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NATURAL RESOURCES

JK

WILLIAM ABBOTT & ASSOCIATES
ATTORNEYS AT LAW

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William W. Abbott

Diane G. Kindermann

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(R33-c attached)

RECEIVED
JAN 28 1997
REGULATORY COMPLIANCE OFFICE

January 27, 1997

Greg Vaughn
Central Valley Regional
Senior Engineer
Central Valley Regional
Water Quality Control Board
3443 Routier Road, Suite A
Sacramento, CA 95827-3098

Re: Notice of Emergency Remediation Measures
Gwin Mine, Calaveras County, California

Dear Mr. Vaughn:

This firm represents Gwin Mine Associates, LLC, ("GMA") the operators of the Gwin Mine. The Gwin Mine is located in Rich Gulch canyon near the towns of Paloma, San Andreas and Mokelumne Hills in the County of Calaveras. This notice is to advise you of the implementation of emergency remediation measures at the Gwin Mine to gain control of an hydraulic discharge at the main shaft occurring as a result of the recent storm events. The notification should be read in conjunction with the enclosed "Notice of Emergency Remediation Measures Report" prepared by SECOR International, Inc., dated January 27, 1997 ("Report").

BACKGROUND FACTS

The Gwin Mine is a gold mine located adjacent to an intermittent stream that empties into the Mokelumne River approximately at the headwaters of the Pardee Reservoir. The Gwin Mine was mined from 1857 to 1908, at which time mining operations ceased. In furtherance of recent reopening and exploratory ativities, the collar of the mine's main shaft was opened several months ago. It has been determined that, over the course of its abandonment, the mine has filled up with water. GMA, through its consultants, has been conducting water quality sampling to submit to the Regional Water Quality Control Board ("RWQCB") for the purposes of obtaining approval to dewater the mine. Preparation of the permit application is underway, but it has not yet been submitted.

EMERGENCY CONDITIONS

Due to the recent storm events, undetermined amounts of surface water upgradient of the mine have been disappearing as the stream diverts downward in the area of the former middle and south shafts of the mine. We conclude that there is hydraulic communication with the old workings in the upper part of the mine. This water then exits the mine at the collar of the main shaft and flows into the stream. Water quality test results reveal that this water contains somewhat elevated levels of arsenic and sulphur concentrations.

As the water exits the mine, sulphur and dolomite precipitate along the streambed for about 200 yards, after which the minewater is diluted by the surface waters.

EMERGENCY REMEDIATION MEASURES

The following three emergency remediation measures will be implemented:

1) Locating the finite points at which the surface water is entering the mine, and sealing those entrance points;

2) Interim diversion of the discharge from the main shaft to onsite tanks for treatment of arsenic and sulphur; and

3) Placement of a geochemical barrier downstream, if necessary, to neutralize any potential acidity.

The enclosed Report provides full descriptions of these emergency remediation measures and provides the framework for implementation of each.

CONCLUSION

In conclusion, the recent storm events have created an emergency situation in which surface waters are mixing with mine water and are being discharged at the main shaft of the mine into the stream. GMA has acted immediately to ensure that there is no threat to water quality by devising and commencing implementation of the above identified interim strategies to gain hydraulic control of the emergency discharge.

Please feel free to contact me should you have questions or comments. Moreover, we will be happy to meet with you at your convenience to further discuss these issues.

Very truly yours,

Diane G. Kindermann

Diane G. Kindermann

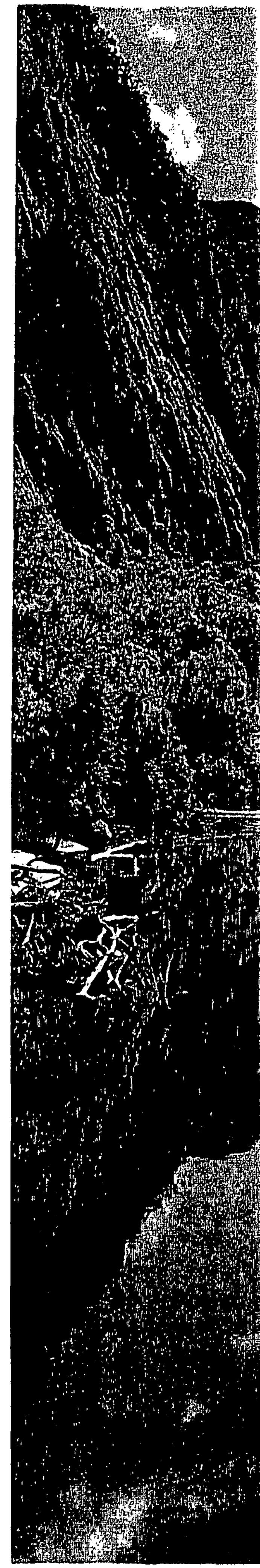
DGK:yb

enclosures

cc: Parker Sorg
Joel Pitto
Sierra Engineering
Secor International
Tim Smith
Alex Coate
Kim Schwab
Jeannine Stroh

NOTICE OF
EMERGENCY REMEDIATION MEASURES
PRELIMINARY REPORT

January 27, 1997



SECOR

R33-c

R 33-c

NOTICE OF EMERGENCY REMEDIATION MEASURES PRELIMINARY REPORT

January 27, 1997

Submitted to:
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Reviewed by:

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Senior Chemical Engineer

TABLE OF CONTENTS

1.0 EXECUTIVE SUMMARY

Water quality within Rich Gulch has been impacted by recent storm events causing mine water to exit the former Main Shaft (see Figure 1). Samples obtained from upstream locations have no detectable arsenic or sulfides and are classified as Ca/Mg bicarbonate waters. As a result of the recent storm events, surface water upgradient of the mine tends to "disappear" as the stream diverts downward in the area of the former middle and south shafts suggesting hydraulic communication with the old workings in the upper part of the mine. This water mixes (to an unknown degree) with mine water and exits the mine at the collar of the Main Shaft. Water exiting the mine and into the stream at this point is turbid, reduced (Eh = -200 mv), has elevated arsenic concentrations (200 to 300 ppb) and elevated sulfide (about 1 ppm). As the reduced mine water mixes with surface water and exits the mine, both elemental sulfur and dolomite precipitate along the streambed. This impact is evident several hundred yards downstream until mixing with seeps and tributaries dilute the minewater. Currently arsenic entering the river ranges from 80 ppb to almost 200 ppb depending on prevailing flow conditions.

During high flow or storm water runoff conditions, the effect is merely one of dilution as surface water flow upstream of the mine exceeds the infiltration rate to the middle and south shafts. Water then follows the stream bed around the collar of the mine and enters the creek opposite the outfall of water from the Main Shaft. This water mixes with mine water about 50 feet from the inflow, causing increased aeration and dilution.

The stream bed deposits are composed primarily of elemental sulfur with lower amounts of carbonates, principally dolomite. Elemental sulfur forms from chemical oxidation of sulfide as water exits the mine while dolomite precipitates from carbonate saturated water possibly due to interaction with limestone placed around the mine collar. The exact mechanism by which elemental sulfur forms is still under investigation.

Based on what is known about these processes to date, *SECOR* recommends the following interim actions to both determine the impacts to surface water and to ameliorate future water quality impacts.

1. At present, the entrance of surface water to the former middle and south shafts should be located and sealed. The entry of surface water to the former upper workings presently appears to be the single most important factor affecting downstream water quality. Sealing the entrances should decrease the flow of water and hence the mass of sulfur and arsenic exiting from the mine at the Main Shaft. At the same time, consideration should be given to diverting the stream bed so that surface water bypasses all the shaft entrances.

2. The mine at the Main Shaft should be dewatered to about 80 feet below the sleeves in the collar as soon as possible to gain hydraulic control of mine water seeping into the stream. The sleeves should be capped to prevent further leakage of mine water to the stream. Mine water from the Main shaft should be pumped into a series of treatment tanks designed to eliminate precipitation of sulfur in the stream and to reduce the load of arsenic to downstream locations. In this way, seepage from the mine can be controlled and diverted for removal of arsenic and other constituents of concern prior to discharge. Treated water should be discharged back into the stream at a suitable downstream location

3. The acid generation potential of deposits in the stream bed should be determined statically and kinetically to insure that pulses of acidity do not enter the watershed or local surface water bodies. If acid generation appears likely, then a downstream geochemical barrier should be put in place to completely neutralize any acidity generated by sulfur oxidation.

2.0 PURPOSE OF REPORT

This preliminary report describes *SECOR's* activities in sampling and analysis for assessing water quality in the Rich Gulch area, Calaveras County (Site) pursuant to the recent storm events. The location and topography of the Site is depicted on Figure 1, Site Map. Recent heavy rainfall and the observation of turbid water near the outfall of the Gwin Mine prompted *SECOR* to evaluate the possible impact mine water might have on surface water chemistry of the area. Amendments to this report will be provided as new data becomes available.

3.0 STATEMENT OF THE PROBLEM

Recent heavy rainfall in the Rich Gulch area, coupled with mine construction activities at the Main Shaft of the former Gwin Mine, appear to have created a condition of increased turbidity in surface water near the Main Shaft area. The stream bed for several hundred yards has become discolored with a yellow-white chalky substance. *SECOR* has sampled the mine water and stream at several locations, at three different times, in order to determine the potential impact of the turbidity to local surface water bodies.

4.0 DESCRIPTION OF WATER QUALITY IN RICH GULCH

Three different sampling events have been conducted by *SECOR* in the Rich Gulch area. Additional analyses, performed on samples collected by Sierra Engineering, have been included in Appendix A. The results of *SECOR's* field activities and analyses are described below.

4.1 Sampling Data - January 13, 1997

The NPDES requirements of the Regional Water Quality Control Board (RWQCB) for the Gwin Mine include establishment of the baseline water quality of the in-stream surface water as well as the Mokelumne River receiving water body. On January 10, 1997, an opaqueness in surface water downstream of the Main Shaft was reported by Sierra Engineering and Counsel to *SECOR.* To evaluate that observation, *SECOR* personnel visited the Gwin Mine site on January 13, 1997. Storm water/surface water samples were collected at the following four locations within Rich Gulch (see Figure 1):

Sample # 1 "distant downstream" - at EBMUD culvert, east side of Gwin Mine Road, point "1.05 miles"

Sample # 2 "near downstream", 0.58 miles north of Sample #4

Sample # 3 north of the Main Shaft, downstream of the silt fence, 0.2 miles north of Sample #4

Sample # 4 upstream - near pullout, point "0 miles", between set control point markers #975 and #974, southernmost point of obvious flow

A single grab sample was collected at each of the locations, for analysis to be performed at *SECOR* Geochemistry Laboratory. Samples # 1, # 2 and # 4 were clear, with no observable color or solids present. Sample # 3 was somewhat opaque, with pasty gray, "chalky" material adhering to rocks and the streambed. There were strong sulfur-like odors present in that area. The water collected at this location was noticeably warmer than surrounding water. One full set of samples was collected at the Sample # 3 location. These samples were transferred under chain of custody documentation to a California certified laboratory, American Environmental Network, Inc. (AEN). The laboratory report is included in Appendix B.

Analytical results for analyses performed at *SECOR's* Geochemistry Laboratory are as follows:

Analyte	Sample ID			
	#1	#2	#3	#4
pH	7.95	7.90	7.01	7.90
Eh (mv)	240.6	246.7	195.6	226.6
Cl^- (mg/L)	43.65	11.09	14.65	23.44
NO_3 (mg/L)	3.96	5.88	0.89	16.21
Ca (mg/L)	61.34	65.63	62.66	29.02
As (μg/L)	105	117	181	ND (<5)
Cd (mg/L)	ND (<20)	ND (<20)	ND (<20)	ND (<20)
Fe (mg/L)	ND (<500)	ND (<500)	ND (<500)	ND (<500)
Pb (mg/L)	ND (<20)	ND (<20)	ND (<20)	ND (<20)

ND = Not Detected at detection limit listed.

The additional analytical results for Sample #3, as analyzed by AEN, are included in the following table:

Analyte	Sample #3 Concentration
Total Alkalinity (as mg $CaCO_3$/L)	290
Total Phosphorous (mg/L)	0.25
Total Suspended Solids (mg/L)	3
Sulfate (mg/L)	7.1
Oil and Grease (mg/L)	ND (<0.5)
MBAS (surfactants) (mg/L)	ND (<0.1)
Silver (mg/L)	ND (<0.005)
Beryllium (mg/L)	ND (<0.002)
Cadmium (mg/L)	ND (<0.005)
Chromium (mg/L)	ND (<0.01)

Analyte	Sample # 3 Concentration
Copper (mg/L)	ND (<0.01)
Mercury (mg/L)	ND (<0.0002)
Nickel (mg/L)	ND (<0.01)
Lead (mg/L)	ND (<0.04)
Antimony (mg/L)	ND (<0.02)
Selenium (mg/L)	ND (<0.004)
Thallium (mg/L)	ND (<0.05)
Zinc (mg/L)	ND (<0.01)
Arsenic (μg/L)	170
Iron (μg/L)	150

It must be noted that the collection of samples on January 13, 1997 followed a storm event (on January 1-3, 1997) which was quite unusual in that it was estimated to be a 50-year storm, and additionally, substantial runoff/runon and snow melt occurred during and subsequent to the storm event. Therefore, these samples may not be truly representative of typical surface water conditions, due to dilution effects.

A review of this data indicates that the upstream sample contained the most nitrate, but being unaffected by mine drainage, contains no arsenic. As would be anticipated with mine drainage, the area around the mine shaft (Sample #3) is impacted in several ways, most importantly by a decreased pH and substantially elevated arsenic concentrations. Moving downstream, in less than one-half mile, the pH recovers, and the arsenic is somewhat diluted by runoff, springs and seeps. At the location of the EDMUD culvert, 0.85 miles downstream from the main shaft, elevated concentrations of arsenic are still apparent.

Additionally, several rocks coated with the chalky substance were retrieved from within the streambed for analysis of the gray-white material. The results of analysis of this material are described in section 4.2 of this report.

4.2 Sampling Data - January 17, 1997 and January 20, 1997

SECOR also collected samples and conducted some in-field measurements in order to better define the local geochemical conditions. Data collected as part of this exercise are to be included in a geochemical model that will describe sulfur dynamics in the Rich Gulch watershed. Samples were collected from seven different locations within the stream. The locations are noted in Figure 1. Samples were analyzed for As, Eh, pH and in some cases sulfides, in the *SECOR* Geochemistry Laboratory. The results of the January 17 sampling are noted below.

Sampling Location	Arsenic (ug/L)	pH	Eh
Main Shaft	264	6.3	-89
10' downstream of shaft	257	6.5	+86
50' downstream of shaft	278	6.6	+114
Main stream above 1st tributary	222	7.0	+149
at River	143	7.5	+171

This sampling was conducted approximately 2½ weeks after the 50-year storm. Base flow for the stream appeared to have returned to a more normal state. As such, the dilution described earlier from overland flow above the mine was not occurring, resulting in arsenic values in the stream similar to those noted in the main shaft. Little dilution occurred until the stream mixed with the first tributary. The pH and Eh trends were similar to those from the first sampling. It should be noted that the Eh values reported for this sampling cannot be considered too accurate as this analyses is best conducted in the field, and these samples were analyzed back in the laboratory. The trend in Eh is, however, consistent with discharge of reducing water that then aerates and mixes.

Due to the limitations posed by some of the lab-based measurements in such a dynamic system, another sampling and analysis event was conducted on January 20. The purpose of this sampling was to:

1. obtain field based measurements of sulfide (the smell of sulfide emanating from the area is quite strong),

2. in-field Eh measurements, and

3. collection of samples for arsenic determination and total sulfur. See Figure 1 for sampling points.

The data collected to date from this event are summarized below:

Sample Location	Eh (mv)	Sulfide ($\mu g S^{=}/L$)	Total sulfides ($\mu g/L$) Total Sulfide = $HS^{-} + S^{=}$
Main shaft	-210	trace	900
Stream near silt fence	-190	trace	790
Stream inflow behind collar	+36	nd	nd
Pool near stream inflow	+6	250	na
Mixing zone of mine water and surface water from behind collar	-70	trace	na
200 ' downstream	-30	na	na
Main stream above 1st tributary	+80	na	na

na = not yet analyzed
nd = not detected
trace = $<10^{-7}$ M

The Eh values taken in the field demonstrate the prevalence of reducing conditions in and around the mine's Main Shaft. Dissolved sulfides within the stream and mine shaft are elevated and responsible for the coating observed in the stream bed (see next section).

