**CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD**
**COLORADO RIVER BASIN REGION**

ORDER NO. 95-016

WASTE DISCHARGE REQUIREMENTS
FOR
SANTA FE PACIFIC GOLD CORPORATION, OWNER/OPERATOR
MESQUITE MINE
Northeast of Glamis - Imperial County

The California Regional Water Quality Control Board, Colorado River Basin Region, finds that:

1. Santa Fe Pacific Gold Corporation (hereinafter referred to as the discharger), 6502 East Highway 78, Brawley, California, 92227, submitted a Report of Waste Discharge dated September 8, 1994, to update Mesquite Mine's operation.

2. The discharger proposes to process up to 12 million tons of ore per year on its approximately 5,600-acre heap leach, carbon absorption processing facility.

3. The main processing facilities are located in Sections 8, 9, 16, 17, 19 and 20, T13S, R19E, SBB&M, about six miles northeast of Glamis near Highway 78 in the eastern part of Imperial County.

4. The estimated life of the processing area is five years. The process will continue to use a solution of sodium cyanide, (or an equivalent cyanide compound) applied onto piles (heaps) of ore, to dissolve gold and transport it in lined ditches or pipes to solution containment basins or tanks. The pregnant solution is piped through carbon column units where gold is removed. Sodium cyanide (or an equivalent cyanide compound) is added to reconstitute the resulting barren solution which is recirculated to the process.

5. The discharger states that ore piles to be leached will be underlain by a lining system designed to be effective throughout the processing life of each pile or segment. The liner design would be based on but not necessarily limited to the following factors:

   a. The size of the ore particles in the initial lift, against the liner;
   b. Maximum pile height;
   c. Ore placement methods;
   d. Subgrade preparation and/or overliner procedures; and
   e. Provisions for controlling the hydraulic head of the solution on the liner.

6. Upon completion of the heap leach process, each pile or segment would be flushed with fresh water or otherwise rinse-treated after completion of leaching operations to reduce cyanide concentrations to an acceptable level which would result in a mining waste classification of Group C, under Article 7, Chapter 15, Title 23 of the California Code of Regulations. The pile would then be either abandoned in place or removed elsewhere.

7. Normal annual precipitation in this area is 3.5 inches, and normal annual surface evaporation is nine feet.

8. The discharger states that the processing facilities are located in an area underlain by bedrock with low potential for water supply. The depth to this limited ground water is approximately 200 feet. The industrial water supply for this project is derived from three deep wells drilled into alluvium, approximately three miles southeast of the processing facilities. The beginning of the alluvium basin, known as the Amos-Ogilby Hydrologic Unit, is estimated to be about one mile from the maximum limits of the processing facilities. Potable water at the mine is obtained by treating the local ground water with a reverse osmosis method to reduce naturally high constituents to acceptable drinking water standards. Ground water quality in the project area is sodium chloride in character with a total dissolved solids (TDS) concentration of approximately 1,700 mg/L. This 1,700 mg/L is the average TDS value for samples taken from four ground water monitoring wells at the processing site prior to commencement of heap leach operations.

9. Overburden soil and rock, and waste rock from the mining operations are being deposited in piles surrounding the mining pits. These materials have the classification of Group C per Article 7 of said Chapter 15, based on laboratory tests on crushed rock which show that the material is not acid generating, and would not cause discharge that would have an affect on water quality.

10. The Water Quality Control Plan for the Colorado River Basin Region of California (Basin Plan) was adopted on November 17, 1993, and designates the beneficial uses of ground and surface waters in this Region.

11. The beneficial use of ground waters in the Amos-Ogilby Hydrologic Unit is:

    a. Municipal Supply (MUN)

12. This discharge has been subject to waste discharge requirements adopted in Board Order No. 89-034.

13. This Board Order updates the waste discharge requirements to comply with current laws and regulations as set forth in the California Water Code and the California Code of Regulations.

14. Federal regulations for storm water discharges were promulgated by the U. S. Environmental Protection Agency on 16 November 1990 (40 CFR Parts 122, 123, and 124). The regulations require specific categories of facilities which discharge storm water associated with industrial activity to obtain NPDES permits and to implement Best Conventional Pollutant Technology (BCPT) to reduce or eliminate industrial storm water pollution.

15. The State Water Resources Control Board adopted Order No. 91-13-DWQ (General Permit No. CAS000001), as amended by Water Quality Order No. 92-12-DWQ, specifying waste discharge requirements for discharges of storm water associated with industrial activities, excluding construction activities, and requiring submittal of a Notice of Intent by industries to be covered under the Permit.

16. The Board has notified the discharger and all known interested agencies and persons of its intent to update waste discharge requirements for said discharge and has provided them with an opportunity for a public meeting and an opportunity to submit comments.

17. The Board in a public meeting heard and considered all comments pertaining to this discharge.

18. Imperial County adopted the final Environmental Impact Report/Environmental Assessment (EIR/EA) for the Mesquite Project on December 12, 1984. The State Clearinghouse Number for the project was 84040408.

19. In accordance with Section 15301, Chapter 3, Title 14 of the California Code of Regulations, the issuance of these waste discharge requirements, which govern the operation of an existing facility involving negligible or no expansion of use beyond that previously existing, is exempt from the provisions of the California Environmental Quality Act (Public Resources Code, Section 21000 et. seq.).

IT IS HEREBY ORDERED, that Board Order No. 89-034 is rescinded, and in order to meet the provisions contained in Division 7 of the California Water Code and regulations adopted thereunder, the discharger shall comply with the following:

A. Specifications

1. The treatment or disposal of wastes at this facility shall not cause pollution or nuisance as defined in Sections 13050(l) and 13050(m) of Division 7 of the California Water Code.

2. The cyanide solutions shall be contained only in the processing system or in other leak-proof containers.

3. There shall be no wind transport of cyanide solution or ore containing cyanide away from the leaching area.

4. The heap leach ore piles shall be underlain by a composite liner. The composite liner shall consist of a synthetic liner which has a maximum permeability of $1 \times 10^{-10}$ cm/sec and a minimum thickness of 40 mils. The synthetic liner shall be underlain by a clay liner at least one foot thick which has a maximum permeability of $1 \times 10^{-6}$ cm/sec. An equivalent liner system may be approved by the Regional Board's Executive Officer if the discharger demonstrates that the equivalent liner will function equal to or better than the above specified minimum system.

5. Each cyanide solution containment basin, each cyanide-bearing sludge containment basin, and each trunk cyanide solution transport ditch, shall be underlain by a double liner with a leachate collection and removal system installed between the two synthetic liners. Each synthetic liner shall have a permeability which does not exceed $1 \times 10^{-10}$ cm/sec. The liners shall have a minimum thickness of 40 mils. Each basin shall contain a double-lined leak detection and withdrawal sump. Each trunk transport ditch shall contain double-lined leak detection and withdrawal sumps at approximately 1,000-foot intervals. The double liners with leachate collection and removal systems shall extend up the sidewalls to at least 2.0 feet (vertically) above the maximum working depth of cyanide solution and/or sludge contained therein.

   The remaining sidewalls of both basins and trunk transport ditches shall have at least a single 40 mil weather-resistant synthetic liner, or an equivalent liner approved by the Regional Board's Executive Officer.

6. The processing area shall be protected from any run-on, washout, or erosion which could occur as a result of a storm having a predicted frequency of once in 100 years.

7. The heap leach processing area shall be diked, and containment basins shall be provided to impound all storm water drainage from the piles and from the cyanide solution collection and transport facilities during a maximum probable one-hour storm, as set forth in Department of Water Resources Bulletin No. 195 for the average of El Centro, California and Yuma, Arizona. In addition, containment capacity shall be provided for 24 hours of cyanide solution drain down from the piles. Also, standby emergency facilities shall be available to assure continual circulation of the leaching solution if at any time it is determined that a planned processing configuration or rate could, in an emergency, result in flow in excess of existing basin storage capacity. The additional storm storage capacity shall be provided before the new processing configuration is started.

8. The impoundment area dikes and containment basins shall provide at least two feet of freeboard above the storage volumes required in Specification No. 7. Transport ditches at the downgradient perimeter of the process area shall include at least two feet of freeboard for flows during a 100-year storm frequency and the ditch capacity with freeboard shall have an area capable of transporting runoff from the maximum probable one-hour storm.

9. There shall be no discharge of process wastewater at any location without prior approval from the Regional Board.

10. All drainage and collection facilities used to contain or transport leaching solution shall be effectively sealed to prevent leakage of these liquids.

11. Leached ore residual shall not be placed in perennial, intermittent, or ephemeral stream channels unless provisions are made to divert runoff around the waste in a non-erosive manner. Waste shall not be placed where it can be eroded by stream flows or cause accelerated stream bank erosion.

12. Prior to removal of leached ore residue from a lined pad for disposal, the cyanide contained therein shall be neutralized as described in Specification No. 16, below.

