remedial Project Manager

Attachment: Semi-Quantitative Gamma Ray walkover survey of Unlined Evaporation Ponds Nos. 1 and 1A, with figures 1,2 and 3

cc: Earle Dixon, BLM
Wayne Garcia Yerington Paiute Tribe
Victoria Guzman, Walker River Paiute Tribe
James Sickles, EPA

ANACONDA COPPER MINE SITE - YERINGTON, NEVADA
SEMI-QUANTITATIVE GAMMA RAY WALKOVER SURVEY OF UNLINED EVAPORATION PONDS NOS. 1 AND 1A

Conducted December 17, 2003 by S. Dean, and J. Sickles of U.S. Environmental Protection Agency and T. Bawden of U. S. Army Corps of Engineers

Since radioisotopes are suspected to be present at the site based on the archival documents found in the Anaconda Archives in Laramie, Wyoming a "walkover" gamma ray survey was performed. The archived documents describe several areas of the site thought to contain uranium with an emphasis on unlined evaporation ponds Nos. 1 and 1A covering approximately 112 acres on the north end of the mine site. The gamma ray walkover survey was semi-quantitative since it did not cover all of the areas of the ponds but rather focused on Pond 1A and the low-lying areas of Pond 1 where uranium bearing sediment would most likely be deposited by secondary transport mechanisms. Samples were not collected as part of the survey since the goal of the survey was to answer whether any radiation anomalies were present. In such a survey if radiation anomalies are detected, the site should be characterized with a more thorough survey and instrumentation. The intent of the site characterization is to develop enough information to determine if the site is actionable, requiring cleanup and verification

Survey Description

The survey was conducted with a Ludlum 2221 scalar/ratemeter with an unshielded 3" x 3" sodium iodide detector for gamma ray counting and an Exploranium GR-130 Gamma Spectrum Analyzer for radionuclide identification. The Ludlum 2221was used in a walkover mode with anomalous areas subjected to a 60 second count initially. Anomalous locations detected in the initial walkover were then verified using a 600 second count using both the Ludlum 2221 and the Exploranium. This provided a verification of the initial count rate and identification of those radionuclides present and responsible for the gamma radiation. The Exploranium records and stores the gamma radiation spectra for the anomalous locations and allows comparison with the various anomalies. The gamma radiation spectra can be printed out later with specific energy peaks for specific radioisotopes indicated (see attached spectra with radium 226 peak highlighted by cursor)

The attached table provides the readings recorded during the walkover survey. The route taken started at the pump station on the west side of Pond 1 where the background was recorded. From there the route progressed southeast along the access road until Pond 1a was entered at the northwest corner. From the northwest corner the survey moved east to center of the pond and south to the end of Pond 1A by the original outfall and circumvented the northeast trending pile of fill supporting a power pole. From the south end of Pond 1A the route trended to the north and northeast to the low lying area in the central and western portions of Pond 1. From the central low lying area in the center of Pond 1 the survey route trended due west to the original background location by the pump station on the west side of the pond (see attached figure).

At the end of the walkover survey three locations were surveyed as possible reference locations as follows;

Reference Location 1 - on alluvial fan west, southwest of ponds, soils include rhyolitic materials
Reference Location 2 - on alluvial fan behind Weed Heights southwest of ponds, soils include granitic materials
Reference Location 3 - east end of Yerington Pit at foot of ramp approximately 75 feet laterally from and 30 feet vertically above water level, abundant granitic material

Readings with both the Ludlum 2221 and Exploranium were taken at each of the possible reference locations.

Preliminary Survey Conclusions

Based on a preliminary review of the results of the survey we can conclude the following:

$ Radiation anomalies occur on the surface of Ponds 1 and 1A. The most anomalous areas are found in the central and western portions of Pond 1 (see attached figure for unlined evaporation ponds).

$ The distribution of the anomalies indicate that the surficial sediments in the ponds are not homogeneous but are heterogeneous.

$ The distribution of the anomalies and identified radionuclides indicates secondary transport of radionuclides into the low lying areas of the ponds, potential by wind and water erosion.