5.0 SIGNIFICANCE OF FINDINGS

5.1 Source of Arsenic

Since the upstream stormwater sample contains <5 μg/L arsenic (As), and the Main Shaft historically carries about 200-300 μg/L As (see Main Shaft water chemistry data in Appendix A), it seems logical that As in surface water north of the Main Shaft is at least partially derived from mine water discharging into the stream. Since the Rich Gulch area is underlain by a rich mineralized zone and is known to contain abundant sources of arsenic and various metals, it is premature to rule out other sources of naturally occurring arsenic. This part of the study is currently under investigation.

5.2 Source of Sulfur

A sample of the white-yellow chalky material coating the stream bed which was analyzed by x-ray diffraction at the Department of Land, Air & Water Resources, U.C. Davis. The diffraction patterns of the sample exactly matched that of elemental sulfur. A copy of the x-ray diffraction patterns is included in Appendix C. This naturally-occurring material can cause adverse effects within the streambed if oxidation of elemental sulfur proceeds as:

$$2S + 3O_2 + 2H_2O = 2H_2SO_4$$

As seen, sulfuric acid, a strong acid, is produced and may cause serious water quality impacts. The source of sulfur in the stream originates from the mine's Main Shaft area. While sulfate in mine shaft water is low, sulfide tends to be high (900 ppb). A discussion of sulfur geochemistry at the site is discussed below.

5.3 Sulfur Dynamics in Rich Gulch

5.3.1 Conceptual Model

Based on the data collected to date, the following site model appears to describe the origin of elemental sulfur in the stream bed:

<u>Origin of Sulfur and Species Distribution within the Mine Shaft</u>

Since the upstream sampling locations show little total sulfur and sulfide gas is observed within the mine shaft, it is logical to assume that the historic mine workings are the main source of sulfur. Within the mine, it appears that groundwater sulfate is reduced by decomposing organic matter which is provided by the increasing amount of framing and shoring timber within the mine and possibly by carbon present in the mine's overburden. Because the mine water is anaerobic, sulfate reduction and hydrogen sulfide gas production occurs by:

$$CH_2O + \tfrac{1}{2}SO_4^{2-} + H^+ \rightarrow CO_2 + \tfrac{1}{2}H_2S + H_2O$$

which shows that 1 mole of sulfate reduced produces 1 mole of sulfide gas.

One H_2S (gas) is produced in the system; some of it will dissolve and then dissociate based on ambient pH conditions:

$$H_2S_{(g)} \rightarrow H_2S_{(aq)}$$
$$H_2S_{(al)} \rightarrow HS^- + H^+$$

and

$$HS^- \rightarrow H^+ + S^=$$

At pH between 6 and 7, most sulfide exists as $H_2S_{(aq)}$ and HS^- which is perfectly consistent with the sulfide data collected from the main shaft. As the sulfide rich mine water mixes with incoming high pH, and high oxygen content water, sulfide rapidly oxidizes to form various sulfur species. Also the water exiting the Main Shaft must percolate through a bed of limestone rock placed around the collar before entering the stream. Thus water entering the stream will also be saturated with respect to dolomite resulting in eventual precipitation of carbonates along with sulfur (see X-ray diffraction patterns in Appendix C). Sulfur species forming under these conditions could include:

$$HS^- + \tfrac{1}{2}O_2 \rightarrow HSO_3^-$$
$$SO_3^{2-} + \tfrac{1}{2}O_2 \rightarrow SO_4^{2-}$$
$$SO_3^{2-} + HS^- + \tfrac{1}{2}O_2 \rightarrow S_2O_3^{2-} + OH^-$$
$$S_2O_3^{2-} + \tfrac{1}{2}O_2 \rightarrow SO_4^{2-} + S$$

As noted, in the process of reducing sulfate and oxidizing sulfide, a number of compounds with intermediate oxidation states can be formed. These include sulfate (SO_4^{2-}), thiosulfate ($S_2O_3^{2-}$), polysulfides (S_n^{2-}) and solid sulfur (S_8^0) in colloidal or orthorhombic form. It is known that partial oxidation of sulfide by molecular oxygen leads to the formation of elemental sulfur, polysulfide, and thiosulfate. The reaction observed as the mine water leaves the collar area and mixes with oxygenated surface water is chemical in nature and leads to the formation of colloidal or orthorhombic elemental sulfur which then deposits on the surface of the streambed.

Kinetic Modeling

Once sufficient data is collected, a kinetic rate expression can be derived that will predict the rate at which elemental sulfur is deposited within the stream bed. The model will be useful for predicting the long-term loading of sulfur to the stream under a variety of mixing scenarios. The rate expression will be generalized to describe the rate of sulfide consumption irrespective of oxidation products, and has the general form:

$$-d[H_2S]/dt = k_{s(-II)}[H_2S]^a[O_2]^b$$

where $k_{s(-II)}$ is the overall rate constant and a and b are the order of the reaction with respect to sulfide and dissolved oxygen. Previous work has demonstrated that a and b are equal to 1 (i.e. first order) in most cases.

The rate constant is also dependent on pH and temperature and can be corrected by:

$$k_{s(-II)} = k_{H2S} + k_{HS}K_1/[H^+])/(1+K_1/[H^+])$$

where $k_{H2S} = 1.33\ M^{-1}min^{-1}$ and $k_{HS} = 0.12\ M^{-1}min^{-1}$ for the oxidation of H_2S and HS, respectively. K_1 is the ionization constant of H_2S. The rate constants can also be corrected for ionic strength and temperature:

$$\log k_{H2S} = 7.44 - (2.4 \times 10^3)/T$$

and

$$\log k_{HS} = 8.72 + 0.16pH - (3.0 \times 10^3)/T + 0.44\ I^{0.5}$$

These equations will be valid from pH 4 to 8, temperature (T) ranging from 8°C to 50°C, and I (ionic strength) of 0 to 6 M.

5.4 Acid Generation Potential

Since both elemental sulfur and carbonate have been deposited in the streambed, the concern in the near-term will be to determine the rate at which oxidation of sulfur to sulfuric acid occurs in relation to the ability of carbonate in the stream bed to neutralize acidity as it is generated:

$$2S + 3O_2 + 2H_2O = 2H^+ + SO_4^{2-} \text{ (acidity production)}$$

$$2H^+ + (CaMg)CO_3 = Ca + Mg + 2HCO_3 \text{ (neutralization of acidity)}$$

$$Ca + SO_4^{2-} = CaSO_4 \text{ (solid phase formation - new sulfur sink)}$$

The objective then becomes determining if enough net neutralization capacity exists to overcome all potential acidity generated by the oxidation of sulfur. Fortunately, there are several ways to determine if acid generation is likely.

5.4.1 Static Acid-Base Accounting Tests

A static acid-base test defines the balance between potentially acid-generating minerals (potential acidity) and acid-neutralizing minerals (sulfide neutralization potential) in a sample. In particular, acid-generating compounds include reactive minerals and acid-neutralizing compounds include carbonate minerals. A sample will theoretically generate net acidity at some point in time only if the potential acidity exceeds the neutralization potential; otherwise the sample will not produce net acidity as long as the neutralization potential is not dissolved faster than the generation of acidity.

Despite the theoretical simplicity, static tests can not be used to predict the quality of drainage emanating from waste materials at any future time. Acid generation processes and, therefore, drainage quality are time-dependant and functions of a large number of complex factors such as mineralogy, rock structure and climate. For this reason, static tests should be treated as a qualitative predictive method, that is they can only indicate whether or not there is a potential for generation of net acidity at some unknown time.

There are several types of static tests such as acid-base accounting, APP/sulfur ratio, and the B.C. Research initial test. However, all of these tests are simply variations on a basic procedure and all require variations of the same basic analyses for determining the balance between potential acidity and neutralization potential. Consequently, the basic, common procedure will be presented and the names of the variations will be de-emphasized.

5.4.2 Procedures for Conducting a Static Test

The initial step in defining the acid-generating/acid-neutralizing balance in a sample begins with a measurement of total sulfur in a sample, commonly performed with a Leco furnace/analyzer. The measurement of total sulfur allows the calculation of "maximum potential acidity", which may overestimate the potential for acid generation if all sulfur in a sample is not acid generating. Therefore, additional analysis may be performed to refine the potential acidity.

Following the delineation of potential acidity, the next parameter, neutralization potential, is defined (see Figure 2). The measurement of neutralization potential provides a gross value for neutralization; however, this value may overestimate the capacity of the sample to neutralize the pH to an environmentally acceptable level above 6. An analysis of carbonate content will provide a more meaningful measure of neutralization potential from the perspective of pH neutralization. The carbonate analysis is recommended as an optional part of static tests.

Following these analyses, the potential for net acidity is calculated by subtracting the potential acidity from the neutralization potential with a negative value indicating the potential for net acidity. Alternatively, a ratio of neutralization potential to potential acidity can be used (APP/sulfur ratio), but the subtraction method (acid-base accounting) will be adopted here.

5.4.3 *Interpretation of static test results*

The subtraction of maximum potential acidity (based on total sulfur) from the gross neutralization potential yields the "net neutralization potential (NNP)". Theoretically, a sample can be expected to generate net acidity at some point in time if the NNP is less than zero. However, based on general experience, values of NNP in the range -20 and +20 tons of $CaCO_3$/1000 t of sample (-2 to +2% $CaCO_3$) may be considered to have the ability to generate net acidity. This range of uncertainty is attributed to the source of error in:

1. obtaining the objective of defining true potential acidity and neutralization;
2. converting total sulfur to acidity using a restricted conversion factor; and
3. analytical error.

The subtraction of potential acidity (based on reactive sulfide) from carbonate content yields the "net neutralization potential from species (NNP(S))". This value will presumably reflect the actual net neutralization potential due to the narrower range of uncertainty and, thus, provide more reliable predictions, although there is no database to confirm these conclusions. The primary sources of error is similar to those for the NNP (above), except that estimating long-term reactive sulfide from a short-term test may result in some uncertainty.

In the event the samples from a geologic unit indicate that unit or may have the potential for net acid generation, kinetic tests should be conducted. Design of these tests is in progress and will be discussed at a later time.

6.0 SUMMARY AND RECOMMENDATIONS

Water quality within Rich Gulch has been impacted by recent storm events causing mine water to exit the former Main Shaft. Samples obtained from upstream locations have no detectable arsenic or sulfides, and are classified as Ca/Mg bicarbonate waters. As a result of the recent storm events, surface water upgradient of the mine tends to "disappear" as the stream diverts downward in the area of the former middle and south shafts. This suggests hydraulic communication with the old workings in the upper part of the mine. This water mixes (to an unknown degree) with mine water and exits the mine at the collar of the Main Shaft. Water exiting the mine and into the stream at this point is turbid, reduced (Eh = -200 mv), has an elevated arsenic content (200 to 300 ppb) and sulfide content of about 1 ppm. As the reduced mine water mixes with surface water and exits the mine, both elemental sulfur and dolomite precipitate along the streambed. This impact is evident several hundred yards downstream until mixing with seeps and tributaries dilute the minewater. Currently, arsenic entering the river ranges from 80 ppb to almost 200 ppb, depending on prevailing flow conditions.

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Based on what is known about these processes to date, *SECOR* recommends the following interim actions to both determine the impacts to surface water and to ameliorate future water quality impacts:

1. The entrance of surface water to the former middle and south shafts should be located and sealed. At present, the entry of surface water to the former upper workings appears to be the single most important factor affecting downstream water quality. Sealing the entrances should decrease the flow of water and hence the mass of sulfur and arsenic exiting from the mine at the Main Shaft. At the same time, consideration should be given to divering the stream bed so that surface water bypasses all the shaft entrances.

2. The mine at the Main Shaft should be dewatered to about 80 feet below the sleeves in the collar as soon as possible to gain hydraulic control of mine water seeping into the stream. The sleeves should be capped to prevent further leakage of mine water to the stream. Mine water from the Main shaft should be pumped into a series of treatment tanks designed to eliminate precipitation of sulfur in the stream and to reduce the load of arsenic to downstream locations. In this way, seepage from the mine can be controlled and diverted for removal of arsenic and other constituents of concern prior to discharge. Treated water should be discharged back into the stream at a suitable downstream location

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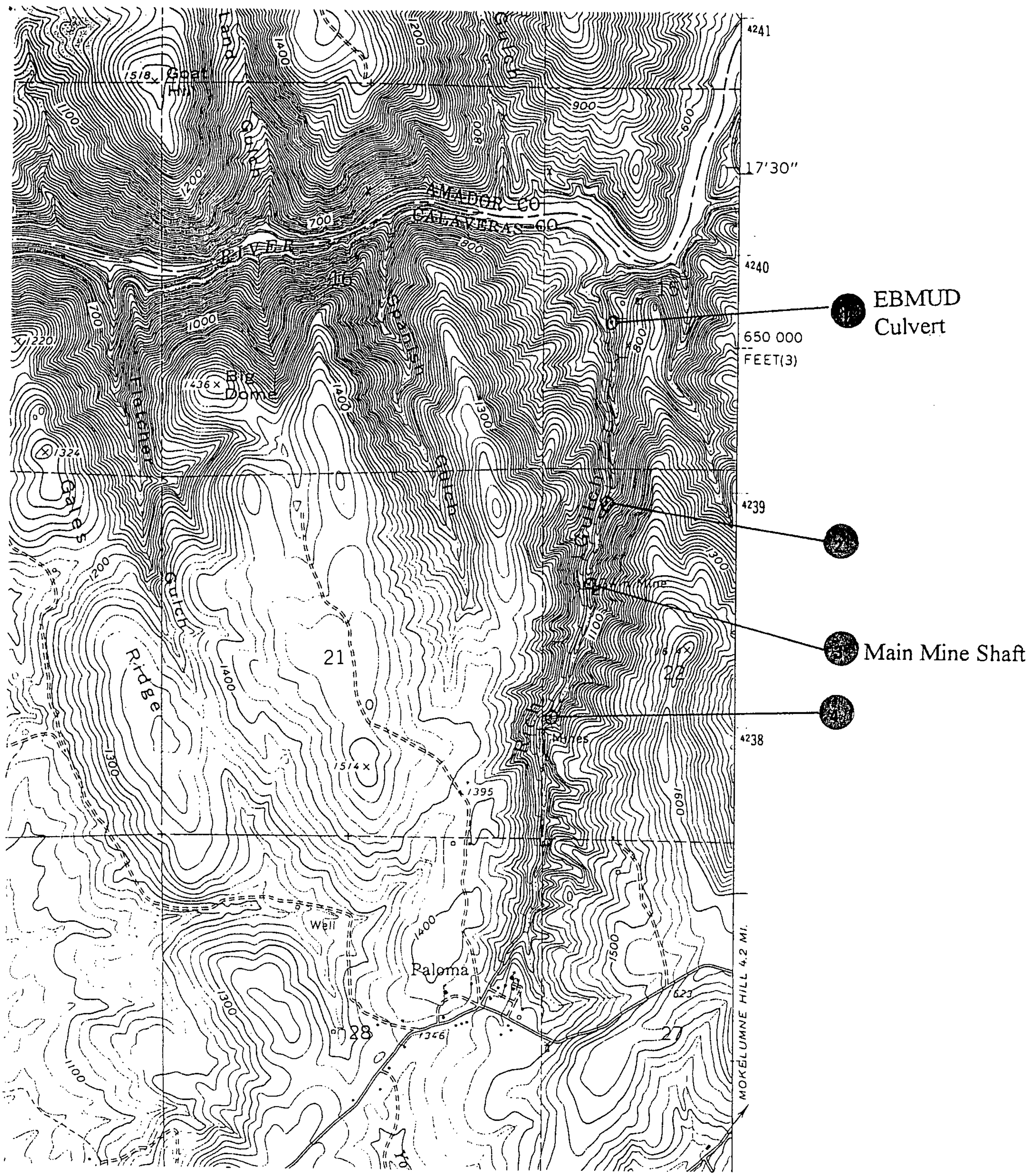
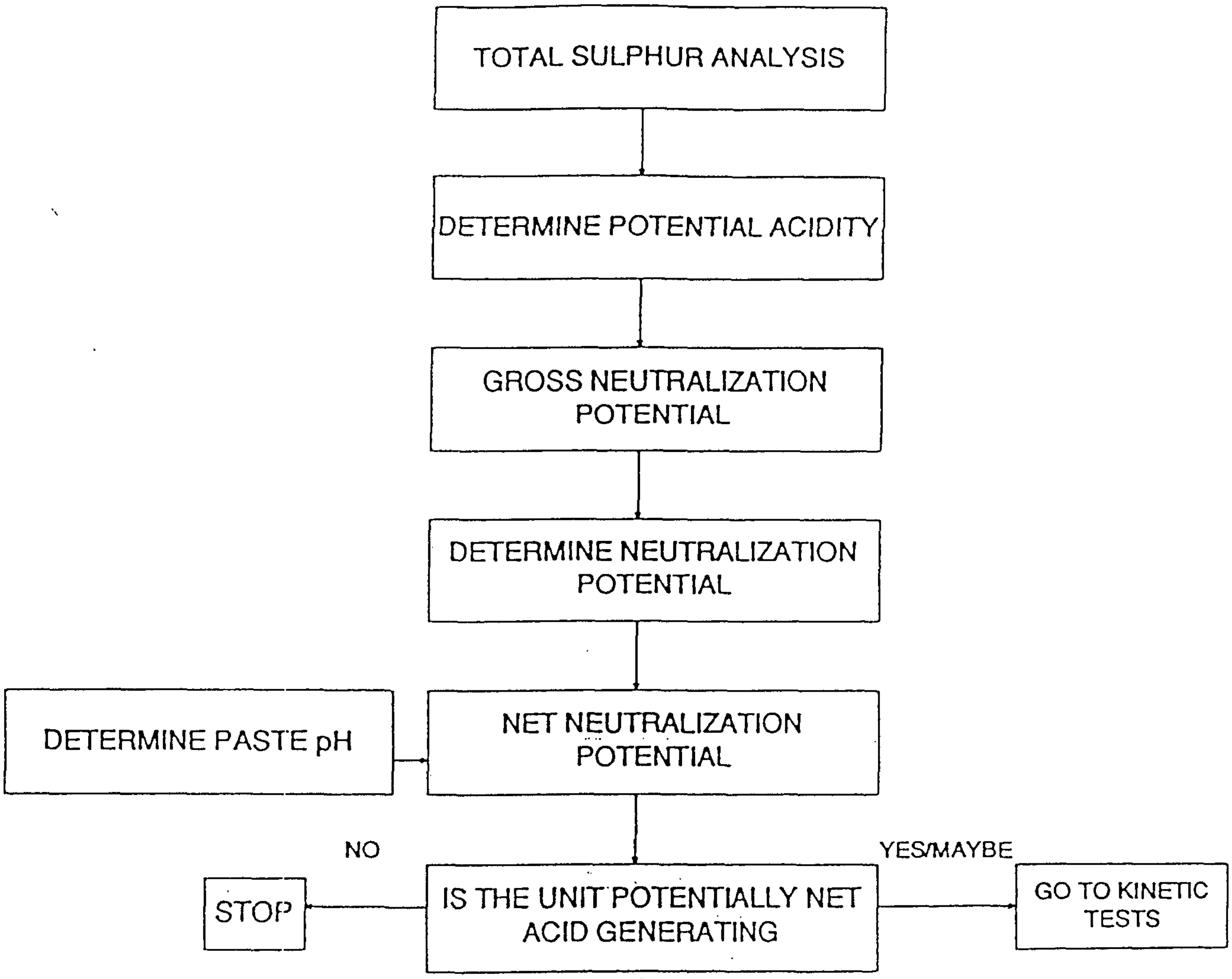