13. Ore residue may be abandoned on a pad, provided the cyanide in the ore is neutralized as described in Specification No. 16, below, and all other necessary and applicable closure requirements are complied with.

14. All industrial waste materials not covered by said Article 7, Chapter 15 shall be discharged at a Regional Board approved waste management unit.

15. Adequate measures shall be taken to assure that unauthorized persons are effectively excluded from the processing area.

16. When abandoning leached ore residue, the procedure for determination of whether free cyanide ($CN^-$) in the ore residue has been neutralized to a satisfactory level shall be as follows:

    a. A sampling grid for the ore pile or segment on the leach pad shall be submitted for approval by the Regional Board's Executive Officer. The sampling grid shall contain a total of at least ten sampling locations on the ore pile or segment being abandoned.

    b. The sample to be analyzed from each sampling location shall contain 100 grams as an aliquot of samples taken as set forth below, except that no sample shall be taken within three feet above the plastic liner unless special provisions are made to avoid penetrating the liner or for sealing said penetrations:

1. An ore pile thirty feet or less in depth shall have samples taken at 25, 50 and 75 percent of the depth.

2. An ore pile greater than thirty feet in depth shall have samples taken every ten feet of depth.

c. The sample analysis procedure shall be as set forth in Attachment A, incorporated herein and made a part of this Board Order.

d. The maximum allowable free cyanide ($CN^-$) shall not exceed the following levels in the filtrate portion of a 5:1 extraction.

1. Ninety percent of at least 10 samples shall contain less than 1 mg/L free cyanide ($CN^-$) in the filtrate.

2. None of the samples shall contain more than 2 mg/L free cyanide ($CN^-$) in the filtrate.

e. For any sampling location that indicates a free cyanide level in excess of 2 mg/L in the filtrate, the areal extent of the inadequately detoxified area shall be determined and detoxified so that the cyanide levels in that particular ore pile will comply with the limitations contained herein.

17. Adjacent and contiguous ore piles or segments shall also be sampled simultaneously when any pile or segment is to be abandoned. If any additional processing is done in the sampled areas, the piles and segments tested will require additional rinsing and testing prior to abandonment.

18. All monitoring shall be conducted in accordance with Article 5 of the California Code of Regulations.

B. Provisions

1. The discharger shall comply with "Monitoring and Reporting Program No. 95-016" and "Appendix I", incorporated herein and made a part of this Board Order, and future revisions thereto, as specified by the Regional Board's Executive Officer.

2. Prior to any modifications in this facility which would result in material change in the quality or quantity of wastewater treated or discharged, or any material change in the location of discharge, the discharger shall report all pertinent information in writing to the Regional Board and obtain revised requirements before any modifications are implemented.

3. Prior to any change in ownership or management of this operation, the discharger shall transmit a copy of this Board Order to the succeeding owner/operator, and forward a copy of the transmittal letter to the Regional Board.

4. The discharger shall ensure that all site operating personnel are familiar with the content of this Board Order, and shall maintain a copy of this Board Order at the site.

5. This Board Order does not authorize violation of any federal, state, or local laws or regulations.

6. The discharger shall allow the Regional Board, or an authorized representative, upon presentation of credentials and other documents as may be required by law, to:

   a. Enter upon the premises regulated by this Board Order, or the place where records must be kept under the conditions of this Board Order;

   b. Have access to and copy, at reasonable times, any records that shall be kept under the conditions of this Board Order;

   c. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this Board Order; and

   d. Sample or monitor at reasonable times, for the purpose of assuring compliance with this Board Order or as otherwise authorized by the California Water Code, any substances or parameters at this location.

7. The discharger shall comply with all of the conditions of this Board Order. Any noncompliance with this Board Order constitutes a violation of the Porter-Cologne Water Quality Control Act and is grounds for enforcement action.

8. The discharger shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) that are installed or used by the discharger to achieve compliance with this Board Order. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of backup or auxiliary facilities or similar systems which are installed by a discharger only when necessary to achieve compliance with the conditions of this Board Order.

9. This Board Order does not convey any property rights of any sort or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of federal, state, or local laws or regulations.

10. The discharger shall comply with the following:

    a. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity.

    b. The discharger shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this Board Order, and records of all data used to complete the application for this Board Order, for a period of at least 5 years from the date of the sample, measurement, report or application. This period may be extended by request of the Regional Board's Executive Officer at any time.

    c. Records of monitoring information shall include:

       1. The date, exact place, and time of sampling or measurements.
       2. The individual(s) who performed the sampling or measurements.
       3. The date(s) analyses were performed.
       4. The individual(s) who performed the analyses.
       5. The results of such analyses.

d. Monitoring must be conducted according to test procedures under 40 CFR Part 136, unless other test procedures have been specified in this Board Order.

11. All regulated disposal systems shall be readily accessible for sampling and inspection.

12. The discharger is the responsible party for the waste discharge requirements, and the monitoring and reporting program for the facility. The discharger shall comply with all conditions of these waste discharge requirements. Violations may result in enforcement actions, including Regional Board Orders or court orders, requiring corrective action or imposing civil monetary liability, or in modification or revocation of these waste discharge requirements by the Regional Board.

13. The discharger shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances), which are installed or used by the discharger to achieve compliance with conditions of this Board Order.

14. The discharger shall retain records of all monitoring information including all calibration and maintenance records, copies of all reports required by this Board Order, and records of all data used to complete the application for this Board Order. Records shall be maintained for a minimum of three years from the date of the sample, measurement, or report. This period may be extended during the course of any unresolved litigation regarding this discharge or when requested by the Regional Board's Executive Officer.

15. The discharger shall furnish, under penalty of perjury, technical monitoring program reports, and such reports shall be submitted in accordance with the specifications prepared by the Regional Board's Executive Officer. Such specifications are subject to periodic revisions as may be warranted.

16. The discharger may be required to submit technical reports as directed by the Regional Board's Executive Officer.

17. The discharger shall develop and implement a Storm Water Pollution Prevention Plan for this facility. The plan must be submitted to the Regional Board's Executive Officer for review and approval no later than 90 days after adoption of this Board Order.

18. The discharger shall submit a Notice of Intent (NOI) to the State Water Resources Control Board to be covered under the Statewide General NPDES Permit for Storm Water Discharges Associated with Industrial Activities, Order No. 91-13-DWQ (as amended by Order No.92-12-DWQ), NPDES No. CAS000001. The discharger shall comply with all the discharge prohibitions, receiving water limitations, and provisions of the General Permit, including the development and implementation of a Storm Water Pollution Prevention Plan. The Storm Water Pollution Prevention Plan shall be submitted to the Regional Board's Executive Officer for review and approval no later than 90 days after the adoption of this Board Order.

19. The discharger shall submit a sampling and monitoring plan for storm water discharges to the Regional Board's Executive Officer for review and approval no later than 90 days after the adoption of this Board Order. The plan shall meet the minimum requirements of Section B, Monitoring Program and Reporting Requirements of the Statewide General NPDES Permit for Storm Water Discharges Associated with Industrial Activities, Order No. 91-13-DWQ (as amended by Order No. 92-12-DWQ), NPDES No. CAS000001.

20. Storm water discharges from the facility shall not cause or threaten to cause pollution, contamination, or nuisance.

21. Storm water discharges from the facility shall not contain hazardous substances equal to or in excess of a reportable quantity listed in 40 CFR Part 117 and/or 40 CFR Part 302.

22. There shall be no discharge of process wastewater at any location without prior approval from the Regional Board's Executive Officer.

23. The discharger shall maintain a ground water monitoring well network and a vadose zone monitoring system as approved by the Regional Board's Executive Officer.

24. At least 60 days[1] prior to commencement of construction of each component of the facility, the discharger shall submit a technical report to the Regional Board for approval by the Regional Board's Executive Officer, which shall include a plan showing in detail the proposed construction of that component.

25. At least 10 days prior to commencement of operations, the discharger shall submit a certificate to the Regional Board, signed by a California Registered Civil Engineer or Certified Engineering Geologist, stating that the pads, containment basins, leakage detection system, flood protection and attendant facilities, and disposal areas are constructed in accordance with the technical report as approved by the Regional Board's Executive Officer to meet the requirements of this Board Order.

26. At least 10 days prior to loading ore onto the pads, the discharger shall notify the Regional Board to allow sufficient time to schedule a staff evaluation of construction and inspection procedures utilized by the discharger for liner installation.

27. The discharger shall submit to the Regional Board, at least 30 days prior to commencement of the herein stated expanded operations, written adequate assurance as determined by the Regional Board's Executive Officer that money is committed in an amount sufficient to insure neutralization of all cyanide, plus cleanup and closure of the processing and tailings disposal site upon abandonment of facilities, in a manner that will not adversely affect water quality.