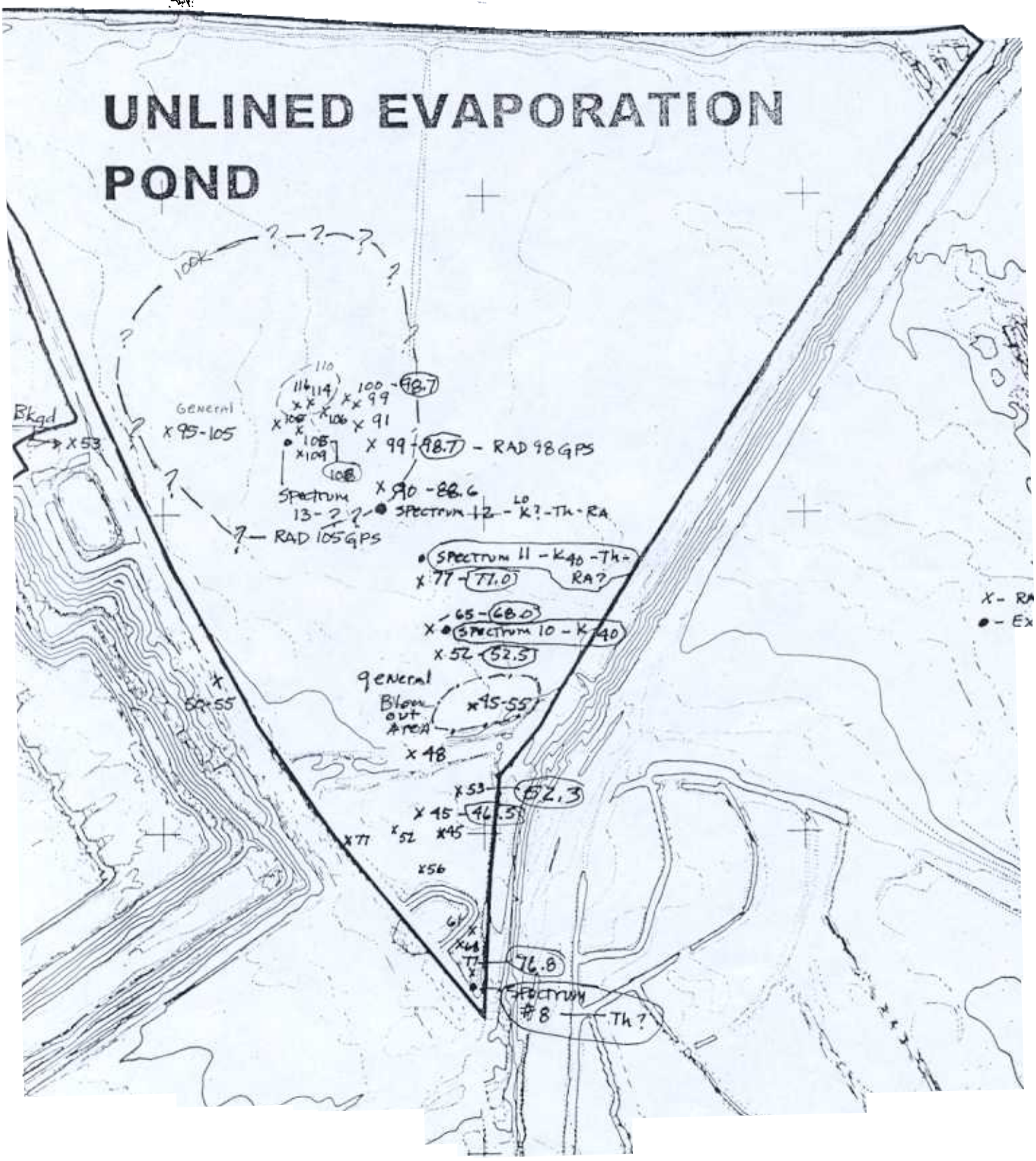
$ The gamma ray spectra for the three potential reference locations correlate reasonably well over three different geologic locales (see attached spectra) .