SOURCE: BASE MAP FROM U.S.G.S. JACKSON, CA QUADRANGLE.
7.5 MINUTE SERIES TOPOGRAPHIC MAP,
PHOTOREVISED 1980.

NORTH

SECOR INTERNATIONAL INCORPORATED	DRAWN JLB	FIGURE 1
	APPR RCC	GWIN MINE ASSOCIATES, L.L.C. CALAVERAS COUNTY, CALIFORNIA
	DATE 24JAN97	MAP OF STORMWATER SURFACE WATER
	JOB NO. 7D017-001-02	COLLECTION LOCATIONS, RICH GULCH



SECOR
INTERNATIONAL INCORPORATED

DRAWN	JLB
APPR	RCC
DATE	24JAN97
JOB NO.	7D017-001-02

FIGURE 2
GWIN MINE ASSOCIATES, L.L.C.
CALAVERAS COUNTY, CALIFORNIA

RECOMMENDED STATIC TEST PROCEDURE FOR EACH GEOLOGIC UNIT

C:\ACAD\WBLOCK\18X11

FIGURES

SIERRA FOOTHILL LABORATORY

REPORT

823 S. HWY. 49
P.O. BOX 1268 • JACKSON, CA 95642
(209) 223-2800

TEST REPORT: 429784

Gwin Mine Associates
PO Box 1059
San Andreas, CA 95249-

Sample Identification:20' Main shaft
Collected By:LG
Date & Time Taken:09/09/96 1515

Other Data: G W 1LG/HNO3
Sample Matrix: Liquid
Report Date: 10/07/96 Received: 09/10/96 Client: GWIN

PARAMETER	RESULTS	UNITS	ANALYZED	EQL	METHOD	BY
Silver, GFAA	<5	ug/L	1230 09/23/96	5.0	EPA200.9	TN
Aluminum, GFAA	290	ug/L	0825 09/23/96	50	EPA200.9	TN
Barium, FAA	0.26	mg/L	1140 09/10/96	0.10	EPA208.1	TN
Beryllium, GFAA	<1	ug/L	0935 09/12/96	1.0	EPA200.9	TN
Cadmium, GFAA	<1	ug/L	1215 09/10/96	1.0	EPA200.9	TN
Chromium, GFAA	3.2	ug/L	1000 09/22/96	2.0	EPA200.9	TN
Copper, FAA	<0.03	mg/L	1405 09/10/96	0.03	EPA220.1	TN
Iron, FAA	0.69	mg/L	1530 09/17/96	0.05	EPA236.1	TN
Mercury, CVAA	<0.5	ug/L	1310 09/11/96	0.5	EPA245.1	TN
Manganese, FAA	0.69	mg/L	1510 09/17/96	0.03	EPA243.1	TN
Sodium, FAA	30	mg/L	1555 09/11/96	0.05	EPA273.1	TN
Nickel, FAA	0.15	mg/L	1600 10/04/96	0.10	EPA249.1	TN
Lead, GFAA	<2	ug/L	1240 09/24/96	2.0	EPA200.9	TN
Antimony, GFAA	2.7	ug/L	1400 09/18/96	2.5	EPA200.9	TN
Selenium, Hydride	<1	ug/L	0845 09/11/96	1.0	SM3114B	TN
Thallium, GFAA	1.1	ug/L	0850 09/24/96	1.0	EPA200.9	TN
Zinc, FAA	<0.05	mg/L	1350 09/10/96	0.05	EPA289.1	TN

Continued

SIERRA
FOOTHILL LABORATORY

REPORT

823 S. HWY. 49
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PARAMETER	RESULTS	UNITS	ANALYZED	EQL	METHOD	BY
Arsenic, Hydride	160	ug/L	1100 09/11/96	2.0	SM3114B	TN

Sample Preparation Steps for 429784

Digestion, Arsenic by Hydride	09/10/96	Date	0830 09/10/96	SM303E	LK
Digestion, Selenium by Hydride	09/10/96	Date	0900 09/10/96	SM303E	LK
Digestion, Mercury, Liquid	09/10/96	Date	1330 09/10/96	EPA7470	LK

Quality Assurance for the SET with Sample 429784

Sample #	Description	Result	Units	Dup/Std Value	Spk Conc.	Percent	Time	Date	By
				Silver, GFAA					
	Blank	<5.0	ug/L				1230	09/23/96	TN
	Standard	8.0	ug/L	8.0		100	1230	09/23/96	TN
	Standard	8.7	ug/L	8.0		109	1230	09/23/96	TN
429975	Duplicate	<5.0	ug/L	<5.0		0	1230	09/23/96	TN
429809	Spike		ug/L		5.0	90	1230	09/23/96	TN
				Aluminum, GFAA					
	Blank	<50	ug/L				0825	09/23/96	TN
	Standard	74	ug/L	75		99	0825	09/23/96	TN
	Standard	60	ug/L	75		80	0825	09/23/96	TN
429784	Duplicate	290	ug/L	280		4	0825	09/23/96	TN
429973	Spike		ug/L		100	124	0825	09/23/96	TN
				Barium, FAA					
	Blank	<0.10	mg/L				1140	09/10/96	TN
	Standard	50.8	mg/L	50.0		102	1140	09/10/96	TN
	Standard	48.5	mg/L	50.0		97	1140	09/10/96	TN
429784	Duplicate	0.26	mg/L	0.17		42	1140	09/10/96	TN
429786	Spike		mg/L		1.00	93	1140	09/10/96	TN
				Beryllium, GFAA					
	Blank	<1.0	ug/L				0935	09/12/96	TN
	Standard	6.0	ug/L	6.0		100	0935	09/12/96	TN
	Standard	5.5	ug/L	6.0		92	0935	09/12/96	TN
	Standard	5.9	ug/L	6.0		98	0935	09/12/96	TN
	Standard	6.0	ug/L	6.0		100	0935	09/12/96	TN
429784	Duplicate	<1.0	ug/L	<1.0		0	0935	09/12/96	TN
429977	Duplicate	<1.0	ug/L	<1.0		0	0935	09/12/96	TN
429809	Spike		ug/L		5.0	132	0935	09/12/96	TN
429974	Spike		ug/L		5.0	114	0935	09/12/96	TN
				Cadmium, GFAA					
	Blank	<1.0	ug/L				1215	09/10/96	TN
	Standard	11	ug/L	10		110	1215	09/10/96	TN
	Standard	9.8	ug/L	10		98	1215	09/10/96	TN
429756	Duplicate	<1.0	ug/L	<1.0		0	1215	09/10/96	TN
429751	Spike		ug/L		10	100	1215	09/10/96	TN

Continued

SIERRA
FOOTHILL LABORATORY

823 S. HWY. 49
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REPORT

Sample #	Description	Result	Units	Dup/Std Value	Spk Conc.	Percent	Time	Date	B
				Chromium, GFAA					
	Blank	<10	ug/L				1000	09/22/96	TN
	Standard	9.5	ug/L	10		95	1000	09/22/96	TN
	Standard	11	ug/L	10		110	1000	09/22/96	TN
	Standard	13	ug/L	10			1000	09/22/96	
	Standard	18	ug/L	10			1000	09/22/96	
429786	Duplicate	6.6	ug/L	6.6		0	1000	09/22/96	TN
429974	Duplicate	3.7	ug/L	3.5		6	1000	09/22/96	TN
429756	Spike		ug/L		10	185	1000	09/22/96	TN
429977	Spike		ug/L		10	210	1000	09/22/96	TN
				Copper, FAA					
	Standard	42.8	mg/L	40.2		106	1405	09/10/96	TN
	Standard	43.6	mg/L	40.2		108	1405	09/10/96	TN
429784	Duplicate	<0.03	mg/L	<0.03		0	1405	09/10/96	TN
429786	Spike		mg/L		0.5	93	1405	09/10/96	TN
				Iron, FAA					
	Blank	<0.05	mg/L				1530	09/17/96	TN
	Standard	52.9	mg/L	50.0		106	1530	09/17/96	TN
	Standard	50.8	mg/L	50.0		102	1530	09/17/96	TN
	Standard	51.8	mg/L	50.0		104	1530	09/17/96	TN
429809	Duplicate	<0.05	mg/L	<0.05		0	1530	09/17/96	TN
429975	Duplicate	<0.05	mg/L	<0.05		0	1530	09/17/96	TN
429785	Spike		mg/L		0.50	101	1530	09/17/96	TN
429858	Spike		mg/L		0.50	101	1530	09/17/96	TN
				Mercury, CVAA					
	Blank	<0.5	ug/L				1310	09/11/96	TN
	Standard	5.3	ug/L	5.0		106	1310	09/11/96	TN
	Standard	5.0	ug/L	5.0		100	1310	09/11/96	TN
429751	Duplicate	<0.5	ug/L	<0.5		0	1310	09/11/96	TN
429756	Spike		ug/L		5.0	104	1310	09/11/96	TN
				Manganese, FAA					
	Blank	<0.03	mg/L				1510	09/17/96	TN
	Standard	52.0	mg/L	49.7		105	1510	09/17/96	TN
	Standard	52.2	mg/L	49.7		105	1510	09/17/96	TN
	Standard	52.2	mg/L	49.7		105	1510	09/17/96	TN
429809	Duplicate	<0.03	mg/L	<0.03		0	1510	09/17/96	TN
429975	Duplicate	<0.03	mg/L	<0.03		0	1510	09/17/96	TN
429785	Spike		mg/L		0.50	105	1510	09/17/96	TN
429860	Spike		mg/L		0.50	100	1510	09/17/96	TN
				Sodium, FAA					
	Blank	<0.05	mg/L				1555	09/11/96	TN
	Standard	93.5	mg/L	100		94	1555	09/11/96	TN
	Standard	96.0	mg/L	100		96	1555	09/11/96	TN
	Standard	97.0	mg/L	100		97	1555	09/11/96	TN
429850	Duplicate	33	mg/L	33		0	1555	09/11/96	TN

Continued

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FOOTHILL LABORATORY

823 S. HWY. 49
P.O. BOX 1268 • JACKSON, CA 95642
(209) 223-2800

REPORT

Sample #	Description	Result	Units	Dup/Std Value	Spk Conc.	Percent	Time	Date	By
429986	Duplicate	1.15	mg/L	1.14		1	1555	09/11/96	TN
429840	Spike		mg/L		2.00	102	1555	09/11/96	TN
429977	Spike		mg/L		2.00	102	1555	09/11/96	TN

Nickel, FAA

Sample #	Description	Result	Units	Dup/Std Value	Spk Conc.	Percent	Time	Date	By
	Blank	<0.10	mg/L				1600	10/04/96	TN
	Standard	48.5	mg/L	49.2		99	1600	10/04/96	TN
	Standard	46.7	mg/L	49.2		95	1600	10/04/96	TN
	Standard	49.2	mg/L	49.2		100	1600	10/04/96	TN
	Standard	47.7	mg/L	49.2		97	1600	10/04/96	TN
430387	Duplicate	<0.10	mg/L	<0.10		0	1600	10/04/96	TN
430392	Spike		mg/L		0.50	103	1600	10/04/96	TN

Lead, GFAA

Sample #	Description	Result	Units	Dup/Std Value	Spk Conc.	Percent	Time	Date	By
	Standard	8.3	ug/L	8.0		104	1240	09/24/96	TN
	Standard	4.6	ug/L	8.0		58	1240	09/24/96	TN
429809	Duplicate	2.4	ug/L	2.2		9	1240	09/24/96	TN
429986	Spike		ug/L		10	82	1240	09/24/96	TN

Antimony, GFAA

Sample #	Description	Result	Units	Dup/Std Value	Spk Conc.	Percent	Time	Date	By
	Blank	<2.5	ug/L				1400	09/18/96	TN
	Standard	17	ug/L	10			1400	09/18/96	
	Standard	12	ug/L	10		120	1400	09/18/96	TN
	Standard	14	ug/L	10			1400	09/18/96	
	Standard	14	ug/L	10			1400	09/18/96	
429756	Duplicate	<2.5	ug/L	<2.5		0	1400	09/18/96	TN
429973	Duplicate	<2.5	ug/L	<2.5		0	1400	09/18/96	TN
429809	Spike		ug/L		10	92	1400	09/18/96	TN
429975	Spike		ug/L		10	123	1400	09/18/96	TN

Selenium, Hydride

Sample #	Description	Result	Units	Dup/Std Value	Spk Conc.	Percent	Time	Date	By
	Blank	<1.0	ug/L				0845	09/11/96	TN
	Standard	6.3	ug/L	5.0			0845	09/11/96	
	Standard	5.2	ug/L	5.0		104	0845	09/11/96	TN
429751	Duplicate	1.0	ug/L	<1.0		200	0845	09/11/96	TN
429756	Spike		ug/L		5.0	98	0845	09/11/96	TN

Thallium, GFAA

Sample #	Description	Result	Units	Dup/Std Value	Spk Conc.	Percent	Time	Date	By
	Blank	<1.0	ug/L				0850	09/24/96	TN
	Standard	6.0	ug/L	8.0		75	0850	09/24/96	TN
	Standard	4.3	ug/L	8.0		54	0850	09/24/96	TN
429785	Duplicate	1.1	ug/L	1.1		0	0850	09/24/96	TN
429974	Spike		ug/L		10	95	0850	09/24/96	TN