28. Lack of construction or operational activity on the site for a period of one year shall constitute abandonment for the purpose of this Board Order.

29. The discharger shall maintain devices installed in the ore piles which permit measurement of solution depth (the hydraulic head) over the liner beneath that ore pile.

30. The procedure for preparing samples for the analyses for free cyanide and extractable metals in the detoxified tailings shall be consistent with the Monitoring and Reporting Program No. 95-016, and Attachments A and B to said Monitoring and Reporting Program. The Monitoring Reports shall be certified to be true and correct, and signed, under penalty of perjury, by an authorized official of the Company.

31. Back-up emergency generators shall be provided to assure that process solution storage ponds never overflow.

32. Upon request from the Regional Board's Executive Officer, the discharger shall furnish special technical and/or monitoring reports on the treatment and discharge of wastes and on the integrity of the cyanide solution containment system.

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[1] 60 days unless a lesser period is approved by the Regional Board's Executive Officer in writing.

33. As required by Title 23 of the California Code of Regulations, Section 2550.0(b), a bond in the amount of $250,000, in addition to the already posted closure bond of $300,000, shall be submitted to this Regional Board office within 60 days of the adoption of this Board Order.

I, Philip A. Gruenberg, Executive Officer, do hereby certify the foregoing is a full, true and correct copy of an Order adopted by the California Regional Water Quality Control Board, Colorado River Basin Region, on March 29, 1995.

Executive Officer

**CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD**
**COLORADO RIVER BASIN REGION**

MONITORING AND REPORTING PROGRAM NO. 95-016 (Revision No. 1)
FOR
SANTA FE PACIFIC GOLD CORPORATION (OWNER/OPERATOR)
NKA NEWMONT GOLD COMPANY
MESQUITE MINE
Northeast of Glamis - Imperial County

Location of Discharge: Sections 8, 9, 16, 17, and 20, T13S R19E, SBB&M

## I. MONITORING GENERAL

A. The reporting responsibilities of the discharger are specified in the California Water Code. This self-monitoring program is issued in accordance with Provision No. 1 of Regional Board Order No. 95-016. The principal purpose of this self-monitoring program is:

1. To document compliance with the Waste Discharge Requirements established by the Regional Board.

2. To facilitate self-policing by the discharger in the prevention and abatement of pollution arising from the discharge.

3. To conduct water quality analyses.

4. To sample and analyze vadose zone gas.

B. All sampling methods, not specified below or in the Monitoring and Response Plan, shall be conducted in accordance with U.S. Environmental Protection Agency approved procedures. Analyses shall be conducted by a laboratory certified by the California Department of Health Services to perform the required analyses, unless a field analysis is specified.

## II. MONITORING REPORTS AND OBSERVATION SCHEDULE

"Reporting Period" means the duration separating the submittal of a given type of monitoring report from the time the next iteration of that report is scheduled for submittal. The reporting period for the monitoring program is semi-annual. An annual report, which is a summary of all the monitoring during the previous year, shall also be submitted to the Regional Board. The submittal dates for each reporting period shall be as follows:

A. **Semi-annual Monitoring Reports**

1. First Semi Annual (January 1 through June 30) - report due by July 31
2. Second Semi-Annual (July 1 through December 31) - report due by February 15

**B. Annual Summary Report**

1. January 1 through December 31 - report due by April 15 of the following year.

## III. REPORTS TO BE FILED WITH THE BOARD

A written Detection Monitoring Report shall be submitted twice annually, in addition to an Annual Summary Report. The reports shall be submitted by the above specified dates. The following information/data should be included at a minimum in each report:

### A. SEMI - ANNUAL MONITORING REPORT REQUIREMENTS:

1. General

The following general information shall be included:

a. The current status of the mining operation; whether the operation is active or inactive.

b. An estimate of the total amount of ore (tons) processed per month.

c. The general condition of the heap leach pads, berms, surface impoundments and any exposed liner material.

d. For heaps designed with the capability for head measurement, the height of the head on the heap leach pad liner recorded monthly.

e. Letter of Transmittal. A letter transmitting the essential points shall accompany each report. Such a letter shall include a discussion of any requirement violations found since the last report was submitted, and shall describe actions taken or planned for correcting those violations. If the discharger has previously submitted a detailed time schedule for correcting the violations, a reference to the correspondence transmitting the schedule will be satisfactory. If no violations have occurred since the last submittal, this shall be stated in the letter of transmittal. Monitoring reports and the letter transmitting the monitoring reports shall be signed by a principal executive officer, at the level of vice-president or above, or by his/her duly authorized representative, if such representative is responsible for the overall operation of the facility from which the discharge originates. The letter shall contain a statement by the official, under penalty of perjury, that to the best of the signer's knowledge the report is true, complete, and correct;

2. Leachate Collection and Removal System (LCRS)

The LCRS for each containment basin (surface impoundment) consists of a drain net located between two synthetic liners. The LCRS is used to assist in determining that a leak may exist in the primary synthetic liner (accumulation of liquid in the LCRS may not directly indicate a leak). The following are the monitoring and reporting requirements of the LCRS:

a. Each LCRS sump shall be monitored weekly and any liquid found shall be removed and either discharged through the process solution or stored in above ground storage tanks or containment basins. The liquid shall be analyzed for free cyanide and total cyanide once per year.

b. The total volume of liquid removed weekly from the LCRS sumps during each semi-annual reporting period shall be presented in a table. If no liquid was present then a statement, "No liquid present" shall be reported in the report.

c. Should the presence of liquid or analysis of the liquid removed from the LCRS alert the discharger that a leak may be occurring from the primary liner, the discharger shall report by telephone to the Regional Board within 48 hours.

3. Vadose Monitoring Wells

The vadose zone monitoring system consists of vadose zone gas monitoring wells drilled 50 to 100 feet below grade. The wells have approximately 10 to 50 foot long screened section that can draw gas from the formation surrounding the casing. The gas evacuated from the well is passed through a cyanide gas indicator. Additionally, several wells are capable of holding/ponding liquid (bailers) at the bottom of the well casing and these wells can be checked for liquid. The following are the monitoring and reporting requirements for the vadose zone gas and bailers monitoring system for each semi-annual monitoring report:

a. Sample and analyze the vadose zone gas monitoring wells for cyanide gas, and if liquid solution is found in the bailer wells, the liquid, in addition, shall be sampled and analyzed for total cyanide and free cyanide according to the following :

i. Once per quarter the following downgradient vadose zone gas and bailer monitoring wells: V2, V3, V4, V6D, V6A, V10, V11A, V14A, V14B, V14C, V15A, V15B, V15C, V16, V17, and V21.

ii. Once per year the following upgradient vadose zone gas and bailer monitoring wells: V7, V8, V9, V12A, V12B, V12C, V18, V19, V20, V22, V23, and V24.

If no cyanide gas or total cyanide and free cyanide is detected from any monitoring point then a statement of "No cyanide gas, or total cyanide and free cyanide detected for the quarter or annual" shall be stated in the semi-annual monitoring report. The vadose gas and bailers monitoring wells shall be referenced accordingly to Attachment B.

b. Maintain a log of when the vadose zone monitoring wells are sampled, record when the sample was taken, by whom, and results. The log shall be maintained on site and shall be available for inspection.

c. Any indication of cyanide gas in the vadose zone shall be reported by telephone to the Regional Board within 48 hours and shall be followed up with written documentation within seven (7) days.

d. The vadose zone monitoring wells capable of holding liquid will be monitored for liquid either quarterly or annual according to the location listed in (Vadose Monitoring) (III.)(A.)(3.)(a.)(i.) and (III.)(A.)(3.)(a.)(ii.) above, and any liquid present shall be analyzed for free cyanide and total cyanide. The semi-annual monitoring report shall include: the volume of liquid found; the vadose zone monitoring well(s) location(s) with liquid; and the results of any analyses. If no liquid is present then the statement "No liquid present in vadose zone monitoring wells" for each well shall be stated in the semi-annual report.

4. Ground Water Monitoring:

The ground water monitoring system consists of a number ground water monitoring wells. The ground water monitoring sampling assists in determining whether the ground water has been impacted by the mining operation. The monitoring frequency is quarterly and the reporting frequency semi - annual. The following are the monitoring and reporting requirements:

a. For each monitored ground water body, a description and graphical presentation of the velocity and direction of the ground water flow under/around the mine, based upon water level elevations taken during the collection of the water quality data submitted in the report (attachment );

b. Pre-sampling Purge for Samples Obtained From Wells: For each monitoring well addressed by the report, a description of the method and time of water level measurement, of the type of pump used for purging and the placement of the pump in the well, and of the method of purging (the pumping rate, the equipment and methods used to monitor field pH, temperature, and conductivity during purging, the calibration of the field equipment, results of the pH, temperature, conductivity, and turbidity testing, the well recovery time, and the method of disposing of the purge water);

c. Sampling: For each monitoring point addressed by the report, a description of the type of pump - or other device - used and its placement for sampling, and detailed description of the sampling procedure (number and description of the samples, field blanks, travel blanks, and duplicate samples taken, the type of containers and preservatives used, the date and times of sampling, the names and qualifications of the person actually taking the samples, and any other observations)

d. Ground water samples shall be collected once per quarter from GW1, GW2, GW3, GW4, GW5, GW6, and GW7 (as indicated on Attachment B) ground water monitoring wells and shall be analyzed for the following constituents, total dissolved solids, temperature, total cyanide, free cyanide, pH, sulfate, arsenic, gold, silver, copper, iron and nitrate.