$ The anomalous areas in Pond 1 exhibit values of up to 2X background on gross gamma counts, while comparison of the gamma spectra from the three reference locations indicates up to 3X background for radium, with additional anomalous areas of thorium and potassium 40.

Walkover Radiation Survey Results - Anaconda Mine Site - Yerington Nevada

Location	Ludlum 2221 Count Rate	Explorarium Count	Radionuclides Detected	Notes
No. 1	53,000 counts per minute	NA	NA	Background at truck - 60 sec count
No. 2	50 to 55 K cpm	NA	NA	Along roadbed
No. 3	77K cpm	NA	NA	Along embankment on west side of Pond 1A
No. 4	52K cpm	NA	NA	center of Pond 1A
No. 5	45K cpm	NA	NA	center of Pond 1A
No. 6	43K cpm	NA	NA	center of Pond 1A
No. 7	56K cpm	NA	NA	center of Pond 1A
No. 8	61K cpm	NA	NA	center of pond 1a - calcine tails, iron bleed present
No. 9	77K cpm; 78.6K on 600 sec count	78.6K - Spectra 8	thorium	at outfall location
No. 10	68K cpm: 65K cpm on 60 sec coun	NA	NA	center of pond 1a south of telephone pole
No. 11	45K cpm; 46.5K cpm on 60 sec cou	NA	NA	northeast end of pond 1a
No. 12	53K cpm; 52.3K cpm on 60 sec cou	NA	NA	northeast end of pond 1a
No. 13	48K cpm	NA	NA	on berm between pond 1a and 1
No. 14	45K to 55K	NA	NA	over blowout from wind erosion
No. 15	68K cpm	65K - Spectra 10	potassium 40	visible salts on surface north of blowout area
No. 16	77K cpm	77K - Spectra 11	potassium 40; thorium; and radium	equivalent to 19 to 20 mr/hr
No. 17	90K cpm	87.9K - Spectra 12	low K40; mostly thorium and radium	northeast of No. 16
No. 18	99K; 98.7K cpm on 60 sec count	NA	NA	GPS location - Rad 98 GPS
No. 19	92K cpm	NA	NA	northeast of No. 17
No. 20	99K cpm	NA	NA	northeast of No. 18
No. 21	100K cpm; 98.7K cpm on 60 sec	NA	NA	northeast of No. 20
No. 22	108K cpm; 105K cpm on 60 sec	105K - Spectra 13	mostly thorium and radium, no K40	GPS Location RAD 105 - GPS in standing water area
No. 23	116K cpm	NA	NA	Among standing water
No. 24	114K cpm	NA	NA	Among standing water
No. 25	109K cpm	NA	NA	west from standing water
No. 26	105K cpm	NA	NA	west from standing water
No. 27	95K to 105K	NA	NA	west to west side berm on west side of pond 1

Reference Location 1 - on alluvial fan with rhyolitic clasts mixed in soil - approximately west, southwest of ponds - 55K cpm with 600 sec count
Exploranium 56K cpm - spectra 14 - K40 - GPS Location RAD BAC-GPS
Reference Location 2 - on alluvial fan with granitic clasts mixed in soil - south west of pond 1 behind Weed Heights - 45.9K cpm with 600 sec count
Exploranium - spectra 15 - K40 and radium - photos 105-104 - GPS location RAD BAC2- GPS
Reference Location 3 - east end of pit at foot of ramp about 75 feet from water line - in granitic material- 41K cpm on 600 sec count
Exploranium - spectra 16 - K40 - GPS RAD BAC3 -GPS


UNLINED EVAPORATION POND
Bkgd
X 53
General
X 95-105
X 99 - 98.7 - RAD 98 GPS
Spectrum 13 - ? ?
RAD 105 GPS
X 90 - 88.6
Spectrum 12 - LO K? - Th - RA
Spectrum 11 - K40 - Th - RA?
X 77 - 77.0
X 65 - 68.0
Spectrum 10 - K40
X 52 - 52.5
General
Blow out Area
X 45-55
X 48
X 53 - 52.3
X 45 - 46.5
X 56
76.8
Spectrum #8 - Th?