Zinc, FAA

Sample #	Description	Result	Units	Dup/Std Value	Spk Conc.	Percent	Time	Date	By
	Blank	<0.05	mg/L				1350	09/10/96	TN
	Standard	42.2	mg/L	40.8		103	1350	09/10/96	TN
	Standard	42.6	mg/L	40.8		104	1350	09/10/96	TN
429784	Duplicate	<0.05	mg/L	<0.05		0	1350	09/10/96	TN
429786	Spike		mg/L		0.50	101	1350	09/10/96	TN

Arsenic, Hydride

Continued

SIERRA
FOOTHILL LABORATORY

823 S. HWY. 49
P.O. BOX 1268 • JACKSON, CA 95642
(209) 223-2800

REPORT

Sample #	Description	Result	Units	Dup/Std Value	Spk Conc.	Percent	Time	Date	By
	Blank	<2.0	ug/L				1100	09/11/96	TN
	Standard	4.9	ug/L	5.0		98	1100	09/11/96	TN
	Standard	5.8	ug/L	5.0		116	1100	09/11/96	TN
429751	Duplicate	<2.0	ug/L	<2.0		0	1100	09/11/96	TN
429756	Spike		ug/L		5.0	87	1100	09/11/96	TN

Tony Nurse/tn
Tony Nurse, Owner/Analyst

SIERRA FOOTHILL LABORATORY

REPORT

823 S. HWY. 49
P.O. BOX 1268 • JACKSON, CA 95642
(209) 223-2800

TEST REPORT: 429787

Gwin Mine Associates
PO Box 1059
San Andreas, CA 95249-

Sample Identification:20' Main shaft
Collected By:LG
Date & Time Taken:09/09/96 1540

Other Data: G W 1gal P
Sample Matrix: Liquid
Report Date: 09/18/96 Received: 09/10/96 Client: GWIN

PARAMETER	RESULTS	UNITS	ANALYZED	EQL	METHOD	BY
Alkalinity, Total	340	mg/L	1300 09/10/96	5.0	EPA310.1	GK
Chloride, Titrimetric	6.7	mg/L	1100 09/17/96	1.0	EPA325.3	GK
Specific Conductance	650	umho/cm	1300 09/10/96	1.0	EPA120.1	GK
Fluoride, Ion Electrode	0.16	mg/L	0945 09/11/96	0.1	EPA340.2	GK
Foaming Agents (MBAS)	<0.1	mg/L	0945 09/10/96	0.1	EPA425.1	GK
Magnesium, Calculation	24	mg/L	1500 09/17/96	0.05	SM3500Mg-E	RJ
Nitrogen, Nitrite-N	<0.02	mg/L	1510 09/10/96	0.02	EPA354	GK
Nitrogen, Nitrate-N	<0.05	mg/L	1445 09/10/96	0.05	EPA353.2	GK
Sulfate, Turbidimetric	6.7	mg/L	1000 09/17/96	0.5	EPA375.4	GK
Solids, Total Dissolved	410	mg/L	0900 09/16/96	10	EPA160.1	MG
pH	6.8	unit	1345 09/10/96	0.1	EPA150.1	GK
Calcium, Titrimetric	84	mg/L	1215 09/17/96	4.0	EPA215.2	GK
Hardness	310	mg/L	1400 09/10/96	5.0	EPA130.1	GK

Quality Assurance for the SET with Sample 429787

Sample #	Description	Result	Units	Dup/Std Value	Spk Conc.	Percent	Time	Date	By
Alkalinity, Total									
	Blank	<5.0	mg/L				1300	09/10/96	GK
	Standard	270	mg/L	310		87	1300	09/10/96	GK
429788	Duplicate	350	mg/L	370		6	1300	09/10/96	GK

Continued

SIERRA
FOOTHILL LABORATORY

REPORT

823 S. HWY. 49
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(209) 223-2800

Sample #	Description	Result	Units	Dup/Std Value	Spk Conc.	Percent	Time	Date	By
429818	Duplicate	920	mg/L	950		3	1300	09/10/96	GK
			Chloride, Titrimetric						
	Blank	<1.0	mg/L				1100	09/17/96	GK
	Standard	140	mg/L	140		100	1100	09/17/96	GK
429788	Duplicate	9.2	mg/L	9.5		3	1100	09/17/96	GK
			Specific Conductance						
	Standard	312	umho/cm	303		103	1300	09/10/96	GK
429789	Duplicate	648	umho/cm	653		1	1300	09/10/96	GK
			Fluoride, Ion Electrode						
	Blank	<0.1	mg/L				0945	09/11/96	GK
	Standard	21	mg/L	20		105	0945	09/11/96	GK
429757	Duplicate	0.14	mg/L	0.14		0	0945	09/11/96	GK
429787	Spike		mg/L		4.0	108	0945	09/11/96	GK
			Foaming Agents (MBAS)						
	Standard	42	mg/L	50		84	0945	09/10/96	GK
			Nitrogen, Nitrite-N						
	Standard	23	mg/L	25		92	1510	09/10/96	GK
429808	Duplicate	<0.02	mg/L	<0.02		0	1510	09/10/96	GK
429814	Spike		ug/L		7.5	98	1510	09/10/96	GK
			Nitrogen, Nitrate-N						
	Standard	19	mg/L	20		95	1445	09/10/96	GK
429787	Duplicate	<0.05	mg/L	<0.05		0	1445	09/10/96	GK
429789	Spike		mg/L		0.4	89	1445	09/10/96	GK
			Sulfate, Turbidimetric						
	Standard	150	mg/L	150		100	1000	09/17/96	GK
429787	Spike		mg/L		28	100	1000	09/17/96	GK
			Solids, Total Dissolved						
	Standard	300	mg/L	290		103	0900	09/16/96	MG
429862	Duplicate	510	mg/L	500		2	0900	09/16/96	MG
430071	Duplicate	130	mg/L	110		17	0900	09/16/96	MG
			pH						
	Standard	7.4	unit	7.4		100	1345	09/10/96	GK
429787	Duplicate	6.8	unit	6.8		0	1345	09/10/96	GK
			Calcium, Titrimetric						
	Blank	<4.0	mg/L				1215	09/17/96	GK
	Standard	200	mg/L	190		105	1215	09/17/96	GK
429808	Duplicate	120	mg/L	110		9	1215	09/17/96	GK
			Hardness						
	Blank	<5.0	mg/L				1400	09/10/96	GK
	Standard	750	mg/L	780		96	1400	09/10/96	GK
429787	Duplicate	310	mg/L	300		3	1400	09/10/96	GK

Tony Nurse

Tony/Nurse Owner/Analyst

SIERRA FOOTHILL LABORATORY

823 S. HWY. 49
P.O BOX 1268 • JACKSON, CA 95642
(209) 223-2800

REPORT

Sierra Foothill Laboratory
Quality Control Worksheet

Sample ID: 429784;787

Analyte	Charge	Conc. (mg/L)	Cation	Anion	Conversion Factor
Alk	Anion	340		6.8000	50.00
Cl	Anion	6.7		0.1890	35.45
F	Anion	0.16		0.0084	19.00
NO3 as N	Anion				14.00
PO4	Anion				31.66
SO4	Anion	6.7		0.1395	48.03
Al	Cation				8.99
B	Cation				10.82
Ba	Cation	0.26	0.0038		68.67
Ca	Cation	84	4.1916		20.04
Cu	Cation				31.77
Fe	Cation	0.69	0.0371		18.62
K	Cation				39.10
Mg	Cation	24	1.9753		12.15
Mn	Cation	0.69	0.0503		13.73
Na	Cation	30	1.3049		22.99
NH3	Cation				18.04
Si	Cation				38.04
Zn	Cation				32.69
EC		650			
TDS		410			
Total			**7.56**	**7.14**	

QC Measurement	Result	Evaluation	Acceptance Criteria
C-A Balance %	94.4%	Acceptable	Greater than 85%
Calculated TDS	461.6		
Calculated TDS / EC Ratio	0.71	High	Range = 0.55 - 0.7
Measured TDS / EC Ratio	0.63	Acceptable	Range = 0.55 - 0.7
Measured TDS / Calculated TDS	0.89	Low	Range = 1.0 - 1.2
EC Ratio / Anion	0.91	Acceptable	Range = 0.8 - 1.2
EC Ratio / Cation	0.86	Acceptable	Range = 0.8 - 1.2

C-A Balance Acceptance Criteria for Drinking Water

Anion Sum (meq/L)	Acceptable % Difference
0 - 3.0	+- 0.2 meq/L
3.0 - 10.0	+- 2%
10.0 - 800	+- 2-5%

SIERRA FOOTHILL LABORATORY

REPORT

823 S. HWY. 49
P.O. BOX 1268 • JACKSON, CA 95642
(209) 223-2800

TEST REPORT: 429785

Gwin Mine Associates
PO Box 1059
San Andreas, CA 95249-

Sample Identification:1200' Main shaft
Collected By:LG
Date & Time Taken:09/09/96 1612

Other Data: G W 1LG/HNO3
Sample Matrix: Liquid
Report Date: 10/07/96 Received: 09/10/96 Client: GWIN

PARAMETER	RESULTS	UNITS	ANALYZED	EQL	METHOD	BY
Silver, GFAA	<5	ug/L	1230 09/23/96	5.0	EPA200.9	TN
Aluminum, GFAA	55	ug/L	0825 09/23/96	50	EPA200.9	TN
Barium, FAA	0.24	mg/L	1140 09/10/96	0.10	EPA208.1	TN
Beryllium, GFAA	<1	ug/L	0935 09/12/96	1.0	EPA200.9	TN
Cadmium, GFAA	<1	ug/L	1215 09/10/96	1.0	EPA200.9	TN
Chromium, GFAA	3.6	ug/L	1000 09/22/96	2.0	EPA200.9	TN
Copper, FAA	<0.03	mg/L	1405 09/10/96	0.03	EPA220.1	TN
Iron, FAA	0.27	mg/L	1530 09/17/96	0.05	EPA236.1	TN
Mercury, CVAA	<0.5	ug/L	1310 09/11/96	0.5	EPA245.1	TN
Manganese, FAA	0.62	mg/L	1510 09/17/96	0.03	EPA243.1	TN
Sodium, FAA	31	mg/L	1555 09/11/96	0.05	EPA273.1	TN
Nickel, FAA	0.35	mg/L	1600 10/04/96	0.10	EPA249.1	TN
Lead, GFAA	<2	ug/L	1240 09/24/96	2.0	EPA200.9	TN
Antimony, GFAA	<2.5	ug/L	1400 09/18/96	2.5	EPA200.9	TN
Selenium, Hydride	<1	ug/L	0845 09/11/96	1.0	SM3114B	TN
Thallium, GFAA	1.1	ug/L	0850 09/24/96	1.0	EPA200.9	TN
Zinc, FAA	<0.05	mg/L	1350 09/10/96	0.05	EPA289.1	TN

Continued

SIERRA
FOOTHILL LABORATORY

823 S. HWY 49
P.O BOX 1268 • JACKSON, CA 95642
(209) 223-2800

REPORT

ARAMETER	RESULTS	UNITS	ANALYZED	EQL	METHOD	BY
Arsenic, Hydride	150	ug/L	1100 09/11/96	2.0	SM3114B	TN

Sample Preparation Steps for 429785

Digestion, Arsenic by Hydride	09/10/96	Date	0830 09/10/96	SM303E	LK
igestion, Selenium by Hydride	09/10/96	Date	0900 09/10/96	SM303E	LK
igestion, Mercury, Liquid	09/10/96	Date	1330 09/10/96	EPA7470	LK

Quality Assurance for the SET with Sample 429785

Sample #	Description	Result	Units	Dup/Std Value	Spk Conc.	Percent	Time	Date	By
				Silver, GFAA					
	Blank	<5.0	ug/L				1230	09/23/96	TN
	Standard	8.0	ug/L	8.0		100	1230	09/23/96	TN
	Standard	8.7	ug/L	8.0		109	1230	09/23/96	TN
29975	Duplicate	<5.0	ug/L	<5.0		0	1230	09/23/96	TN
29809	Spike		ug/L		5.0	90	1230	09/23/96	TN
				Aluminum, GFAA					
	Blank	<50	ug/L				0825	09/23/96	TN
	Standard	74	ug/L	75		99	0825	09/23/96	TN
	Standard	60	ug/L	75		80	0825	09/23/96	TN
429784	Duplicate	290	ug/L	280		4	0825	09/23/96	TN
29973	Spike		ug/L		100	124	0825	09/23/96	TN
				Barium, FAA					
	Blank	<0.10	mg/L				1140	09/10/96	TN
	Standard	50.8	mg/L	50.0		102	1140	09/10/96	TN
	Standard	48.5	mg/L	50.0		97	1140	09/10/96	TN
429784	Duplicate	0.26	mg/L	0.17		42	1140	09/10/96	TN
429786	Spike		mg/L		1.00	93	1140	09/10/96	TN
				Beryllium, GFAA					
	Blank	<1.0	ug/L				0935	09/12/96	TN
	Standard	6.0	ug/L	6.0		100	0935	09/12/96	TN
	Standard	5.5	ug/L	6.0		92	0935	09/12/96	TN
	Standard	5.9	ug/L	6.0		98	0935	09/12/96	TN
	Standard	6.0	ug/L	6.0		100	0935	09/12/96	TN
429784	Duplicate	<1.0	ug/L	<1.0		0	0935	09/12/96	TN
29977	Duplicate	<1.0	ug/L	<1.0		0	0935	09/12/96	TN
429809	Spike		ug/L		5.0	132	0935	09/12/96	TN
429974	Spike		ug/L		5.0	114	0935	09/12/96	TN
				Cadmium, GFAA					
	Blank	<1.0	ug/L				1215	09/10/96	TN
	Standard	11	ug/L	10		110	1215	09/10/96	TN
	Standard	9.8	ug/L	10		98	1215	09/10/96	TN
29756	Duplicate	<1.0	ug/L	<1.0		0	1215	09/10/96	TN
429751	Spike		ug/L		10	100	1215	09/10/96	TN

Continued

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FOOTHILL LABORATORY

823 S. HWY. 49
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REPORT

Sample #	Description	Result	Units	Dup/Std Value	Spk Conc.	Percent	Time	Date	By
	Chromium, GFAA								
	Blank	<10	ug/L				1000	09/22/96	TN
	Standard	9.5	ug/L	10		95	1000	09/22/96	TN
	Standard	11	ug/L	10		110	1000	09/22/96	TN
	Standard	13	ug/L	10			1000	09/22/96	
	Standard	18	ug/L	10			1000	09/22/96	
429786	Duplicate	6.6	ug/L	6.6		0	1000	09/22/96	TN
429974	Duplicate	3.7	ug/L	3.5		6	1000	09/22/96	TN
429756	Spike		ug/L		10	185	1000	09/22/96	TN
429977	Spike		ug/L		10	210	1000	09/22/96	TN
	Copper, FAA								
	Standard	42.8	mg/L	40.2		106	1405	09/10/96	TN
	Standard	43.6	mg/L	40.2		108	1405	09/10/96	TN
429784	Duplicate	<0.03	mg/L	<0.03		0	1405	09/10/96	TN
429786	Spike		mg/L		0.5	93	1405	09/10/96	TN
	Iron, FAA								
	Blank	<0.05	mg/L				1530	09/17/96	TN
	Standard	52.9	mg/L	50.0		106	1530	09/17/96	TN
	Standard	50.8	mg/L	50.0		102	1530	09/17/96	TN
	Standard	51.8	mg/L	50.0		104	1530	09/17/96	TN
429809	Duplicate	<0.05	mg/L	<0.05		0	1530	09/17/96	TN
429975	Duplicate	<0.05	mg/L	<0.05		0	1530	09/17/96	TN
429785	Spike		mg/L		0.50	101	1530	09/17/96	TN
429858	Spike		mg/L		0.50	101	1530	09/17/96	TN
	Mercury, CVAA								
	Blank	<0.5	ug/L				1310	09/11/96	TN
	Standard	5.3	ug/L	5.0		106	1310	09/11/96	TN
	Standard	5.0	ug/L	5.0		100	1310	09/11/96	TN
429751	Duplicate	<0.5	ug/L	<0.5		0	1310	09/11/96	TN
429756	Spike		ug/L		5.0	104	1310	09/11/96	TN
	Manganese, FAA								
	Blank	<0.03	mg/L				1510	09/17/96	TN
	Standard	52.0	mg/L	49.7		105	1510	09/17/96	TN
	Standard	52.2	mg/L	49.7		105	1510	09/17/96	TN
	Standard	52.2	mg/L	49.7		105	1510	09/17/96	TN
429809	Duplicate	<0.03	mg/L	<0.03		0	1510	09/17/96	TN
429975	Duplicate	<0.03	mg/L	<0.03		0	1510	09/17/96	TN
429785	Spike		mg/L		0.50	105	1510	09/17/96	TN
429860	Spike		mg/L		0.50	100	1510	09/17/96	TN
	Sodium, FAA								
	Blank	<0.05	mg/L				1555	09/11/96	TN
	Standard	93.5	mg/L	100		94	1555	09/11/96	TN
	Standard	96.0	mg/L	100		96	1555	09/11/96	TN
	Standard	97.0	mg/L	100		97	1555	09/11/96	TN
429850	Duplicate	33	mg/L	33		0	1555	09/11/96	TN