**B. ANNUAL SUMMARY REPORT REQUIREMENTS:**

The discharger shall submit an annual report to the Regional Board covering the previous monitoring year. The reporting period ends December 31 of each year. This report shall contain:

1. A Graphical Presentation of Analytical Data. For each Monitoring Point submit in graphical format the laboratory analytical data for all samples taken within at least the previous five calendar years. Each graphic shall plot the concentration of one or more constituents over time for a given Monitoring Point at a scale appropriate to show trends or variations in water quality. The graphs shall plot each datum, rather than plotting mean values. For any given constituent or parameter, the scale shall be the same. On the basis of any aberrations noted in the plotted data, the Regional Board's Executive Officer may direct the discharger to carry out a preliminary investigation, the results of which will determine whether or not a release is indicated;

2. All monitoring analytical data obtained during the previous two six-month Reporting Periods should be presented in tabular form.

3. A comprehensive discussion of compliance record, and the result of any corrective actions taken or planned which may be needed to bring the discharge into full compliance with the waste discharge requirements;

4. A map showing the area, if any, in which back filling has been completed during the previous calendar year;

5. A written summary of ground water and vadose zone (gas and liquid if any) analyses, indicating any changes made since the previous annual report; and

6. An evaluation of the effectiveness of the leachate monitoring/control facilities.

**IV. CONTINGENCY REPORTING**

A. The discharger shall report by telephone concerning any accidental seepage, spillage, leakage, or release of waste material from the designated area within 48 hours after it is discovered. A written report shall be filled with the Regional Board within seven (7) days, containing at least the following information:

1. A map showing the location(s) of the discharge;
2. An estimate of the flow rate;
3. A description of the nature of the discharge (e.g., all pertinent observation and analyses); and
4. Corrective measures underway or proposed.

B. Should a release be tentatively identified, the discharger shall notify within 48 hours the Regional Board verbally as to the monitoring point(s) and constituents or parameter(s) involved, shall provide written notification within seven days of such determination, and shall carry out a discrete retest. If the retest confirms the existence of a release, the

discharger shall carry out the requirements of C.d. below. In any case, the discharger shall inform the Regional Board of the outcome of the retest as soon as the results are available, following up with written results submitted by certified mail within seven days of completing the retest.

C. If either the discharger or the Regional Board determines that there is significant physical evidence of a release, the discharger shall immediately notify the Regional Board of this fact (or acknowledge the Regional Board's determination) and shall carry out the requirements of C.d. below for all potentially-affected monitored media.

D. If the discharger concludes that a release has been discovered:

1. If this conclusion is not based upon "direct monitoring" of the of the Constituent of Concern, then the discharger shall, within thirty days, sample for all Constituents of Concern at all Monitoring Points and submit them for laboratory analysis. Within seven days of receiving the laboratory analytical results, the discharger shall notify the Regional Board of the concentration of all Constituents of Concern at each Monitoring Point. Because this scan is not to be tested against background, only a single datum is required for each Constituent of Concern at each Monitoring Point

2. The discharger shall, within 90 days of discovering the release, submit a Revised Report of Waste Discharge proposing an Evaluation Monitoring Program.

3. The discharger shall, within 180 days of discovering the release, submit a preliminary engineering feasibility study for remediation.

E. Any time the discharger concludes - or the Regional Board Executive Officer concludes - that a liquid - or gaseous - phase release from the Unit has proceeded beyond the facility boundary, the discharger shall so notify all persons who either own or reside upon the land that directly overlies any part of the plume (Affected Persons).

1. Initial notification to affected persons shall be accomplished within seven days of making this conclusion and shall include a description of the discharger's current knowledge of the natural extend of the release; and

2. Subsequent to initial notification, the discharger shall provide updates to all Affected Persons - including any newly Affected Persons - within seven days of concluding there has been any material change in the nature or extent of the release.

## V. RECORD TO BE MAINTAINED

Written reports shall be maintained by the discharger or laboratory, and shall be retained for a minimum of five years. This period of retention shall be extended during the course of any unresolved litigation regarding this discharge or when requested by the Regional Board. Such records shall show the following for each sample:

A. Identity of sample and of the Monitoring point from which it was taken, along with the identity of the individual who obtained the sample;

B. Date and time of sampling;

C. Date and time that analyses were started and completed, and the name of the personnel performing each analysis;

D. Complete procedure used, including method of preserving the sample, and the identity and volumes of reagent used;

E. Calculation of the results; and

F. Result of analyses, and the Maximum Detection Limit (MDL) for each analysis

## VI. SUMMARY OF SELF MONITORING AND REPORTING PROGRAMS

(III.)(A.)(1.) **General**

| | Parameters | Type Unit | Frequency | Reporting Frequency |
|---|---|---|---|---|
| a. | Status of the mining operation | ------ | ------- | Semi-annual |
| b. | Total amount of ore processed | tons | monthly | Semi- annual |
| c. | Condition of the heap leach, pad, berms, surface impoundments, and any exposed liner material | ----- | ------- | Semi-annual |
| d. | The height of the hydraulic head on heap liner | cm or in | monthly | Semi-annual |
| e. | Letter of transmittal | -------- | ------- | Semi-annual |

(III.)(A.)(2.) **Leaching Collection and Removal System (LCRS)**

| | Parameters/ Constituents | Type Unit | Frequency | Reporting Frequency |
|---|---|---|---|---|
| a. | Monitoring frequency of LCRS sump | ------ | weekly | Semi-annual |
| | (1). Free cyanide | mg/L | Annually | Annually |
| | (2). Total Cyanide | mg/L | Annually | Annually |
| b. | Liquid removed from LCRS sump | Gal. | Weekly | Semi-annual |
| c. | Significant change in the volume of liquid or analysis of cyanide concentration in liquid from LCRS sump | ------ | If change noted | Within 48 hr. |

(III.)(A.)(3.) **Vadose monitoring Wells**

| | Parameters/ Constituents | Type Unit | Sampling Frequency | Reporting Frequency |
|---|---|---|---|---|
| a. | Downgradient vadose zone gas and bailer monitoring wells V2, V3, V4, V6D, V6A, V10, V11A, V14A, V14B, V14C, V15A, V15B, V15C, V16, V17, and V21 | ------ | Quarterly | Semi-annual |
| | Parameters/ Constituents | Type Unit | Sampling Frequency | Reporting Frequency |
| | (1) Cyanide gas | ppm | Quarterly | Semi-annual |
| | If liquid is found in the above bailer monitoring wells: | | | |
| | (1). Free cyanide | mg/L | Quarterly | Semi-annual |
| | (2). Total cyanide | mg/L | Quarterly | Semi-annual |
| | Upgradient vadose zone gas and bailers monitoring well s V7, V8, V9, V12A, V12B, V12C, V18, V19, V20, V22, V23, and V24 | ------ | Annually | Annually |
| | (1). Cyanide gas | ppm | Annually | Annually |
| | If liquid is found in the above bailer monitoring wells: | | | |
| | (1). Free cyanide | mg/L | Annually | Annually |
| | (2). Total cyanide | mg/L | Annually | Annually |
| b. | Log of sampling activities | ------ | ------ | Upon request |
| c. | Indication of any cyanide gas | ppm | ------ | If present, within 48 hr. |
| d. | If any liquid is found in bailer monitoring well, please report: | | | |
| | (1). Volume of liquid removed from bailer | Gal. | Quarterly | Semi-annual |
| | (2). Number of wells and location(s) | ----- | Quarterly | Semi-annual |

| | | | | | |
|---|---|---|---|---|---|
| (III.)(A.)(IV.) | **Ground Water Monitoring** | | | | |
| | a. | Description and graphical presentation of velocity and direction of ground water | ----- | Quarterly | Semi-annual |
| | b. | Description of pre-sampling purge for samples obtained from wells | ----- | Quarterly | Semi-annual |
| | c. | Description of sampling procedure | ----- | Quarterly | Semi-annual |
| | d. | Ground water samples of wells GW1, GW2, GW3, GW4, GW5, GW6, and GW7 | ----- | Quarterly | Semi- annual |
| | | (1). Total dissolved solids | mg/L | Quarterly | Semi-annual |
| | | (2). Temperature | °F | Quarterly | Semi-annual |
| | | (3). Total cyanide | mg/L | Quarterly | Semi-annual |
| | | (4). Free cyanide | mg/L | Quarterly | Semi-annual |
| | | (5). pH | # | Quarterly | semi-annual |
| | | (6). Sulfate | mg/L | Quarterly | Semi-annual |
| | | (7). Arsenic | mg/L | Quarterly | Semi-annual |
| | | (8). Gold | mg/L | Quarterly | Semi-annual |
| | | (9). Silver | mg/L | Quarterly | Semi-annual |
| | | (10). Copper | mg/L | Quarterly | Semi-annual |
| | | (11). Iron | mg/L | Quarterly | Semi-annual |
| | | (12). Nitrate | mg/L | Quarterly | Semi-annual |
| (III.)(B.). | **Annual Summary Report** | | ------ | ---------- | Annually |
| (IV.). | **Contingency Reporting** | | ------ | ---------- | Within 48 hr. |

## REPORTING

1. The discharger shall arrange the data in tabular form so that the specified information is readily discernible. The data shall be summarized in such a manner as to clearly illustrate whether the facility is operating in compliance with waste discharge requirements.