Date : 03:12:17 Time : 11:54:41
Units : cpm
GR130 Serial # 1163 Version # 515
Sample Time (s) : 600.00
Number of Samples : 16

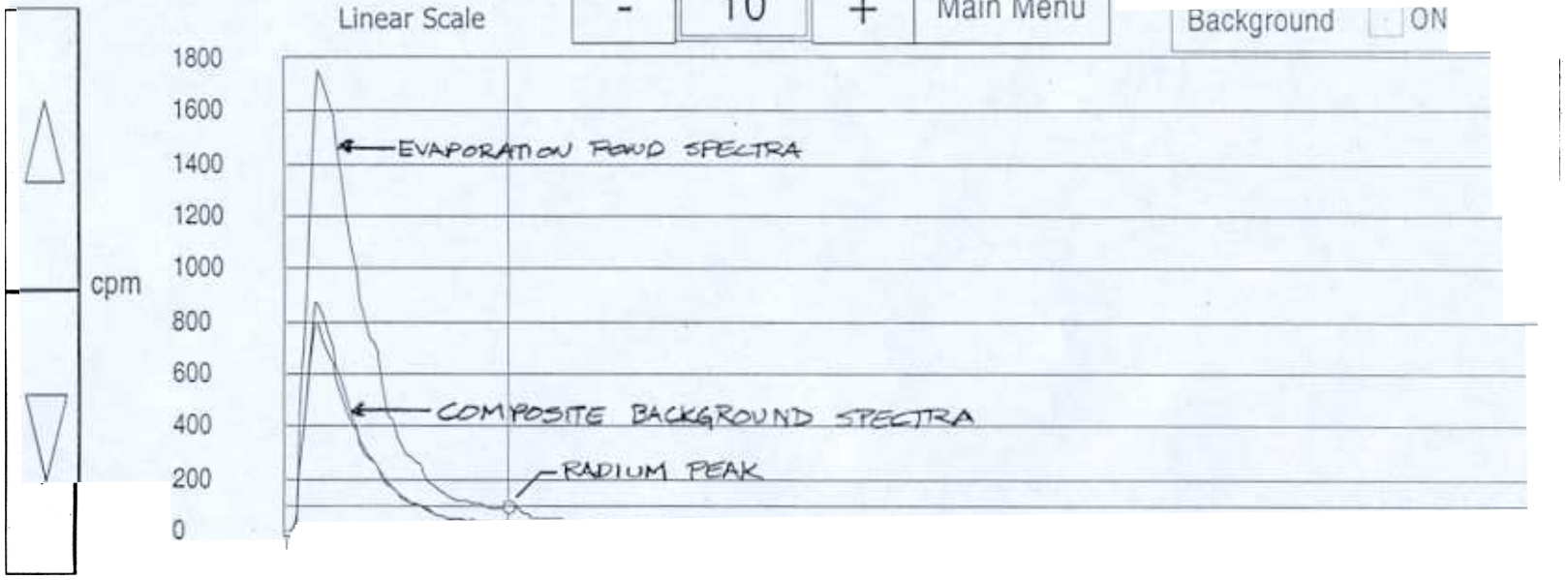
EXPLORANIUM GR130
Spectrum Data

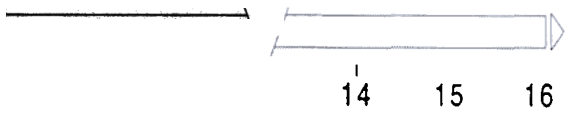
Cursor 0 590 102

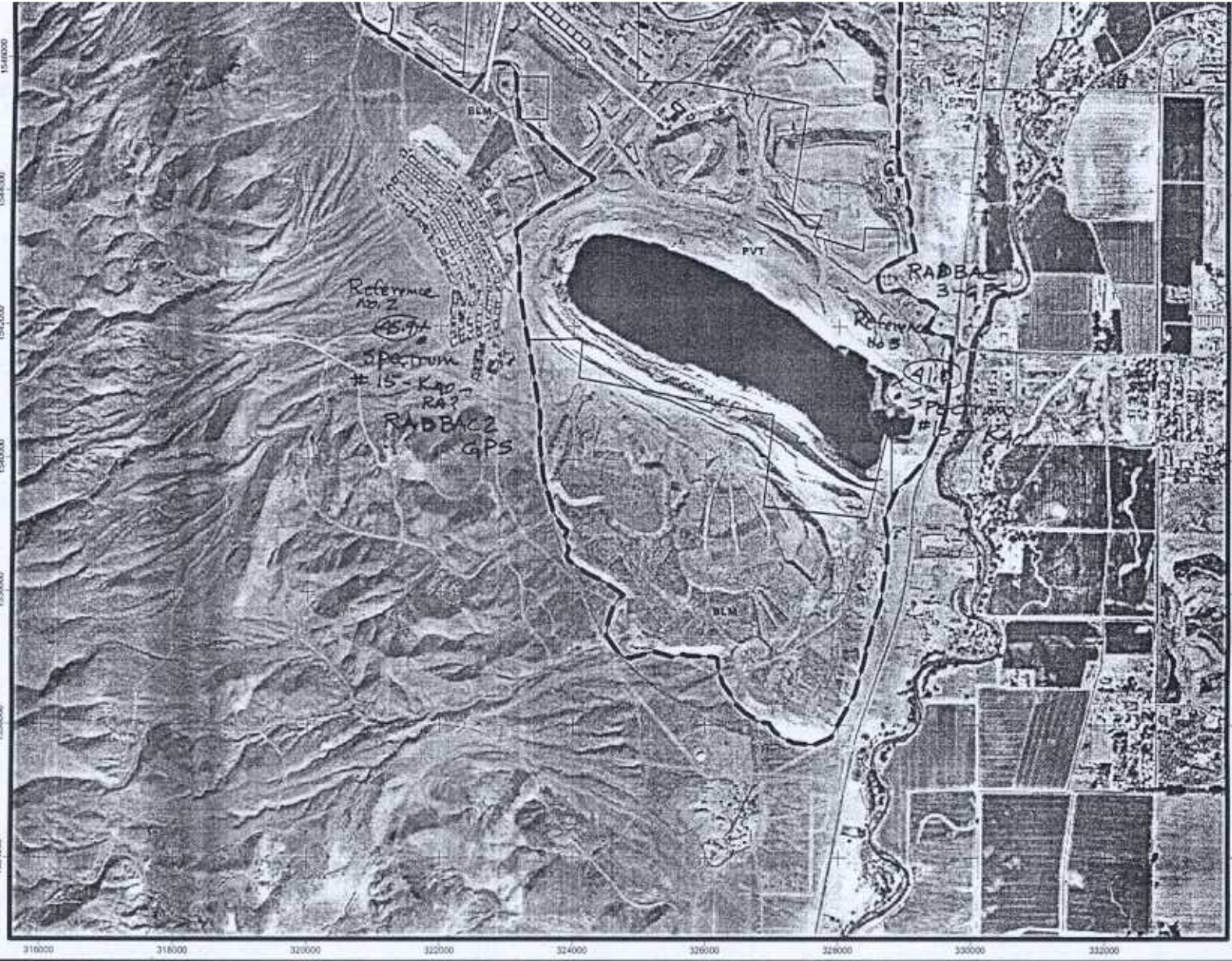
Blue Spectrum

Anaconda Evaporation Pond vs Composite Background Spectrum

Linear Scale - 10 + Main Menu Background ON







NOTES:
1.) PROJECTION: NEVADA STATE PLANE, WEST ZONE
1927 NORTH AMERICAN DATUM (FEET)
2.) LAND STATUS OBTAINED FROM BLM 2002

EXPLANATION

- MINE BOUNDARY
- MINE UNIT
- LAND STATUS BOUNDARY
- BURIED SEWER LINE

BROWN AND CALDWELL
Carson City, Nevada

DATE: JANUARY 2003

Atlantic Richfield Company

PROJECT NUMBER: 21243

SCALE:
700 0 700 1400 Feet
1:24000

N

FIGURE 2
SURFACE MINE UNITS

P:\ARCO\21243\Figs\ArcGis\Figure_2