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Sample #	Description	Result	Units	Dup/Std Value	Spk Conc.	Percent	Time	Date	By
429986	Duplicate	1.15	mg/L	1.14		1	1555	09/11/96	TN
429840	Spike		mg/L		2.00	102	1555	09/11/96	TN
429977	Spike		mg/L		2.00	102	1555	09/11/96	TN
				Nickel, FAA					
	Blank	<0.10	mg/L				1600	10/04/96	TN
	Standard	48.5	mg/L	49.2		99	1600	10/04/96	TN
	Standard	46.7	mg/L	49.2		95	1600	10/04/96	TN
	Standard	49.2	mg/L	49.2		100	1600	10/04/96	TN
	Standard	47.7	mg/L	49.2		97	1600	10/04/96	TN
430387	Duplicate	<0.10	mg/L	<0.10		0	1600	10/04/96	TN
430392	Spike		mg/L		0.50	103	1600	10/04/96	TN
				Lead, GFAA					
	Standard	8.3	ug/L	8.0		104	1240	09/24/96	TN
	Standard	4.6	ug/L	8.0		58	1240	09/24/96	TN
429809	Duplicate	2.4	ug/L	2.2		9	1240	09/24/96	TN
429986	Spike		ug/L		10	82	1240	09/24/96	TN
				Antimony, GFAA					
	Blank	<2.5	ug/L				1400	09/18/96	TN
	Standard	17	ug/L	10			1400	09/18/96	
	Standard	12	ug/L	10		120	1400	09/18/96	TN
	Standard	14	ug/L	10			1400	09/18/96	
	Standard	14	ug/L	10			1400	09/18/96	
429756	Duplicate	<2.5	ug/L	<2.5		0	1400	09/18/96	TN
429973	Duplicate	<2.5	ug/L	<2.5		0	1400	09/18/96	TN
429809	Spike		ug/L		10	92	1400	09/18/96	TN
429975	Spike		ug/L		10	123	1400	09/18/96	TN
				Selenium, Hydride					
	Blank	<1.0	ug/L				0845	09/11/96	TN
	Standard	6.3	ug/L	5.0			0845	09/11/96	
	Standard	5.2	ug/L	5.0		104	0845	09/11/96	TN
429751	Duplicate	1.0	ug/L	<1.0		200	0845	09/11/96	TN
429756	Spike		ug/L		5.0	98	0845	09/11/96	TN
				Thallium, GFAA					
	Blank	<1.0	ug/L				0850	09/24/96	TN
	Standard	6.0	ug/L	8.0		75	0850	09/24/96	TN
	Standard	4.3	ug/L	8.0		54	0850	09/24/96	TN
429785	Duplicate	1.1	ug/L	1.1		0	0850	09/24/96	TN
429974	Spike		ug/L		10	95	0850	09/24/96	TN
				Zinc, FAA					
	Blank	<0.05	mg/L				1350	09/10/96	TN
	Standard	42.2	mg/L	40.8		103	1350	09/10/96	TN
	Standard	42.6	mg/L	40.8		104	1350	09/10/96	TN
429784	Duplicate	<0.05	mg/L	<0.05		0	1350	09/10/96	TN
429786	Spike		mg/L		0.50	101	1350	09/10/96	TN
				Arsenic, Hydride					

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FOOTHILL LABORATORY

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REPORT

10/07/96 429785 Continued

Sample #	Description	Result	Units	Dup/Std Value	Spk Conc.	Percent	Time	Date	By
	Blank	<2.0	ug/L				1100	09/11/96	TN
	Standard	4.9	ug/L	5.0		98	1100	09/11/96	TN
	Standard	5.8	ug/L	5.0		116	1100	09/11/96	TN
429751	Duplicate	<2.0	ug/L	<2.0		0	1100	09/11/96	TN
429756	Spike		ug/L		5.0	87	1100	09/11/96	TN

Tony Nurse/sm

Tony Nurse, Owner/Analyst

SIERRA FOOTHILL LABORATORY

REPORT

823 S. HWY. 49
P.O. BOX 1268 • JACKSON, CA 95642
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TEST REPORT: 429788

Gwin Mine Associates
PO Box 1059
San Andreas, CA 95249-

Sample Identification:1200' Main shaft
Collected By:LG
Date & Time Taken:09/09/96 1642

Other Data: G W 1gal P
Sample Matrix: Liquid
Report Date: 09/18/96 Received: 09/10/96 Client: GWIN

PARAMETER	RESULTS	UNITS	ANALYZED	EQL	METHOD	BY
Alkalinity, Total	350	mg/L	1300 09/10/96	5.0	EPA310.1	GK
Chloride, Titrimetric	9.2	mg/L	1100 09/17/96	1.0	EPA325.3	GK
Specific Conductance	653	umho/cm	1300 09/10/96	1.0	EPA120.1	GK
Fluoride, Ion Electrode	0.16	mg/L	0945 09/11/96	0.1	EPA340.2	GK
Foaming Agents (MBAS)	0.22	mg/L	0945 09/10/96	0.1	EPA425.1	GK
Magnesium, Calculation	28	mg/L	1500 09/17/96	0.05	SM3500Mg-E	RJ
Nitrogen, Nitrite-N	<0.02	mg/L	1510 09/10/96	0.02	EPA354	GK
Nitrogen, Nitrate-N	<0.05	mg/L	1445 09/10/96	0.05	EPA353.2	GK
Sulfate, Turbidimetric	6.7	mg/L	1000 09/17/96	0.5	EPA375.4	GK
Solids, Total Dissolved	410	mg/L	0900 09/16/96	10	EPA160.1	MG
pH	6.8	unit	1345 09/10/96	0.1	EPA150.1	GK
Calcium, Titrimetric	86	mg/L	1215 09/17/96	4.0	EPA215.2	GK
Hardness	330	mg/L	1400 09/10/96	5.0	EPA130.1	GK

Quality Assurance for the SET with Sample 429788

Alkalinity, Total

Sample #	Description	Result	Units	Dup/Std Value	Spk Conc.	Percent	Time	Date	By
	Blank	<5.0	mg/L				1300	09/10/96	GK
	Standard	270	mg/L	310		87	1300	09/10/96	GK
429788	Duplicate	350	mg/L	370		6	1300	09/10/96	GK

Continued

SIERRA
FOOTHILL LABORATORY

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REPORT

Sample #	Description	Result	Units	Dup/Std Value	Spk Conc.	Percent	Time	Date	By
429818	Duplicate	920	mg/L	950		3	1300	09/10/96	GK
Chloride, Titrimetric									
	Blank	<1.0	mg/L				1100	09/17/96	GK
	Standard	140	mg/L	140		100	1100	09/17/96	GK
429788	Duplicate	9.2	mg/L	9.5		3	1100	09/17/96	GK
Specific Conductance									
	Standard	312	umho/cm	303		103	1300	09/10/96	GK
429789	Duplicate	648	umho/cm	653		1	1300	09/10/96	GK
Fluoride, Ion Electrode									
	Blank	<0.1	mg/L				0945	09/11/96	GK
	Standard	21	mg/L	20		105	0945	09/11/96	GK
429757	Duplicate	0.14	mg/L	0.14		0	0945	09/11/96	GK
429787	Spike		mg/L		4.0	108	0945	09/11/96	GK
Foaming Agents (MBAS)									
	Standard	42	mg/L	50		84	0945	09/10/96	GK
Nitrogen, Nitrite-N									
	Standard	23	mg/L	25		92	1510	09/10/96	GK
429808	Duplicate	<0.02	mg/L	<0.02		0	1510	09/10/96	GK
429814	Spike		ug/L		7.5	98	1510	09/10/96	GK
Nitrogen, Nitrate-N									
	Standard	19	mg/L	20		95	1445	09/10/96	GK
429787	Duplicate	<0.05	mg/L	<0.05		0	1445	09/10/96	GK
429789	Spike		mg/L		0.4	89	1445	09/10/96	GK
Sulfate, Turbidimetric									
	Standard	150	mg/L	150		100	1000	09/17/96	GK
429787	Spike		mg/L		28	100	1000	09/17/96	GK
Solids, Total Dissolved									
	Standard	300	mg/L	290		103	0900	09/16/96	MG
429862	Duplicate	510	mg/L	500		2	0900	09/16/96	MG
430071	Duplicate	130	mg/L	110		17	0900	09/16/96	MG
pH									
	Standard	7.4	unit	7.4		100	1345	09/10/96	GK
429787	Duplicate	6.8	unit	6.8		0	1345	09/10/96	GK
Calcium, Titrimetric									
	Blank	<4.0	mg/L				1215	09/17/96	GK
	Standard	200	mg/L	190		105	1215	09/17/96	GK
429808	Duplicate	120	mg/L	110		9	1215	09/17/96	GK
Hardness									
	Blank	<5.0	mg/L				1400	09/10/96	GK
	Standard	750	mg/L	780		96	1400	09/10/96	GK
429787	Duplicate	310	mg/L	300		3	1400	09/10/96	GK

Tony Nurse/sm

Tony Nurse, Owner/Analyst

SIERRA
FOOTHILL LABORATORY

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REPORT

Sierra Foothill Laboratory
Quality Control Worksheet

Sample ID: 429785;788

Analyte	Charge	Conc. (mg/L)	Cation	Anion	Conversion Factor
Alk	Anion	350		7.0000	50.00
Cl	Anion	9.2		0.2595	35.45
F	Anion	0.16		0.0084	19.00
NO3 as N	Anion				14.00
PO4	Anion				31.66
SO4	Anion	6.7		0.1395	48.03
Al	Cation				8.99
B	Cation				10.82
Ba	Cation	0.24	0.0035		68.67
Ca	Cation	86	4.2914		20.04
Cu	Cation				31.77
Fe	Cation	0.27	0.0145		18.62
K	Cation				39.10
Mg	Cation	28	2.3045		12.15
Mn	Cation	0.62	0.0452		13.73
Na	Cation	31	1.3484		22.99
NH3	Cation				18.04
Si	Cation				38.04
Zn	Cation				32.69
EC		653			
TDS		410			
Total			8.01	7.41	

QC Measurement	Result	Evaluation	Acceptance Criteria
C-A Balance %	92.5%	Acceptable	Greater than 85%
Calculated TDS	480.1		
Calculated TDS / EC Ratio	0.74	High	Range = 0.55 - 0.7
Measured TDS / EC Ratio	0.63	Acceptable	Range = 0.55 - 0.7
Measured TDS / Calculated TDS	0.85	Low	Range = 1.0 - 1.2
EC Ratio / Anion	0.88	Acceptable	Range = 0.8 - 1.2
EC Ratio / Cation	0.82	Acceptable	Range = 0.8 - 1.2

C-A Balance Acceptance Criteria for Drinking Water

Anion Sum (meq/L)	Acceptable % Difference
0 - 3.0	+- 0.2 meq/L
3.0 - 10.0	+- 2%
10.0 - 800	+- 2-5%

SIERRA
FOOTHILL LABORATORY

REPORT

823 S. HWY. 49
P.O. BOX 1268 • JACKSON, CA 95642
(209) 223-2800

TEST REPORT: 429786

Gwin Mine Associates
PO Box 1059
San Andreas, CA 95249-

Sample Identification:2400' Main shaft
Collected By:LG
Date & Time Taken:09/09/96 1815

Other Data: G W 1LG/HNO3
Sample Matrix: Liquid
Report Date: 10/07/96 Received: 09/10/96 Client: GWIN

PARAMETER	RESULTS	UNITS	ANALYZED	EQL	METHOD	BY
Silver, GFAA	<5	ug/L	1230 09/23/96	5.0	EPA200.9	TN
Aluminum, GFAA	<50	ug/L	0825 09/23/96	50	EPA200.9	TN
Barium, FAA	0.25	mg/L	1140 09/10/96	0.10	EPA208.1	TN
Beryllium, GFAA	<1	ug/L	0935 09/12/96	1.0	EPA200.9	TN
Cadmium, GFAA	<1	ug/L	1215 09/10/96	1.0	EPA200.9	TN
Chromium, GFAA	6.6	ug/L	1000 09/22/96	2.0	EPA200.9	TN
Copper, FAA	<0.03	mg/L	1405 09/10/96	0.03	EPA220.1	TN
Iron, FAA	0.20	mg/L	1530 09/17/96	0.05	EPA236.1	TN
Mercury, CVAA	<0.5	ug/L	1310 09/11/96	0.5	EPA245.1	TN
Manganese, FAA	0.60	mg/L	1510 09/17/96	0.03	EPA243.1	TN
Sodium, FAA	31	mg/L	1555 09/11/96	0.05	EPA273.1	TN
Nickel, FAA	0.50	mg/L	1600 10/04/96	0.10	EPA249.1	TN
Lead, GFAA	<2	ug/L	1240 09/24/96	2.0	EPA200.9	TN
Antimony, GFAA	2.7	ug/L	1400 09/18/96	2.5	EPA200.9	TN
Selenium, Hydride	<1	ug/L	0845 09/11/96	1.0	SM3114B	TN
Thallium, GFAA	1.4	ug/L	0850 09/24/96	1.0	EPA200.9	TN
Zinc, FAA	<0.05	mg/L	1350 09/10/96	0.05	EPA289.1	TN

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SIERRA FOOTHILL LABORATORY

REPORT

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PARAMETER	RESULTS	UNITS	ANALYZED	EQL	METHOD	BY
Arsenic, Hydride	120	ug/L	1100 09/11/96	2.0	SM3114B	TN

Sample Preparation Steps for 429786

Digestion, Arsenic by Hydride	09/10/96	Date	0830 09/10/96	SM303E	LK
Digestion, Selenium by Hydride	09/10/96	Date	0900 09/10/96	SM303E	LK
Digestion, Mercury, Liquid	09/10/96	Date	1330 09/10/96	EPA7470	LK

Quality Assurance for the SET with Sample 429786

Sample #	Description	Result	Units	Dup/Std Value	Spk Conc.	Percent	Time	Date	By
Silver, GFAA									
	Blank	<5.0	ug/L				1230	09/23/96	TN
	Standard	8.0	ug/L	8.0		100	1230	09/23/96	TN
	Standard	8.7	ug/L	8.0		109	1230	09/23/96	TN
429975	Duplicate	<5.0	ug/L	<5.0		0	1230	09/23/96	TN
429809	Spike		ug/L		5.0	90	1230	09/23/96	TN
Aluminum, GFAA									
	Blank	<50	ug/L				0825	09/23/96	TN
	Standard	74	ug/L	75		99	0825	09/23/96	TN
	Standard	60	ug/L	75		80	0825	09/23/96	TN
429784	Duplicate	290	ug/L	280		4	0825	09/23/96	TN
429973	Spike		ug/L		100	124	0825	09/23/96	TN
Barium, FAA									
	Blank	<0.10	mg/L				1140	09/10/96	TN
	Standard	50.8	mg/L	50.0		102	1140	09/10/96	TN
	Standard	48.5	mg/L	50.0		97	1140	09/10/96	TN
429784	Duplicate	0.26	mg/L	0.17		42	1140	09/10/96	TN
429786	Spike		mg/L		1.00	93	1140	09/10/96	TN
Beryllium, GFAA									
	Blank	<1.0	ug/L				0935	09/12/96	TN
	Standard	6.0	ug/L	6.0		100	0935	09/12/96	TN
	Standard	5.5	ug/L	6.0		92	0935	09/12/96	TN
	Standard	5.9	ug/L	6.0		98	0935	09/12/96	TN
	Standard	6.0	ug/L	6.0		100	0935	09/12/96	TN
429784	Duplicate	<1.0	ug/L	<1.0		0	0935	09/12/96	TN
429977	Duplicate	<1.0	ug/L	<1.0		0	0935	09/12/96	TN
429809	Spike		ug/L		5.0	132	0935	09/12/96	TN
429974	Spike		ug/L		5.0	114	0935	09/12/96	TN
Cadmium, GFAA									
	Blank	<1.0	ug/L				1215	09/10/96	TN
	Standard	11	ug/L	10		110	1215	09/10/96	TN
	Standard	9.8	ug/L	10		98	1215	09/10/96	TN
429756	Duplicate	<1.0	ug/L	<1.0		0	1215	09/10/96	TN
429751	Spike		ug/L		10	100	1215	09/10/96	TN