2. Record of monitoring information shall include:

   a. The date, exact place, and time of sampling or measurement(s);
   b. The individual(s) who performed the sampling or measurement(s)
   c. The date(s) analyses were performed;
   d. The individual(s) who performed the analyses;
   e. The analytical techniques or method used; and
   f. The result of such analyses.

3. Each report shall contain the following statement:

"I declare under the penalty of law that I have personally examined and am familiar with the information submitted in this document, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

4. A duly authorized representative of the discharger may sign the documents if:

   a. The authorization is made in writing by the person described above;

   b. The authorization specified an individual or person having responsibility for the overall operation of the regulated disposal system; and

   c. The written authorization is submitted to the Regional Board's Executive Officer.

5. Monitoring reports shall be certified under penalty of perjury to be true and correct, and shall contain the required information at the frequency designated in this monitoring report.

6. Semi - annual monitoring report shall be submitted to the Regional Board in accordance with the following schedule:

   First Semi-annual (January 1 through June 30) - due July 31
   Second Semi-annual (July 1 through December 31) - due February 15

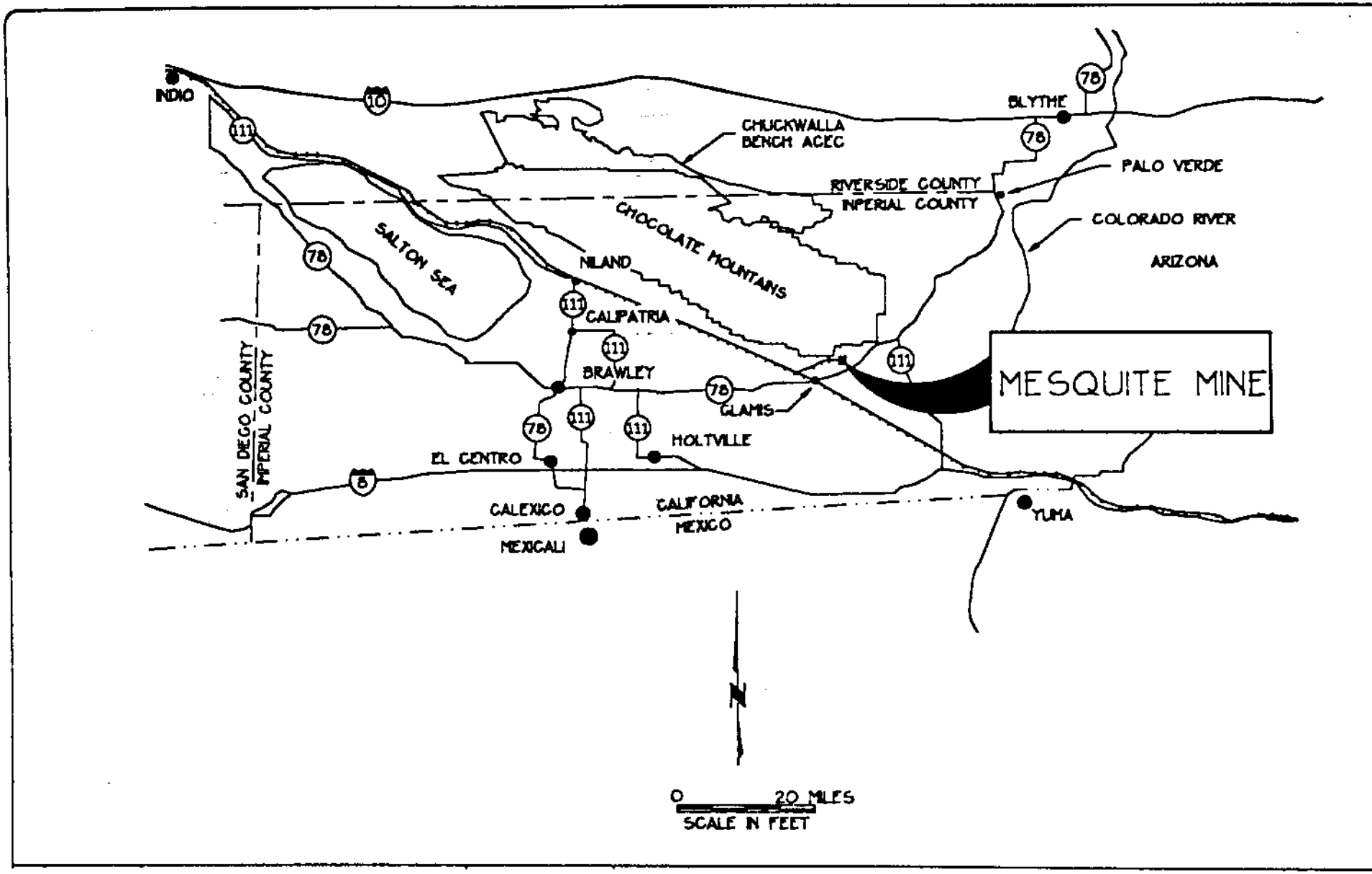
7. Annual summary report shall be submitted to the Regional Board by April 15 of each year.

8. Submit Monitoring Reports to:

   California Regional Water Quality Control Board
   Colorado River Basin Region
   730720 Fred Waring Drive, Suite 100
   Palm Desert, CA 92260