Continued

SIERRA
FOOTHILL LABORATORY

823 S. HWY. 49
P.O. BOX 1268 • JACKSON, CA 95642
(209) 223-2800

REPORT

Sample #	Description	Result	Units	Dup/Std Value	Spk Conc.	Percent	Time	Date	By
				Chromium, GFAA					
	Blank	<10	ug/L				1000	09/22/96	TN
	Standard	9.5	ug/L	10		95	1000	09/22/96	TN
	Standard	11	ug/L	10		110	1000	09/22/96	TN
	Standard	13	ug/L	10			1000	09/22/96	
	Standard	18	ug/L	10			1000	09/22/96	
429786	Duplicate	6.6	ug/L	6.6		0	1000	09/22/96	TN
429974	Duplicate	3.7	ug/L	3.5		6	1000	09/22/96	TN
429756	Spike		ug/L		10	185	1000	09/22/96	TN
429977	Spike		ug/L		10	210	1000	09/22/96	TN
				Copper, FAA					
	Standard	42.8	mg/L	40.2		106	1405	09/10/96	TN
	Standard	43.6	mg/L	40.2		108	1405	09/10/96	TN
429784	Duplicate	<0.03	mg/L	<0.03		0	1405	09/10/96	TN
429786	Spike		mg/L		0.5	93	1405	09/10/96	TN
				Iron, FAA					
	Blank	<0.05	mg/L				1530	09/17/96	TN
	Standard	52.9	mg/L	50.0		106	1530	09/17/96	TN
	Standard	50.8	mg/L	50.0		102	1530	09/17/96	TN
	Standard	51.8	mg/L	50.0		104	1530	09/17/96	TN
429809	Duplicate	<0.05	mg/L	<0.05		0	1530	09/17/96	TN
429975	Duplicate	<0.05	mg/L	<0.05		0	1530	09/17/96	TN
429785	Spike		mg/L		0.50	101	1530	09/17/96	TN
429858	Spike		mg/L		0.50	101	1530	09/17/96	TN
				Mercury, CVAA					
	Blank	<0.5	ug/L				1310	09/11/96	TN
	Standard	5.3	ug/L	5.0		106	1310	09/11/96	TN
	Standard	5.0	ug/L	5.0		100	1310	09/11/96	TN
429751	Duplicate	<0.5	ug/L	<0.5		0	1310	09/11/96	TN
429756	Spike		ug/L		5.0	104	1310	09/11/96	TN
				Manganese, FAA					
	Blank	<0.03	mg/L				1510	09/17/96	TN
	Standard	52.0	mg/L	49.7		105	1510	09/17/96	TN
	Standard	52.2	mg/L	49.7		105	1510	09/17/96	TN
	Standard	52.2	mg/L	49.7		105	1510	09/17/96	TN
429809	Duplicate	<0.03	mg/L	<0.03		0	1510	09/17/96	TN
429975	Duplicate	<0.03	mg/L	<0.03		0	1510	09/17/96	TN
429785	Spike		mg/L		0.50	105	1510	09/17/96	TN
429860	Spike		mg/L		0.50	100	1510	09/17/96	TN
				Sodium, FAA					
	Blank	<0.05	mg/L				1555	09/11/96	TN
	Standard	93.5	mg/L	100		94	1555	09/11/96	TN
	Standard	96.0	mg/L	100		96	1555	09/11/96	TN
	Standard	97.0	mg/L	100		97	1555	09/11/96	TN
429850	Duplicate	33	mg/L	33		0	1555	09/11/96	TN

Continued

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REPORT

Sample #	Description	Result	Units	Dup/Std Value	Spk Conc.	Percent	Time	Date	By
429986	Duplicate	1.15	mg/L	1.14		1	1555	09/11/96	TN
429840	Spike		mg/L		2.00	102	1555	09/11/96	TN
429977	Spike		mg/L		2.00	102	1555	09/11/96	TN
				Nickel, FAA					
	Blank	<0.10	mg/L				1600	10/04/96	TN
	Standard	48.5	mg/L	49.2		99	1600	10/04/96	TN
	Standard	46.7	mg/L	49.2		95	1600	10/04/96	TN
	Standard	49.2	mg/L	49.2		100	1600	10/04/96	TN
	Standard	47.7	mg/L	49.2		97	1600	10/04/96	TN
430387	Duplicate	<0.10	mg/L	<0.10		0	1600	10/04/96	TN
430392	Spike		mg/L		0.50	103	1600	10/04/96	TN
				Lead, GFAA					
	Standard	8.3	ug/L	8.0		104	1240	09/24/96	TN
	Standard	4.6	ug/L	8.0		58	1240	09/24/96	TN
429809	Duplicate	2.4	ug/L	2.2		9	1240	09/24/96	TN
429986	Spike		ug/L		10	82	1240	09/24/96	TN
				Antimony, GFAA					
	Blank	<2.5	ug/L				1400	09/18/96	TN
	Standard	17	ug/L	10			1400	09/18/96	
	Standard	12	ug/L	10		120	1400	09/18/96	TN
	Standard	14	ug/L	10			1400	09/18/96	
	Standard	14	ug/L	10			1400	09/18/96	
429756	Duplicate	<2.5	ug/L	<2.5		0	1400	09/18/96	TN
429973	Duplicate	<2.5	ug/L	<2.5		0	1400	09/18/96	TN
429809	Spike		ug/L		10	92	1400	09/18/96	TN
429975	Spike		ug/L		10	123	1400	09/18/96	TN
				Selenium, Hydride					
	Blank	<1.0	ug/L				0845	09/11/96	TN
	Standard	6.3	ug/L	5.0			0845	09/11/96	
	Standard	5.2	ug/L	5.0		104	0845	09/11/96	TN
429751	Duplicate	1.0	ug/L	<1.0		200	0845	09/11/96	TN
429756	Spike		ug/L		5.0	98	0845	09/11/96	TN
				Thallium, GFAA					
	Blank	<1.0	ug/L				0850	09/24/96	TN
	Standard	6.0	ug/L	8.0		75	0850	09/24/96	TN
	Standard	4.3	ug/L	8.0		54	0850	09/24/96	TN
429785	Duplicate	1.1	ug/L	1.1		0	0850	09/24/96	TN
429974	Spike		ug/L		10	95	0850	09/24/96	TN
				Zinc, FAA					
	Blank	<0.05	mg/L				1350	09/10/96	TN
	Standard	42.2	mg/L	40.8		103	1350	09/10/96	TN
	Standard	42.6	mg/L	40.8		104	1350	09/10/96	TN
429784	Duplicate	<0.05	mg/L	<0.05		0	1350	09/10/96	TN
429786	Spike		mg/L		0.50	101	1350	09/10/96	TN
				Arsenic, Hydride					

Continued

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REPORT

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Sample #	Description	Result	Units	Dup/Std Value	Spk Conc.	Percent	Time	Date	By
	Blank	<2.0	ug/L				1100	09/11/96	TN
	Standard	4.9	ug/L	5.0		98	1100	09/11/96	TN
	Standard	5.8	ug/L	5.0		116	1100	09/11/96	TN
429751	Duplicate	<2.0	ug/L	<2.0		0	1100	09/11/96	TN
429756	Spike		ug/L		5.0	87	1100	09/11/96	TN

Tony Nurse/tn

Tony Nurse, Owner/Analyst

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FOOTHILL LABORATORY

823 S. HWY. 49
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(209) 223-2800

REPORT

TEST REPORT: 429789

Gwin Mine Associates
PO Box 1059
San Andreas, CA 95249-

Sample Identification:2400' Main shaft
Collected By:LG
Date & Time Taken:09/09/96 1850

Other Data: G W 1gal P
Sample Matrix: Liquid
Report Date: 09/18/96 Received: 09/10/96 Client: GWIN

PARAMETER	RESULTS	UNITS	ANALYZED	EQL	METHOD	BY
Alkalinity, Total	370	mg/L	1300 09/10/96	5.0	EPA310.1	GK
Chloride, Titrimetric	6.7	mg/L	1100 09/17/96	1.0	EPA325.3	GK
Specific Conductance	648	umho/cm	1300 09/10/96	1.0	EPA120.1	GK
Fluoride, Ion Electrode	0.17	mg/L	0945 09/11/96	0.1	EPA340.2	GK
Foaming Agents (MBAS)	0.25	mg/L	0945 09/10/96	0.1	EPA425.1	GK
Magnesium, Calculation	32	mg/L	1500 09/17/96	0.05	SM3500Mg-E	RJ
Nitrogen, Nitrite-N	<0.02	mg/L	1510 09/10/96	0.02	EPA354	GK
Nitrogen, Nitrate-N	<0.05	mg/L	1445 09/10/96	0.05	EPA353.2	GK
Sulfate, Turbidimetric	7.0	mg/L	1000 09/17/96	0.5	EPA375.4	GK
Solids, Total Dissolved	420	mg/L	0900 09/16/96	10	EPA160.1	MG
pH	6.8	unit	1345 09/10/96	0.1	EPA150.1	GK
Calcium, Titrimetric	96	mg/L	1215 09/17/96	4.0	EPA215.2	GK
Hardness	370	mg/L	1400 09/10/96	5.0	EPA130.1	GK

Quality Assurance for the SET with Sample 429789

Alkalinity, Total

Sample #	Description	Result	Units	Dup/Std Value	Spk Conc.	Percent	Time	Date	By
	Blank	<5.0	mg/L				1300	09/10/96	GK
	Standard	270	mg/L	310		87	1300	09/10/96	GK
429788	Duplicate	350	mg/L	370		6	1300	09/10/96	GK

Continued

SIERRA
FOOTHILL LABORATORY

REPORT

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Sample #	Description	Result	Units	Dup/Std Value	Spk Conc.	Percent	Time	Date	By
429818	Duplicate	920	mg/L	950		3	1300	09/10/96	GK
	Chloride, Titrimetric								
	Blank	<1.0	mg/L				1100	09/17/96	GK
	Standard	140	mg/L	140		100	1100	09/17/96	GK
429788	Duplicate	9.2	mg/L	9.5		3	1100	09/17/96	GK
	Specific Conductance								
	Standard	312	umho/cm	303		103	1300	09/10/96	GK
429789	Duplicate	648	umho/cm	653		1	1300	09/10/96	GK
	Fluoride, Ion Electrode								
	Blank	<0.1	mg/L				0945	09/11/96	GK
	Standard	21	mg/L	20		105	0945	09/11/96	GK
429757	Duplicate	0.14	mg/L	0.14		0	0945	09/11/96	GK
429787	Spike		mg/L		4.0	108	0945	09/11/96	GK
	Foaming Agents (MBAS)								
	Standard	42	mg/L	50		84	0945	09/10/96	GK
	Nitrogen, Nitrite-N								
	Standard	23	mg/L	25		92	1510	09/10/96	GK
429808	Duplicate	<0.02	mg/L	<0.02		0	1510	09/10/96	GK
429814	Spike		ug/L		7.5	98	1510	09/10/96	GK
	Nitrogen, Nitrate-N								
	Standard	19	mg/L	20		95	1445	09/10/96	GK
429787	Duplicate	<0.05	mg/L	<0.05		0	1445	09/10/96	GK
429789	Spike		mg/L		0.4	89	1445	09/10/96	GK
	Sulfate, Turbidimetric								
	Standard	150	mg/L	150		100	1000	09/17/96	GK
429787	Spike		mg/L		28	100	1000	09/17/96	GK
	Solids, Total Dissolved								
	Standard	300	mg/L	290		103	0900	09/16/96	MG
429862	Duplicate	510	mg/L	500		2	0900	09/16/96	MG
430071	Duplicate	130	mg/L	110		17	0900	09/16/96	MG
	pH								
	Standard	7.4	unit	7.4		100	1345	09/10/96	GK
429787	Duplicate	6.8	unit	6.8		0	1345	09/10/96	GK
	Calcium, Titrimetric								
	Blank	<4.0	mg/L				1215	09/17/96	GK
	Standard	200	mg/L	190		105	1215	09/17/96	GK
429808	Duplicate	120	mg/L	110		9	1215	09/17/96	GK
	Hardness								
	Blank	<5.0	mg/L				1400	09/10/96	GK
	Standard	750	mg/L	780		96	1400	09/10/96	GK
429787	Duplicate	310	mg/L	300		3	1400	09/10/96	GK

Tony Nurse/m

Tony Nurse, Owner/Analyst

SIERRA FOOTHILL LABORATORY

REPORT

823 S. HWY. 49
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Sierra Foothill Laboratory
Quality Control Worksheet

Sample ID: 429786;789

Analyte	Charge	Conc. (mg/L)	Cation	Anion	Conversion Factor
Alk	Anion	370		7.4000	50.00
Cl	Anion	6.7		0.1890	35.45
F	Anion	0.17		0.0089	19.00
NO3 as N	Anion				14.00
PO4	Anion				31.66
SO4	Anion	7		0.1457	48.03
Al	Cation				8.99
B	Cation				10.82
Ba	Cation	0.25	0.0036		68.67
Ca	Cation	96	4.7904		20.04
Cu	Cation				31.77
Fe	Cation	0.2	0.0107		18.62
K	Cation				39.10
Mg	Cation	32	2.6337		12.15
Mn	Cation	0.6	0.0437		13.73
Na	Cation	31	1.3484		22.99
NH3	Cation				18.04
Si	Cation				38.04
Zn	Cation				32.69
EC		648			
TDS		420			
Total			**8.83**	**7.74**	

QC Measurement	Result	Evaluation	Acceptance Criteria
C-A Balance %	87.7%	Marginal	Greater than 85%
Calculated TDS	511.9		
Calculated TDS / EC Ratio	0.79	High	Range = 0.55 - 0.7
Measured TDS / EC Ratio	0.65	Acceptable	Range = 0.55 - 0.7
Measured TDS / Calculated TDS	0.82	Low	Range = 1.0 - 1.2
EC Ratio / Anion	0.84	Acceptable	Range = 0.8 - 1.2
EC Ratio / Cation	0.73	Low	Range = 0.8 - 1.2

C-A Balance Acceptance Criteria for Drinking Water

Anion Sum (meq/L)	Acceptable % Difference
0 - 3.0	+- 0.2 meq/L
3.0 - 10.0	+- 2%
10.0 - 800	+- 2-5%

SIERRA
FOOTHILL LABORATORY

REPORT

823 S. HWY. 49
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429784 20' Main shaft
G W 11G/HNO3

Taken: 09/09/96 1515 Recvd: 09/10/96 Mail: 10/07/96

Parameter	Results	Units	EQL	Analyzed		By
Silver, GFAA	<5	ug/L	5.0	09/23/96	1230	TN
Aluminum, GFAA	290	ug/L	50	09/23/96	0825	TN
Barium, FAA	0.26	mg/L	0.10	09/10/96	1140	TN
Beryllium, GFAA	<1	ug/L	1.0	09/12/96	0935	TN
Cadmium, GFAA	<1	ug/L	1.0	09/10/96	1215	TN
Chromium, GFAA	3.2	ug/L	2.0	09/22/96	1000	TN
Copper, FAA	<0.03	mg/L	0.03	09/10/96	1405	TN
Iron, FAA	0.69	mg/L	0.05	09/17/96	1530	TN
Mercury, CVAA	<0.5	ug/L	0.5	09/11/96	1310	TN
Manganese, FAA	0.69	mg/L	0.03	09/17/96	1510	TN
Sodium, FAA	30	mg/L	0.05	09/11/96	1555	TN
Nickel, FAA	0.15	mg/L	0.10	10/04/96	1600	TN
Lead, GFAA	<2	ug/L	2.0	09/24/96	1240	TN
Antimony, GFAA	2.7	ug/L	2.5	09/18/96	1400	TN
Selenium, Hydride	<1	ug/L	1.0	09/11/96	0845	TN
Thallium, GFAA	1.1	ug/L	1.0	09/24/96	0850	TN
Zinc, FAA	<0.05	mg/L	0.05	09/10/96	1350	TN
Arsenic, Hydride	160	ug/L	2.0	09/11/96	1100	TN

429785 1200' Main shaft
G W 11G/HNO3

Taken: 09/09/96 1612 Recvd: 09/10/96 Mail: 10/07/96

Parameter	Results	Units	EQL	Analyzed		By
Silver, GFAA	<5	ug/L	5.0	09/23/96	1230	TN
Aluminum, GFAA	55	ug/L	50	09/23/96	0825	TN
Barium, FAA	0.24	mg/L	0.10	09/10/96	1140	TN
Beryllium, GFAA	<1	ug/L	1.0	09/12/96	0935	TN
Cadmium, GFAA	<1	ug/L	1.0	09/10/96	1215	TN
Chromium, GFAA	3.6	ug/L	2.0	09/22/96	1000	TN
Copper, FAA	<0.03	mg/L	0.03	09/10/96	1405	TN
Iron, FAA	0.27	mg/L	0.05	09/17/96	1530	TN
Mercury, CVAA	<0.5	ug/L	0.5	09/11/96	1310	TN
Manganese, FAA	0.62	mg/L	0.03	09/17/96	1510	TN
Sodium, FAA	31	mg/L	0.05	09/11/96	1555	TN
Nickel, FAA	0.35	mg/L	0.10	10/04/96	1600	TN
Lead, GFAA	<2	ug/L	2.0	09/24/96	1240	TN
Antimony, GFAA	<2.5	ug/L	2.5	09/18/96	1400	TN
Selenium, Hydride	<1	ug/L	1.0	09/11/96	0845	TN
Thallium, GFAA	1.1	ug/L	1.0	09/24/96	0850	TN
Zinc, FAA	<0.05	mg/L	0.05	09/10/96	1350	TN
Arsenic, Hydride	150	ug/L	2.0	09/11/96	1100	TN

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REPORT

Sierra Foothill Laboratory

10/08/96Gwin Mine Associates GWIN from 09/10/96 to 09/10/96 Page: 2

429786 2400' Main shaft Taken: 09/09/96 1815 Recvd: 09/10/96 Mail: 10/07/96

G W 11G/HNO3

Parameter	Results	Units	EQL	Analyzed		By
Silver, GFAA	<5	ug/L	5.0	09/23/96	1230	TN
Aluminum, GFAA	<50	ug/L	50	09/23/96	0825	TN
Barium, FAA	0.25	mg/L	0.10	09/10/96	1140	TN
Beryllium, GFAA	<1	ug/L	1.0	09/12/96	0935	TN
Cadmium, GFAA	<1	ug/L	1.0	09/10/96	1215	TN
Chromium, GFAA	6.6	ug/L	2.0	09/22/96	1000	TN
Copper, FAA	<0.03	mg/L	0.03	09/10/96	1405	TN
Iron, FAA	0.20	mg/L	0.05	09/17/96	1530	TN
Mercury, CVAA	<0.5	ug/L	0.5	09/11/96	1310	TN
Manganese, FAA	0.60	mg/L	0.03	09/17/96	1510	TN
Sodium, FAA	31	mg/L	0.05	09/11/96	1555	TN
Nickel, FAA	0.50	mg/L	0.10	10/04/96	1600	TN
Lead, GFAA	<2	ug/L	2.0	09/24/96	1240	TN
Antimony, GFAA	2.7	ug/L	2.5	09/18/96	1400	TN
Selenium, Hydride	<1	ug/L	1.0	09/11/96	0845	TN
Thallium, GFAA	1.4	ug/L	1.0	09/24/96	0850	TN
Zinc, FAA	<0.05	mg/L	0.05	09/10/96	1350	TN
Arsenic, Hydride	120	ug/L	2.0	09/11/96	1100	TN

429787 20' Main shaft Taken: 09/09/96 1540 Recvd: 09/10/96 Mail: 09/18/96

G W 1gal P

Parameter	Results	Units	EQL	Analyzed		By
Alkalinity, Total	340	mg/L	5.0	09/10/96	1300	GK
Chloride, Titrimetric	6.7	mg/L	1.0	09/17/96	1100	GK
Specific Conductance	650	umho/cm	1.0	09/10/96	1300	GK
Fluoride, Ion Electrode	0.16	mg/L	0.1	09/11/96	0945	GK
Foaming Agents (MBAS)	<0.1	mg/L	0.1	09/10/96	0945	GK
Magnesium, Calculation	24	mg/L	0.05	09/17/96	1500	RJ
Nitrogen, Nitrite-N	<0.02	mg/L	0.02	09/10/96	1510	GK
Nitrogen, Nitrate-N	<0.05	mg/L	0.05	09/10/96	1445	GK
Sulfate, Turbidimetric	6.7	mg/L	0.5	09/17/96	1000	GK
Solids, Total Dissolved	410	mg/L	10	09/16/96	0900	MG
pH	6.8	unit	0.1	09/10/96	1345	GK
Calcium, Titrimetric	84	mg/L	4.0	09/17/96	1215	GK
Hardness	310	mg/L	5.0	09/10/96	1400	GK

429788 1200' Main shaft Taken: 09/09/96 1642 Recvd: 09/10/96 Mail: 09/18/96

G W 1gal P

Parameter	Results	Units	EQL	Analyzed		By
Alkalinity, Total	350	mg/L	5.0	09/10/96	1300	GK
Chloride, Titrimetric	9.2	mg/L	1.0	09/17/96	1100	GK
Specific Conductance	653	umho/cm	1.0	09/10/96	1300	GK

SIERRA FOOTHILL LABORATORY

REPORT

823 S. HWY. 49
P.O. BOX 1268 • JACKSON, CA 95642
(209) 223-2800

Fluoride, Ion Electrode	0.16	mg/L	0.1	09/11/96	0945	GK
Foaming Agents (MBAS)	0.22	mg/L	0.1	09/10/96	0945	GK
Magnesium, Calculation	28	mg/L	0.05	09/17/96	1500	RJ
Nitrogen, Nitrite-N	<0.02	mg/L	0.02	09/10/96	1510	GK
Nitrogen, Nitrate-N	<0.05	mg/L	0.05	09/10/96	1445	GK
Sulfate, Turbidimetric	6.7	mg/L	0.5	09/17/96	1000	GK
Solids, Total Dissolved	410	mg/L	10	09/16/96	0900	MG
pH	6.8	unit	0.1	09/10/96	1345	GK
Calcium, Titrimetric	86	mg/L	4.0	09/17/96	1215	GK
Hardness	330	mg/L	5.0	09/10/96	1400	GK

429789 2400' Main shaft   Taken: 09/09/96 1850   Recvd: 09/10/96   Mail: 09/18/96
G W 1gal P

Parameter	Results	Units	EQL	Analyzed		By
Alkalinity, Total	370	mg/L	5.0	09/10/96	1300	GK
Chloride, Titrimetric	6.7	mg/L	1.0	09/17/96	1100	GK
Specific Conductance	648	umho/cm	1.0	09/10/96	1300	GK
Fluoride, Ion Electrode	0.17	mg/L	0.1	09/11/96	0945	GK
Foaming Agents (MBAS)	0.25	mg/L	0.1	09/10/96	0945	GK
Magnesium, Calculation	32	mg/L	0.05	09/17/96	1500	RJ
Nitrogen, Nitrite-N	<0.02	mg/L	0.02	09/10/96	1510	GK
Nitrogen, Nitrate-N	<0.05	mg/L	0.05	09/10/96	1445	GK
Sulfate, Turbidimetric	7.0	mg/L	0.5	09/17/96	1000	GK
Solids, Total Dissolved	420	mg/L	10	09/16/96	0900	MG
pH	6.8	unit	0.1	09/10/96	1345	GK
Calcium, Titrimetric	96	mg/L	4.0	09/17/96	1215	GK
Hardness	370	mg/L	5.0	09/10/96	1400	GK

APPENDIX B

ANALYTICAL REPORT
AMERICAN ENVIRONMENTAL NETWORK (AEN) LABORATORY

CERCO analytical, inc.
3942-A Valley Avenue
Pleasanton, CA 94566
Tel: 510.462.2771
Fax: 510.462.2775

Mr. William Svoboda
American Environmental Network
3440 Vincent Road
Pleasant Hill, CA 94523

Sample Source:
Client Project I.D. No.: 7D917-001-04
Client P.O. No.9701116
Date Received: 01/14/97
Matrix: Water

January 15, 1997
Job No.9701058
Sample No.001
Cust. No.10083

Lab No.	Sample I.D.	MBAS Results mg/L	Detection Limit mg/L	Method Number	Date Sampled	Date Analyzed
001	Sample #3	N.D.	0.1	SM 5540C	01/13/97	01/15/97

N.D. - None Detected

John B. Gregory
Laboratory Director

California State Certified Laboratory No.2153

Quality Control Report Available on Request

SECOR

SAMPLE ID: SAMPLE #3
AEN LAB NO: 9701116-01
AEN WORK ORDER: 9701116
CLIENT PROJ. ID: 7D017-001-04

DATE SAMPLED: 01/13/97
DATE RECEIVED: 01/14/97
REPORT DATE: 01/15/97

ANALYTE	METHOD/ CAS#	RESULT	REPORTING LIMIT	UNITS	DATE ANALYZED
Alkalinity, Total	EPA 310.1	290 *	2	mg CaCO3/L	01/14/97
Total Phosphorus	EPA 365.2	0.25 *	0.05	mg/L	01/15/97
Total Suspended Solids	EPA 160.2	3 *	2	mg/L	01/14/97
#Anion Sample Prep.		-		Prep date	01/14/97
Sulfate	EPA 300	7.1 *	0.5	mg/L	01/14/97
#Water Extrn for O&G	IR	-		Extrn Date	01/14/97
Oil & Grease (IR)	SM 5520C	ND	0.5	mg/L	01/15/97

ND = Not detected at or above the reporting limit
* - Value at or above reporting limit

RISC

Chain-of Custody Number: 970114

SECOR Chain-of Custody Record

Field Office: SACRAMENTO
Address: 1787 TRIBUTE ROAD, SUITE C
SACRAMENTO CA 95815-4404

☐ Additional documents are attached, and are a part of this Record.
Job Name: STORMWATER / SURFACE WATER
Location: GWIN MINE
CALAVERAS COUNTY

Project #: 7D017-001-04 Task #:
Project Manager: BILL WALKER
Laboratory: AEN
Turnaround Time: 1 DAY

Sampler's Name: CAROL MASLANKA
Sampler's Signature: Carol Maslanka

Analysis Request

Sample ID	Date	Time	Matrix	PHOSPHATE	TPHg/BTEX/WTPH-G 8015 (modified)/8020	TPHd/WTPH-D 8015 (modified)	TPH 418.1/WTPH 418.1	Aromatic Volatiles 602/8020	Volatile Organics 624/8240 (GC/MS)	Halogenated Volatiles 601/8010	SULFIDE	SULFATE	ALKALINITY	Priority Pollutant Metals (13)	TSS	O&G	MBAS	Comments/ instructions	Number of Containers
1A-SAMPLE #3	1/13/97	1:05	W	X									X		X	X	X	Note 1 Day Rush T.A.T.	3
																		1/14 - see attached COC for revisions per Bill S. @ AEN. JGG	

Special Instructions/Comments:
PLEASE CALL / FAX DATA TO CAROL MASLANKA AS SOON AS AVAILABLE
ph 916-648-9160
fax 916-648-8052

Relinquished by:	Received by:
Sign: Carol Maslanka	Sign: Richard C. Casias
Print: CAROL MASLANKA	Print: RICHARD C. CASIAS
Company: SECOR	Company: SECOR
Time: 5:05 PM Date: 1/13/97	Time: 5:05 Date: 1/13/97
Relinquished by: RCC to Fed X	Received by: LAB
Sign: Richard C. Casias	Sign: Lucas Podkowski
Print:	Print: Lucas Podkowski
Company: SECOR	Company: AEN
Time: 5:50 pm Date: 1/13/97	Time: 10:30 Date: 1/14/97

Sample Receipt

Total no. of containers:	3
Chain of custody seals	
Rec'd. in good condition/cold:	
Conforms to record:	

Client:
Client Contact:
Client Phone: 916 648-9160

SECOR CUSTREC Rev. 1/93

Date: 1/13/97 Page 2 of 2

SECOR

SAMPLE ID: SAMPLE #3
AEN LAB NO: 9701115-01
AEN WORK ORDER: 9701115
CLIENT PROJ. ID: 7D017-001-04

DATE SAMPLED: 01/13/97
DATE RECEIVED: 01/14/97
REPORT DATE: 01/21/97

ANALYTE		METHOD/ CAS#	RESULT	REPORTING LIMIT	UNITS	DATE ANALYZED
#Digestion. Metals by GFAA		EPA 3020	-		Prep Date	01/15/97
#Digestion. Metals by ICP		EPA 3010	-		Prep Date	01/15/97
Iron		EPA 6010	0.16 *	0.05	mg/L	01/16/97
Priority Pollutant Metals						
Ag	Silver	EPA 6010	ND	0.005	mg/L	01/16/97
As	Arsenic	EPA 7060	0.17 *	0.002	mg/L	01/16/97
Be	Beryllium	EPA 6010	ND	0.002	mg/L	01/16/97
Cd	Cadmium	EPA 6010	ND	0.005	mg/L	01/16/97
Cr	Chromium	EPA 6010	ND	0.01	mg/L	01/16/97
Cu	Copper	EPA 6010	ND	0.01	mg/L	01/16/97
Hg	Mercury	EPA 7470	ND	0.0002	mg/L	01/15/97
Ni	Nickel	EPA 6010	ND	0.01	mg/L	01/16/97
Pb	Lead	EPA 6010	ND	0.04	mg/L	01/16/97
Sb	Antimony	EPA 6010	ND	0.02	mg/L	01/16/97
Se	Selenium	EPA 7740	ND	0.004	mg/L	01/16/97
Tl	Thallium	EPA 6010	ND	0.05	mg/L	01/16/97
Zn	Zinc	EPA 6010	ND	0.01	mg/L	01/16/97

ND = Not detected at or above the reporting limit
* = Value at or above reporting limit

AMERICAN ENVIRONMENTAL NETWORK 11 East Olive Road Pensacola, Florida 32514 (904) 474-1001

(0) Page 1
Date 24-Jan-97

"PRELIMINARY RESULTS ONLY - SINGLE"

Accession:	701281
Client:	AMERICAN ENVIRONMENTAL NETWORK (CA), INC.
Project Number:	9701115
Project Name:	7D017-001-04
Project Location:	N/S
Test:	TOTAL ORGANIC HALIDES IN WATER

Sample Number: 001 Dry Weight %: N/A Client Sample ID: SAMPLE #3

Parameter:	Units:	Results:	Rpt Lmts:	Q:
TOTAL ORGANIC HALIDES	MG/L	0.02	0.01	
ANALYST	INITIALS	KL		

Comments:

C151
R75A

Chain-of Custody Number: 9701115

JAN-21-97 TUE 14:58 AEN CALIFORNIA FAX NO. 5109300256 P.02/03

SECOR Chain-of Custody Record

☐ Additional documents are attached, and are a part of this Record.