Ordered by : Gary F. Harris
for Executive Officer

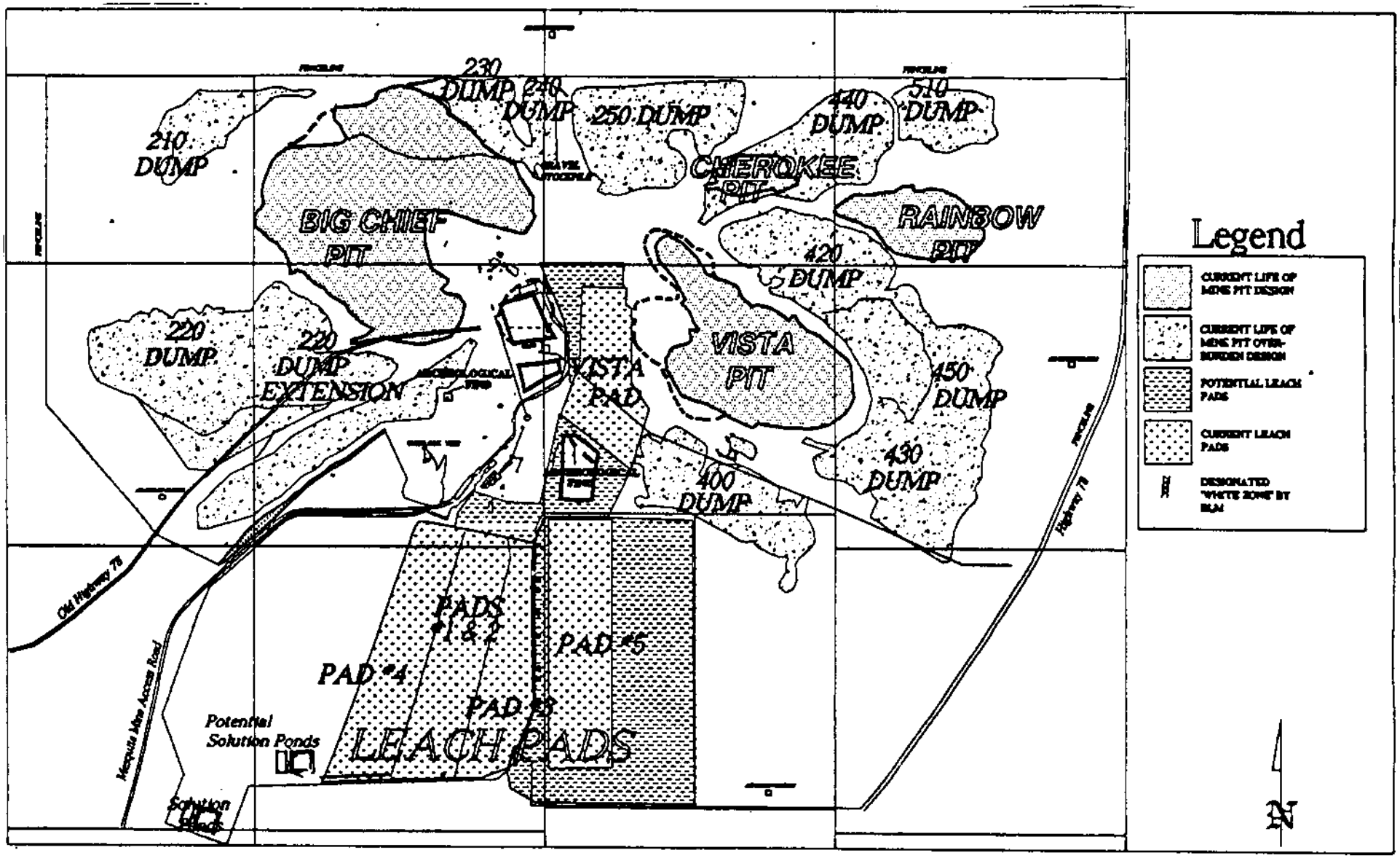
1/7/99
Date




**LOCATION MAP**

SANTA FE PACIFIC GOLD CORPORATION, OWNER/OPERATOR
MESQUITE MINE
Northeast of Glamis - Imperial County

Board Order No. 95-016




**SITE AND GROUND WATER CONTOURS MAP**

SANTA FE PACIFIC GOLD CORPORATION, OWNER/OPERATOR
MESQUITE MINE
Northeast of Glamis - Imperial County

SCALE
Equals 1 Mile

Board Order No. 95-016

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
COLORADO RIVER BASIN REGION

ATTACHMENT A

ANALYTICAL PROCEDURE
FOR
IONIC CYANIDE
Also Known As Free Soluble Cyanide

Description: Ionic cyanide and most weak complexes are soluble in distilled water. The strong complexes of ions, although normally soluble are bound too tightly to the particle surface and are not solubilized. The sample is leached with distilled water in a single pass, flow-through manner. The leachate is collected, alkalized for preservation, and made up to a definite volume. This leachate sample is then analyzed via "Standard Methods" 412 C or E. Method 412 D may not be used.

Apparatus:

1. Large glass funnel, the stem throat plugged with glass wool;
2. Large glass funnel with glass fiber filter paper: Whatman GF/C, 934-AH, or equivalent.
3. Balance capable of weighing to nearest 0.01 g.
4. 500 ml volumetric flasks.
5. Items necessary to perform cyanide analysis as described in narrative above.

Reagents:

1. 2.5 N NaOH (100 g NaOH/1)
2. Reagents necessary to perform cyanide analysis as described in narrative above.

Procedure:

Weigh out, to nearest 0.01 g, 100 ± 1 g of samples as received. Place in glass funnel, either glass wool plugged or with filter paper. Add 50.00 ml of 2.5 N NaOH to 500 ml volumetric flask and place it so as to catch the filtrate from the funnel. Pour 50 ml of distilled (or deionized) water onto the solid sample and allow to percolate through. When liquid level is even with the top of the solids, add an additional 50 ml of water. Repeat the addition of water until a total of 400 ml $H_2O$ has been used. Make up volume in volumetric flask to mark with distilled water. This constitutes the sample ready for analysis.

The titrametric (412C) and the ion selective probe (412E) require no further preparation. The sample is then read directly by either titrametric (412C) or the ion selective probe (412E) and the results indicating the amount of ionic cyanide reported in mg/L.

# APPENDIX 1

SANTA FE PACIFIC GOLD CORPORATION - MESQUITE

WATER QUALITY MONITORING
AND
RESPONSE PLAN

## 2.0 REQUIRED MONITORING PROGRAM

Section 2550.1 of Article 5 requires that regulated ore processing facilities institute:

- A detection monitoring program to permit the detection of a release from the waste management unit;
- An evaluation program including monitoring to allow for evaluation of the nature and extent of a release from the waste management unit, based on physical evidence of a release or statistically significant evidence through a monitoring program;
- A corrective action program to remediate releases from a waste management unit.

On the basis of monthly monitoring activities completed to date, as reported to the Regional Water Quality Control Board, Colorado River Basin Region, no monitoring results have been observed in the vadose zone or in groundwater that would confirm a release from the process units and no significant change in water quality is evident over the period of monitoring. Monitoring at the Mesquite Mine processing facilities will, therefore, will continue as a detection monitoring program.

## 3.0 PROPOSED CONSTITUENTS OF CONCERN

The constituents of concern for vadose-zone and groundwater monitoring are described in this section. Periodic analyses of the process water, the cyanide leach solution and monitoring of groundwater and the vadose zone beneath the leach pads and solution ponds at the Mesquite Mine provide the data base for elucidating water chemistry and the constituents of concern.

Raw water pumped from the well field (the GF wells) in the Amos-Ogilby alluvial basin south of the mine site is of poor quality with large concentrations of total dissolved solids (TDS). Major cation and anion data plotted on a Piper trilinear diagram shown in Figure 7 indicate that the groundwater is of sodium-chloride type. TDS ranges to more than 1200 mg/l and overall water quality is such that it is unsuitable for drinking and most agricultural purposes. The available water quality data for the wells including some trace constituents are presented in Appendix A.

Groundwater sampled from the monitor wells at Mesquite also is unsuitable for drinking purposes with TDS concentrations ranging to more than 2,100 mg/l. Major cation and anion data plotted on a Piper trilinear diagram shown in Figure 8 indicate that the groundwater ranges from sodium-chloride type to an intermediate type with approximately equal proportions of sulfate and bicarbonate. There is no correlation between apparent water type and rock type screened in the monitor wells.

The major cation and anion data for water sampled from seeps and dewatering wells in the Vista, Big Chief and Cherokee pits are also plotted on the trilinear diagram shown in Figure 8. The bedrock groundwater is sodium rich and contains proportionally more bicarbonate than water sampled from the monitor wells. The available water quality data for the monitor wells, the dewatering wells and seeps including trace elements are presented in Appendix A.

The results of periodic analyses of the leach solution are presented in Appendix A. Moderate to high amounts of dissolved sodium and calcium along with sulfate from the oxide ore are expected to be present in the leach solution. Concentrations of trace metals, most in the form of stable aqueous complexes, in the leach solution are remarkably low and are in accord with trace metal constituents in the oxide ore.

On the basis of the groundwater monitoring data and the major and trace metal constituents in the cyanide leach solution, the constituents of concern are divided into two categories; primary monitoring parameters and constituents of concern. The primary monitoring parameters are complexed and free cyanide and TDS. Also included as primary monitoring parameters are the field parameters pH and temperature. The additional constituents of concern are listed in Table 3 where selected major anions and the available trace metal data from the process water wells, the leachate solution and the groundwater monitor wells are compared.

Cyanide is present in the leach solution in a variety of different complexes. $CN^-$, aqueous cyanide, reacts readily to form more stable compounds and it forms volatile hydrogen cyanide (HCN) at pH below about 9 pH units. Aqueous cyanide also readily complexes with metals in the ore to form complexes ranging from the soluble sodium and calcium cyanide complexes to the more stable copper and iron complexes. The stronger complexes are very stable in natural aqueous environments.

The major cations sodium, calcium and magnesium are likely concentrated in the cyanide leach solution; however, the concentrations of any single major cation in the leach solution are not expected to be markedly different from concentrations expected in the monitor wells. For this reason, TDS, at an average concentration of about 1220 mg/l in the raw-water supply wells, is selected for detection monitoring rather than selecting a single major cation or several major cations in combination for monitoring.

Iron, copper, gold, silver and arsenic are selected as constituents of concern on the basis of comparison of their concentrations in leach solutions from oxide and non-oxide ore with their concentrations in groundwater from the monitor wells (Table 3). With the exception of monitor wells GW-1 and GW-6, iron in the leach solution from the non-oxide ore exceeds iron concentration in the monitor wells. Copper in leach solution from both the oxide ore and non-oxide ore and arsenic in leach solutions from the oxide ore exceed their respective concentrations in the water from the monitor wells. While the concentrations of gold and silver are not routinely monitored in groundwater, they are most concentrated in the leach solution and as such are constituents of concern. Gold and silver are expected to be sensitive indicators of the impact by leachate to the vadose zone or groundwater.

Other constituents of concern, although of secondary importance are sulfate and nitrate. Both of these constituents may be elevated in vadose zone or groundwater degraded by migration of the leach solution. Sulfate is likely elevated in solutions from leached oxide ore and nitrate is one of the final breakdown products of cyanide in the aqueous environment.

The field parameters, temperature and pH, are expected to be sensitive indicators of water quality change in the unlikely event of an unauthorized release of leaching solution. Temperature and pH have been stable over the duration of historical monitoring and changes can be detected readily in the field.

## 4.0 PROPOSED CONCENTRATION LIMITS

Section 2550.4 of Article 5 requires that concentration limits be established for each constituent of concern for each media to be monitored. Although for the Mesquite processing facilities the constituents of concern are applicable both to monitoring in the vadose zone and the saturated zone, as a practical matter only HCN gas is measured as a detection monitoring parameter in the vadose zone. Detection of cyanide gas in the vadose zone followed by confirmation of the constituents of concern present in adjacent soils is sufficient cause to initiate evaluation monitoring. There are no monitoring data for the infrequent surface-water flows.

Groundwater monitoring was initiated in 1985 when monitor wells GW-1, GW-2 and GW-3 were installed to monitor Leach Pads 1 through 3. Wells GW-4 through 6 were added to the network as new pads were constructed and brought into service. The water quality data collected over the period of monitoring indicate that the six monitor wells tap waters with significantly different characteristics. Background concentrations based on the available data for the constituents of concern, therefore, have been calculated and are presented for each well independently. Further support for intra-well comparison of background and monitoring data will be presented in Section 8.0.

A data base containing the relevant statistics for the detection monitoring parameters for each of the GW monitor wells is presented in Appendix B. The summary statistics for the detection monitoring parameters are presented in Table 4. Using these statistical data and the statistical methods described in Section 8.0, intrawell tolerance limits were calculated for the detection monitoring parameters TDS, pH, and temperature. Free cyanide and total cyanide have not been detected in the monitor wells, therefore, no statistical data are available.

## 5.0 MONITORING POINTS AND POINTS OF COMPLIANCE

Section 2550.5 of Article 5 specifies that the point of compliance is a vertical surface located at the hydraulically downgradient limit of the waste management unit that extends through the uppermost aquifer underlying the unit. The groundwater monitor wells are installed to sample groundwater downgradient from the leach pads and solution ponds. The vadose-zone monitor

well system is designed and sampled to detect HCN gas in soils beneath the lined facilities. For example, at pad 5 the vadose-zone monitoring wells are located at the southwest corner of the most southern of each sequential group of three cells. This is the point where the highest hydrostatic head could occur on the liner and the collection point for leachate percolating through the ore. Sumps are installed along the transfer ditches and as parts of LCRS at the solution ponds.

The monitoring points and points of compliance for vadose zone compliance monitoring are as follows:

- Vadose-zone well V-1A is a near vertical* well centrally located between pads 2 and 3;
- Vadose-zone well V-2 is a near vertical well located on the berm at the southwestern corner of pad 3;
- Vadose-zone well V-3A is a near vertical well located on the berm at the southwestern corner of pad 1;
- Vadose-zone well V-4 is a near vertical well located between pads 1 and 4 near the southwestern of pad 1;
- Vadose-zone well V-5 is a near vertical well centrally located between pads 1 and 4;
- Vadose-zone well V-6 is a near vertical well located south of the solution ponds;
- Vadose-zone well V-7 is a near vertical well located on the berm at the northwestern corner of pad 1;
- Vadose-zone well V-8 is a near vertical well located on the berm on the east side of pad 3;
- Vadose-zone well V-9 is a near vertical well centrally located on the eastern berm of pad 3;
- Vadose-zone well V-10 is a near vertical well located on the berm near the southeastern corner of pad 3;
- Vadose-zone wells V-11A,B,C are in a cluster angled beneath the southwestern corner of cell 11 on pad 4;

- Vadose-zone wells V-12A,B,C are in a cluster angled beneath the southwestern corner of cell 6 on pad 4;

- Vadose-zone wells V-14 A,B,C are in a cluster angled beneath the southeastern corner of the Vista pad;

- Vadose-zone wells V-15 A,B,C are in a cluster angled beneath the southwestern corner of the Vista pad;

- Vadose-zone well V-16 is an angle well beneath the southwestern corner of cell 2 on pad 5;

- Vadose-zone well V-17 is an angle well beneath the southwestern corner of cell 5 on pad 5;

- Vadose-zone well V-18 is an angle well beneath the southwestern corner of cell 8 on pad 5;

- Vadose-zone well V-19 is an angle well beneath the southwestern corner of cell 12 on pad 5; and

- Vadose-zone well V-20 is an angle well beneath the southwestern corner of cell 14 on pad 5.

  * 7 degrees from vertical

The monitoring points and points of compliance for groundwater compliance monitoring are as follows:

- Groundwater monitor well GW-1 monitors first groundwater immediately downgradient from the solution ponds;

- Groundwater monitor well GW-2 monitors first groundwater across gradient from pads 1 through 4;

- Groundwater monitor well GW-3 monitors first groundwater immediately downgradient from the southwest corner of pad 5;

- Groundwater monitor well GW-4 monitors first groundwater upgradient from the leach pads and solution ponds;

- Groundwater monitor well GW-5 monitors first groundwater immediately downgradient from the southern portions of pads 1 through 4; and

- Groundwater monitor well GW-6 monitors first groundwater immediately down gradient from the Vista pad.

## 6.0 MONITORING PROGRAM

The current Monitoring and Reporting Program No. 89-034 specifies analysis for free cyanide and total cyanide in groundwater from each monitor well and analysis for free cyanide and total cyanide in any liquid found in the vadose-zone monitoring system. In addition to monitoring for the cyanide constituents in groundwater, field monitoring parameters pH, temperature and specific conductance along with water levels for each monitor well are reported monthly. TDS is also reported monthly for groundwater. The following sections will describe the detection monitoring program proposed for the Mesquite facility. The detection monitoring program is summarized in Table 5.

### 6.1 Vadose Zone

HCN gas in soil gas is monitored on a monthly schedule at each of the vadose-zone gas monitor wells. HCN gas should be present if free cyanide is present in the unsaturated soil surrounding the well. The monitor wells are also inspected for the presence of liquid (leachate) and if found, the liquid is sampled and analyzed for the constituents of concern. The presence of HCN gas or leachate in the monitor well is sufficient to initiate evaluation monitoring.

The following is the procedure for follow-up to detection of HCN in the well clusters on pad 4 and the Vista pad.

- Monitoring for the presence of fluids in the C wells. At a minimum the wells will be monitored quarterly for liquid;

- Soils samples will be collected from the A and C wells

The vadose monitor wells (single wells, not cluster wells) installed on pad 5 will be sampled for the presence of leachate if HCN gas is detected during routine monitoring. Detection of HCN gas will be followed by collection of leachate and/or soil samples for analysis for the constituents of concern.

Leachate collection sumps and LCRS are inspected monthly for liquid. Leachate if present is sampled and analyzed for the primary constituents of concern.

## 6.2 Groundwater

Groundwater is monitored on a monthly schedule at the Mesquite facility. The parameters depth to water, pH, temperature and specific conductance are measured in the field. Monthly measurement of turbidity will be added to this suite of field parameters for each well. TDS, free cyanide and total cyanide, detection monitoring parameters, currently are measured in the laboratory. Sulfate, nitrate, Cu, Au, Ag, Fe and As will be added to the list of constituents to be measured in the six monitor wells on a quarterly schedule.

# 7.0 SAMPLING AND ANALYTICAL PROCEDURES

The sampling protocol for the vadose-zone wells, monitor wells and LCRS sumps are described in this section. The sampling protocols are current practice at the Mesquite Mine and are modified here to bring them into compliance with Article 5.

## 7.1 Vadose-zone Wells

The monitoring program for the vadose wells consists of routine sampling of air from inside the well and the surrounding geologic formation, with the air being tested for HCN gas. The monitoring is performed on a monthly schedule as follows:

# GAS MONITORING PROCEDURE FOR VADOSE WELLS 14ABC, 15ABC, AND PAD 5

EQUIPMENT:

| | | |
|---|---|---|
| Key #3595 | Vadose Well Chart | Duct Tape |
| Generator | Pen | Drinking Water |
| Gas Monitoring Box | Draeger Apparatus | Ear Plugs |

PROCEDURE:

1. Unlock well cap.
2. Set gas monitor box so that it is close enough for the clear hose to reach the well cap.
3. Remove gray plugs from outside right side of box.
4. Ensure all fittings and connections are secure.
5. Open all valves (start up, draeger, and pressure adjustment).
6. Start generator and test vacuum motor.
7. Prepare draeger apparatus.
8. Attach clear tubing to vadose well connection.
9. Start vacuum motor.
10. Slowly close the start up valve. Watch the pressure indicator, not allowing it to go above 15. (It should not move at all).
11. Slowly close the pressure adjustment valve. Again watch the pressure indicator. (Once again, it should not move).
12. Carefully adjust the Draeger sample valve, setting the pressure between 3 and 15.
13. Begin sampling immediately, hold tip of Draeger tube just inside the sample outlet. Sample every 5 minutes, for 15 minutes using 10 strokes on the Draeger billows pumps. Mark the times and results on the vadose well chart.
14. Turn vacuum pump and generator off. Remove the tubing from the vadose well. A sucking sound should be heard from the well, indicating a good run.
15. Replace the gray plugs.