Field Office: SACRAMENTO
Address: 1787 TRIBUTE ROAD, SUITE Q
SACRAMENTO CA 95815-4404

Job Name: STORMWATER / SURFACE WATER
Location: GWIN MINE
CALAVERAS COUNTY

Project # 7D017-001-04 Task #
Project Manager BILL WALKER
Laboratory AEN
Turnaround Time 7 DAYS

Sampler's Name CAROL MASLANKA
Sampler's Signature Carol Maslanka

Analysis Request

Sample ID	Date	Time	Matrix	HCID	TPHg/BTEX/WTPH-G 8015 (modified)/8020	TPHd/WTPH-D 8015 (modified)	TPH 418.1/WTPH 418.1	Aromatic Volatiles 602/8020	Volatile Organics 624/8240 (GC/MS)	Halogenated Volatiles 601/8010	Semi-volatile Organics 625/8270 (GC/MS)	Pesticides/PCBs 608/8080	Total Lead 7421	Priority Pollutant Metals (13)	~~TCLP Metals~~	Iron	TOX	Comments/ Instructions	Number of Containers
SAMPLE #3	1/13/97	1:05	W											X	~~X~~	X	X	Standard T.A.T of 7 Days	2

Special Instructions/Comments:

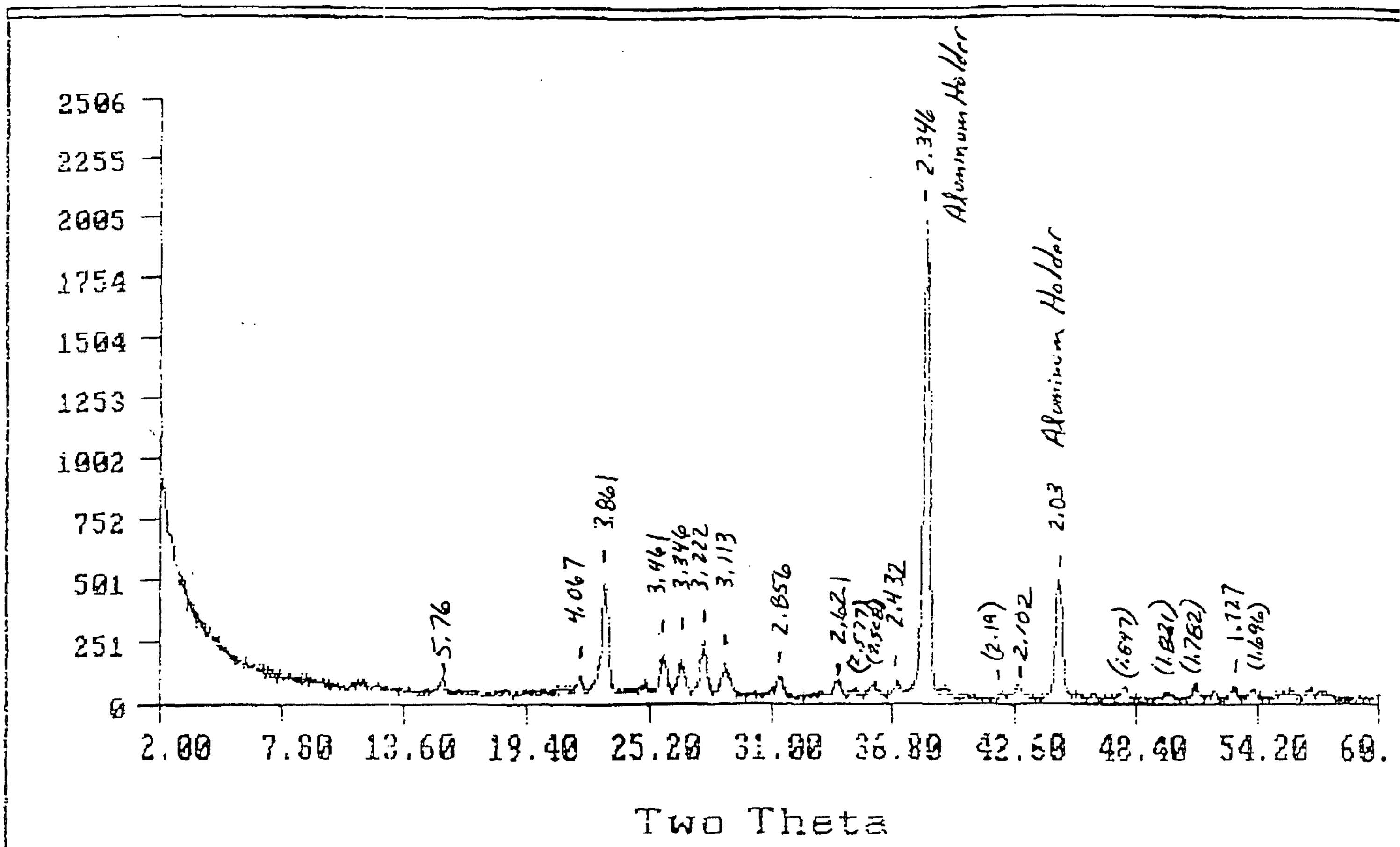
Relinquished by:	Received by:	Sample Receipt	
Sign Carol Maslanka	Sign Richard C. Casias	Total no. of containers:	2
Print CAROL MASLANKA	Print RICHARD C. CASIAS	Chain of custody seals:	
Company SECOR	Company SECOR	Rec'd. in good condition/cold:	
Time 5:05 PM Date 1/13/97	Time 5:06 Date 1/13/97	Conforms to record:	
Relinquished by: RCC to Fed-X	Received by: LAB	Client:	
Sign Richard C. Casias	Sign Luann Podkowski	Client Contact:	
Print	Print Luann Podkowski		
Company SECOR	Company AEN		
Time 5:50 pm Date 1/13/97	Time 10:30 Date 1/14/97	Client Phone:	

CUSTREC Rev. 1/95

Date: 1/13/97 Page 1 of 1

APPENDIX C

X-RAY DIFFRACTION PATTERNS



CTHV1	CTHV2	EL	DE	GAIN	TIME	COUNTS	STR 2T	END 2T	STEP	CUR 2
1425	0	0.30	0.90	2	2.00	43	2.00	60.00	0.04	60.0

KV	MA	SCALE	IN/DEG	CHART	WAVELENGTH	AREA	IM	BKG2T	ELEMENT NAM
40	20	1200	1.00	OFF	CUK	0	1	0.00	RD60204

Peak search data for RADROCK.FIT
randy rock (1/14/97)
Target - CUK

	D-Space	2Theta	Int	Back	Int-Back	Rel Int	PStart	Pend	Area	FWHM
	20.674247	4.274	310	275	35	16	4.20	4.44	0.0	0.000
	4.066606	21.855	123	275	-152	6	21.76	22.04	0.0	0.000
	3.861497	23.031	499	275	224	25	22.60	23.44	0.0	0.000
	3.461122	25.739	203	275	-72	10	25.48	26.12	0.0	0.000
	3.345756	26.642	172	275	-103	9	26.24	26.88	0.0	0.000
	3.222237	27.683	251	275	-24	13	27.44	28.04	0.0	0.000
	3.113104	28.674	160	275	-115	8	28.40	28.68	0.0	0.000
	2.856150	31.317	118	275	-157	6	31.16	31.56	0.0	0.000
	2.431656	36.966	103	275	-172	5	36.88	37.08	0.0	0.000
Al	2.346294	38.362	1994	275	1719	100	37.80	38.84	0.0	0.000
Al	2.031699	44.597	518	275	243	26	44.24	45.00	0.0	0.000
	1.726840	53.028	84	45	39	4	52.96	53.20	0.0	0.000

d	3.85	3.21	3.44	7.69	α-S
I/I₁	100	60	40	6	Sulfur (Sulfur)

Rad. CuK λ 1.5405 Filter Dia. 114.6mm
Cut off 50Å I/I₁ Photometer Guinier camera
Ref. deWolff, Techn. Phys. Dienst, Delft, Holland

Sys. Orthorhombic S.G. Fddd (70)
a₀ 10.45 b₀ 12.84 c₀ 24.46 A 0.8139 C 1.905
α β γ Z 128 Dx 2.076
Ref. Ibid.

εα 1.9579 nωβ 2.0377 εγ 2.2452 Sign +
2V 68°58 D 2.07 mp 112.8° Color Yellow
Ref. (Natural crystal prism, Na light, 20°C)
Dana's System of Mineralogy 7th Ed. Vol. 1

Validated by calculated pattern 24-733.

See following card

d Å	I/I₁	hkl	d Å	I/I₁	hkl
7.69	8	111	2.614	4	400
5.76	14	113	2.569	8	333
5.68	6	022	2.501	8	244
4.80	2	202	2.424	14	317
4.19	2	131	2.401	2	404
4.06	12	220	2.375	4	422
3.91	12	131	2.366	4	335
3.85	100	222	2.288	6	0.2.10
3.57	8	133	2.215	2	048,2.0.10
3.44	40	026	2.146	4	1.1.11
3.28	4	224	2.112	10	319,062
3.33	25	311	2.098	2	2.2.10
3.21	60	206	2.057	2	511
3.11	25	313	2.041	2	0.0.12,248
3.08	18	135	2.003	2	353
3.06	2	008	1.988	4	408
2.842	18	044	1.957	2	262
2.688	2	331	1.926	2	444
2.673	2	842	1.900	8	355,066,515
2.621	14	137	1.856	2	3.1.11

8-247a

d	3.85	3.21	3.44	7.69	α-S
I/I₁	100	60	40	6	Sulfur (Sulfur)

Rad. λ Filter Dia.
Cut off I/I₁
Ref.

Sys. S.G.
a₀ b₀ c₀ A C
α β γ Z Dx
Ref.

εα nωβ εγ Sign
2V D mp Color
Ref.

See preceding card

d Å	I/I₁	hkl	d Å	I/I₁	hkl
1.838	2	159	1.461	2	
1.823	4	2.4.10	1.439	4	
1.781	12	266,357	1.424	4	
1.754	8	595	1.419	2	
1.725	8	603	1.391	2	
1.698	8	1.3.13	1.368	2	
1.665	2		1.354	4	
1.658	2				
1.647	6				
1.622	6				
1.607	6				
1.601	2				
1.595	4				
1.563	2				
1.542	2				
1.531	2				
1.515	3				
1.504	2				
1.490	2				
1.475	2				

11-78

d	2.89	2.19	1.79	4.03	$CaMg(CO_3)_2$
I/I₁	100	30	30	<5	Calcium Magnesium Carbonate — Dolomite

Rad. CuKα λ 1.5418 Filter Ni Dia.
Cut off I/I₁ Diffractometer
Ref. Howie and Broadhurst, Am. Min. 43 1210-3 (1958)

Sys. Hexagonal (Rhombohedral) S.G. R3̄ (148)
a₀ 4.8113 b₀ c₀ 16.02 A C 3.330
α β γ Z 3 Dx 2.862
Ref. Ibid., refined on 33 lines V 321.22

εα nωβ 1.680 εγ 1.503 Sign −
2V D 2.86 mp Color Colorless or white
Ref. Ibid.

Sample from Haley, Ross Twp., Ontario, Canada.
Analysis (wt. %): SiO_2 0.12, FeO 0.22, MgO 21.12, CaO 31.87, CO_2 47.22, H_2O 0.02.
Dolomite group.

d Å	I/I₁	hkl	d Å	I/I₁	hkl
4.03	<5	101	1.389	15	030
3.69	5	012	1.335	10	0.0.12
2.886	100	104	1.297	<5	217
2.670	10	006	1.269	<5	0.2.10
2.540	10	015	1.238	5	128
2.405	10	110	1.202	<5	220
2.192	30	113	1.168	<5	1.1.12
2.066	5	021	1.144	<5	312
2.015	15	202	1.132	5	2.1.10
1.848	5	024	1.096	<5	226,309
1.804	20	018	1.068	<1	0.0.15
1.786	30	116	1.008	5	404
1.781		009	1.001	5	318
1.569	10	211	0.973	<5	1.0.16
1.545	10	122	.962	5	2.0.12
1.496	1	1.0.10	.969	<1	322
1.465	5	214	.930	<1	324
1.445	5	028	.926	<5	2.1.14
1.431	10	119	.923	<5	408
1.413	5	125	Plus 7 lines to 0.821		

5-586

d	3.04	2.29	2.10	3.86	$CaCO_3$ ★
I/I₁	100	18	18	12	Calcium Carbonate (Calcite)

Rad. $CuK\alpha_1$ λ 1.5405 Filter Ni Dia.
Cut off I/I₁ Diffractometer I/I
Ref. Swanson and Fuyat, NBS Circular 539, Vol. II, 51 (1953)

Sys. Hexagonal S.G. R3c (167)
a_0 4.989 b_0 c_0 17.062 A C 3.420
α β γ Z 6 Dx 2.711
Ref. Ibid.

εα 1.487 nωβ 1.659 εγ Sign -
2V D mp Color Colorless
Ref. Ibid.

Specimen from Mallinckrodt Chem. Works. Spect. anal: <0.1% Sr; <0.01% Ba; <0.001% Al, B, Cs, Cu, K, Mg, Na, Si, Sn; <0.0001% Ag, Cr, Fe, Li, Mn.
X-Ray pattern at 26°C.
Other form: aragonite.
Merck Index, 6th Ed., p. 190.
Calcite group.

d A	I/I₁	hkl	d A	I/I₁	hkl
3.86	12	102	1.297	2	218
3.036	100	104	1.284	1	306
2.845	3	006	1.247	1	220
2.495	14	110	1.235	2	1112
2.285	18	113	1.1795	3	2110
2.095	18	202	1.1538	3	314
1.927	5	204	1.1425	1	226
1.913	17	108	1.1244	<1	2111
1.875	17	116	1.0613	1	2014
1.626	4	211	1.0473	3	404
1.604	8	212	1.0447	4	138
1.587	2	1010	1.0352	2	0116,1115
1.525	5	214	1.0234	<1	1213
1.518	4	208	1.0118	2	3012
1.510	3	119	0.9895	<1	231
1.473	2	215	.9846	1	322
1.440	5	300	.9782	1	1017
1.422	3	0012	.9767	3	2114
1.356	1	217	.9655	2	234
1.339	2	2010	Plus 4 reflections.		

3.03	1.87	3.85	100	34	29

$CaCO_3$

Calcium Carbonate Calcite

Ref. Smith et al., Annual Report to the Joint Committee on Powder Diffraction Standards (1973)

Sys. Hexagonal S.G. R3c (167) Dx 2.722 Z 6
a_0 4.990 b_0 c_0 17.002
α β γ
Ref. Chesin et al., Acta Cryst., 18 689 (1965)

Scale factor (Integrated Intensities)
λ 1.54050 Calcite group.

d A	I/I₀	h k l	d A	I/I₀	h k l	d A	I/I₀	h k l	d A	I/I₀	h k l
3.852	29	012	2.094	27	202	1.6040	15	122			
3.030	100	104	1.9261	4	024	1.5821	2	1010			
2.834	2	006	1.9071	17	018	1.5247	3	214			
2.495	7	110	1.8726	34	116	1.5061	2	119			
2.284	18	113	1.6259	2	211	1.4405	5	300			
						1.4168	3	0012			
						1.3561	3	0210			
						1.1779	3	2110			
						1.1536	3	134			
						1.1417	3	226			
						1.0471	2	404			
						1.0440	2	318			

8-479

d	2.74	2.10	1.70	2.74	$MgCO_3$ ★
I/I₁	100	45	35	100	Magnesium Carbonate (Magnesite)

Rad. $CuK\alpha_1$ λ 1.5405 Filter Ni Dia.
Cut off I/I₁ Diffractometer I/I cor.
Ref. NBS Circular 539 7 28 (1957)

Sys. Hexagonal S.G. R3c (167)
a_0 4.6332 b_0 c_0 15.015 A C 3.2407
α β γ Z 6 Dx 3.009
Ref. Ibid.

εα 1.510 nωβ 1.700 εγ Sign -
2V D mp Color Colorless
Ref. Ibid.

Sample from the Baker Chemical Company, Phillipsburg, New Jersey, USA, heated at 120,000 psi and 280°C for 4 days. Spect. anal. <0.1% Ca, Na; <0.01% Al, Fe, Mn, Nb, Pb, Si, Sr; <0.001% Ba, Cr, Cu, Ni. Calcite structure type. Pattern made at 25°C.
Other data 17-544.

d A	I/I₁	hkl	d A	I/I₁	hkl
2.742	100	104	1.0510	2	226
2.503	18	006	1.0145	<1	1211
2.318	4	110	0.9697	2	404
2.102	45	113	.9573	2	318
1.939	12	022	.9455	<1	2014
1.769	4	024	.9188	4	2113*
1.700	35	116,018	.9134	6	3012*
1.510	4	211	.8941	<1	324,1310
1.488	6	122	.8837	2	048
1.406	4	1010,214	.8758	2	140,1214
1.371	4	208;119	.8626	<1	3111,413
1.354	8	118	.8460	<1	327
1.338	8	300	.8346	<1	0018,4010
1.252	4	0012	.8265	<1	416,238
1.2384	<1	217	.7981	2	2116,502
1.2022	<1	0210			
1.1798	<1	128,306			
1.1583	<1	220			
1.1011	<1	1112			
1.0660	4	2110,134			