*Important notes: Do not allow tubing to suck in dirt or debris. If pressure adjustment gage is forced above 15, it can be broken.

# VADOSE WELL MONITORING PROCEDURE
# WELLS 1-13

EQUIPMENT:

Bailer
Well Lock Key #3595
Rope Reel
Vadose Well Location Map
Vadose Well Field Sheet

PROCEDURE:

1. Unlock the vadose well cover.

2. Lower the bailer into the PVC well pipe until it comes to a complete stop.

3. Gently reel the bailer to the surface.

4. Note the presence of any solution in the sump or moisture on the surface of the bailer.

5. Lock well cover.

6. If solution is observed in any of the wells, report immediately.

## 7.2 Groundwater Monitor Wells

The groundwater monitor wells are fitted with electric submersible pumps for purging and sampling. Water levels in the wells are measured to the nearest 0.01 foot with an electric water level indicator before purging and sampling. Each well is purged of at least 3 casing volumes of water prior to and following sampling. Measurement of water turbidity in the field will be added to the sampling protocol. The monitoring is performed on a monthly schedule as follows:

### GROUND WATER SAMPLING

EQUIPMENT:

| | | |
|---|---|---|
| Generator | 240 V Breaker Box | Tape Measure |
| 5-6 1000 ml bottles | Thermometer | Pen/Pencil |
| Key #'s 2337 & 3975 | Well Sounder | Field Sheet |
| Conductivity Meter | Plastic Beaker | pH meter |
| PVC L-Shaped Pipe | pH 7.0 Standard Solution | |

PROCEDURE:

1. Unlock ground water (GW) well.
2. Lower Well Sounder cord into 1" PVC pipe.
3. Note depth of GW on field sheet.
4. Remove well sounder cord.
   (Steps #5 and #6 apply to all GW wells except well #6.)
5. Connect extension cord from well to the 240 V breaker box.
6. Connect breaker box to the generator.
   (For GW well #6, connect extension cord from well directly to the generator.)
7. Push lever to "off" position on the breaker box.
8. Start generator.
9. Push lever to "on" position on the breaker box.
10. As the color of the water begins to clear up, fill beaker.
11. Place conductivity probe and thermometer in beaker.
12. When constant conductivity and temperature readings are achieved, record them on the field sheet.
13. Calibrate pH meter with the pH 7.0 Standard Solution.
14. Obtain and record a pH reading of the water.
15. Obtain a water sample by placing on-half of a 1000 ml bottle opening in the water stream until the bottle is full.
16. Cap and level the bottles (Date and well number).
17. Shut off breaker box and generator.
18. Dismantle arrangement.
19. Lock GW well cap.

Note: The water flows for GW wells #2 and #5 are unpredictable and usually do not last for more than a few minutes. Therefore, steps 12-16 should be done quickly.

After sampling is completed, the monitoring wells MBH1 (key #X2524) and MBH2 (key #A611) should be sounded to for depth.

POST COLLECTION PROCEDURES:

1. Preserve each sample by adding 1 ml of 10M NaOH per 500 ml of solution.
2. Place samples in refrigerator.

# GROUND WATER (GW) DISTILLATION FOR CYANIDE

EQUIPMENT:

- Distillation Apparatus
- 50% Sulfuric Acid Solution ($H_2SO_4$)
- 50 ml graduated cylinder
- 500 ml graduated cylinder
- 250 ml flask
- Magnesium Chloride ($MgCl_2$)
- 1.0 N NaOH

PROCEDURE:

1. Clean all glass parts.
2. Add 50 ml 1.0 N NaOH to part #1. (Refer to the diagram)
3. Add 500 ml of the GW sample to part #2.
4. Add 20 ml $MgCl_2$ to part #2.
5. Add 50 ml $H_2SO_4$ to part #2.
6. Turn on vacuum.
7. Adjust vacuum clamps on each set to 2 bubbles per second in part #2 (Do not allow the foam in part #1 to reach the vacuum connection).
8. Put ice in bucket. Add water to the bucket.
9. Begin in cold water circulation with the hose submersed in the ice water.
10. Turn on the thermostat to setting 59.
11. Run for 60 minutes. Monitor the foam level in part #1, making sure the foam does not reach the vacuum connection.
12. After 60 minutes has expired, turn off the thermostat.
13. Continue monitoring the foam level in part #1 for 30 minutes. This allows the solution and the apparatus to cool.
14. After 30 minutes, turn off the vacuum and circulation pump.
15. Remove the solution from part #1 and put it in a 250 ml flask. Fill to the 250 ml line with Distilled water.
16. Read and record the concentration of cyanide in the sample using an ion electrode with a capability range between 0.01 and 10 ppms.

7.3 Ditch and LCRS Sumps

Ditch and LCRS sumps are inspected for liquid and a sample collected if liquid is present. The monitoring is performed on a monthly schedule as follows:

SUMP PROCEDURE

EQUIPMENT:

GEO Pump
Field Sheet
8-10 1000 ml bottles (clean)
4000 ml Graduated Cylinder
25' Extension Core Bailer
Portable Generator
Labels

PROCEDURE:

1. Start the generator.
2. Unscrew 4" cap from PVC pipe extending from each sump.
3. Lower the bailer until it reaches the bottom of the sump.
4. Allow a few moments for the solution to reach equilibrium.
5. Gently pull the bailer from the sump.
6. Observe and note the level of the solution in the bailer.
7. Discharge the contents of the bailer into a 4000 ml beaker.
8. Attach one end of the master flex tubing on the GEO pump to the tubing located in the sump.
9. Connect the GEO pump to the generator via the extension cord.
10. Start the GEO pump and collect solution in a 4000 ml cylinder. Make sure not to fill above the 4000 ml mark. Note on the field sheet the amount of solution evacuated from the sump.
11. Dismantle the arrangement and cap the sump.
12. Fill a 1000 ml bottle with the solution from the 4000 ml cylinder and discard excess solution into the ditch.

POST COLLECTION:

1. Calibrate pH meter according to standard procedures.
2. Read and note the pH on each sample.
3. Preserve each sample by adding 1 ml of 10M NaOH per 500 ml of solution.
4. Place in the refrigerator.

## 8.0 STATISTICAL PROCEDURES

The statistical methods for analysis of the detection monitoring data for each well are presented in this section. Analysis of the background monitoring data is presented in Section 8.1, the statistical methods selected to verify releases is presented in Section 8.2 and the verification or retest procedure is presented in Section 8.3 Time-concentration plots of the raw detection monitoring data for each monitor well are presented in Appendix C. No data are available for the constituents of concern in the vadose zone or in surface water.

### 8.1 Background Concentrations

Subsection (e)(10) of Section 2550.7 of Article 5 requires that the discharger propose and justify a method for determining and updating background values for each constituent of concern and for each detection monitoring parameter. Basic statistics including mean, standard deviation and coefficient of variation (CV) were calculated from the historical groundwater monitoring data for each detection monitoring parameter. These data and the plots of raw monitoring data were reviewed for each well to determine background concentrations. In all cases CVs for the data indicated normal distributions and trends for the raw data were essentially flat. The resulting background data are presented in Table 6.

Background data will be reviewed and updated annually. Monitoring data for the constituents of concern exclusive of the monitoring parameters will be plotted on time-concentration graphs on a monthly basis and basic statistics will be calculated after eight months of data are accumulated.

### 8.2 Statistical Analysis of Data to Verify Releases

Article 5 offers analysis of variance (ANOVA) as the preferred method of statistical analysis of groundwater monitoring data when the monitoring is based on comparison of upgradient and downgradient water quality data. ANOVA procedures compare the means of different groups of observations to determine whether there are significant differences among the groups. For example, in a simple hydrologic system one might expect that groundwater samples from upgradient and downgradient wells would be very similar chemically; that samples from each well would be a population drawn from the same parent population.

The TDS data from groundwater monitor wells at Mesquite were investigated using a technique for one-way ANOVA. The hypothesis tested was that the means are equal and the alternate hypothesis was that they are not. The resulting ANOVA table along with the calculated F statistic are presented in Table 6. The F statistic calculated from the data exceeds the expected F value at the 1 % significance level. The hypothesis of equal means is rejected. This means that the mean concentration of TDS is different from well to well such that a simple upgradient-downgradient model for groundwater monitoring is untenable. Therefore, an intrawell technique using tolerance limits derived from statistical analysis of the detection monitoring data is presented in the following.

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