phelps dodge
Tyrone Inc. P. O. Drawer 571, Tyrone, New Mexico 88065 • (505) 538-5331

June 25, 2004

Via Certified Mail #70993400000643556810
Return Receipt Requested

Mr. Clint Marshall
Mining Environmental Compliance Section
New Mexico Environment Department
P. O. Box 26110
Santa Fe, New Mexico 87502

Dear Mr. Marshall:

Re: Phelps Dodge Tyrone, Inc., DP-1341,
Condition 88, Process Solution Elimination Study

Attached please find three copies of the Phelps Dodge Tyrone, Inc. (Tyrone), Process Solution Elimination Study pursuant to DP-1341, Condition 88.

Tyrone looks forward to your comments and to meeting with you and your staff as needed to obtain your approval of a method for process water elimination as specified in DP-1341, Condition 88.

Please contact Mr. Chuck Thompson at (505) 538-7181 if you have any questions or comments regarding this submittal.

Very truly yours,

Ned Hall for

Joseph A. Brunner, Manager
Environment, Land & Water
New Mexico Operations

JAB:ct
Attachments
20040625-100

PROCESS SOLUTION ELIMINATION STUDY

Phelps Dodge Tyrone, Inc.
Tyrone, New Mexico

JUNE 2004

M3 Engineering & Technology Corp.

M3-PN02060

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1 INTRODUCTION

The Tyrone Mine Facility, encompassing approximately 9,000 acres, consists of an open pit, inactive concentrator, inactive tailing deposition ponds and solution extraction-electrowinning (SXEW) facility and is located just off State Highway 90, approximately 10 miles southwest of Silver City in Grant County, New Mexico.

The New Mexico Environment Department (NMED) has issued the Supplemental Discharge Permit for Closure, DP-1341 to Phelps Dodge Tyrone, Inc. (Tyrone). Condition 88 of DP-1341 requires that Tyrone perform a process solution elimination study. Condition 88 states:

> *Tyrone shall perform a process solution elimination study. In accordance with the schedule approved under Condition 74, Tyrone shall submit to NMED for approval a work plan including an implementation schedule for a process solution elimination study. The purpose of the study is to evaluate alternatives and identify environmentally sound and cost effective methods to treat or eliminate the process solutions following Cessation of Operation or closure at the Tyrone Mines Facility. The study shall evaluate factors including but not limited to treatment plant size, pump size(s), number of pumps, pump rating, type of emitters, acreages and number of leach piles in the evaporation circuit, evaporation rates, and the use of evaporation ponds. Based upon the study results, Tyrone shall submit to NMED for approval a method for process water elimination.*

This document has been prepared to comply with the requirements of Condition 88 of DP-1341.

2 BACKGROUND

The climate of Tyrone is warm and semi-arid. Mean annual precipitation is about 16 inches and mean annual temperature near 50F. Precipitation falls mainly as rain, but snow may occur in the period from November to March. High-intensity, short duration thunderstorms are common in the summer months. About 60 percent of the precipitation falls during the summer months. Precipitation is characterized mostly by small magnitude events ranging from less than 2.5 to 6.4 mm (0.1 to 0.25 inches) per day. Evaporative demand in this region is high and annual evaporation far exceeds annual precipitation (TTEMI, 2004).

Tyrone is currently actively mining and producing copper cathodes in its SXEW facility. The mining operations include drilling, blasting, and hauling of waste and leach grade ore to various stockpiles located generally at the perimeter of the pit areas of the mine facility. All copper recovery from the mined ore is by leaching of stockpiles and the SXEW process. Tyrone is permitted to discharge up to 98.3 million gallons per day of acidic leach solution, raffinate, to the tops and sides of the leach stockpiles. The resulting leachate is collected at the base of the stockpile as pregnant leach solution (PLS) after it percolates through the stockpile. The PLS is pumped to the SXEW plant for copper recovery.

Tyrone mine facility operations manage process water through various plants, reservoirs, pits, and stockpiles. Process water is typically composed of acidic leach solutions for SXEW operations, makeup water, groundwater discharge to the pits, interceptor well water and storm water collected throughout the mine site. The main consumptive use of water at Tyrone is loss by evaporation during recirculation of water in the leach circuit. Make-up water is added to the circuit at the SXEW plant.

Tyrone submitted at the request of NMED, the *Feasibility Study, Solution Management of Process Water for Closure, Phelps Dodge Tyrone, Inc., Tyrone, New Mexico* dated April 2002 (M3, 2002), for regulatory review. The purpose of the study was to describe "the proposed water management plan to reduce the process water inventory over a 5-year period in the event of mine closure to allow treatment of the remaining solutions". The study proposed water removal by natural and forced evaporation on previously disturbed areas. The study identified a total of 1.8 billion gallons of inventoried process waters. Two alternatives were investigated to remove the process water: the "Recirculation System" and the "Existing Evaporation System". Both alternatives were shown to be able to evaporate the inventoried process waters within the prescribed 5-year time frame. Both alternatives collected process waters and pumped them to the tops of leach stockpiles where a percentage of the waters evaporated while the remaining portion infiltrated through the stockpile to be recirculated again to the top surface. The "Recirculation System" was characterized by the evaporation of water from the wetted surfaces of the leach stockpiles, the evaporation from the surface of the various impoundments containing process water and the forced evaporation of water droplets sprayed into the air through a system of sprinkler nozzles located on the top surfaces of the leach stockpiles. The "Existing Evaporation System" was characterized by evaporation of water from the wetted surfaces of the leach stockpiles and from the water surface of the impoundments. Forced evaporation through the use of spray nozzles was not considered in this alternative; instead, process water was distributed on the leach stockpile top surfaces via drip emitters to wet the leach stockpile surface. Capital and operating costs were estimated for both alternatives.

3 EXISTING PROCESS WATER INVENTORY

The Tyrone process water inventory is contained in three distinct areas:

- Pits
- Stockpiles
- Retention Ponds

The location of the process water storage sites is shown in Figure 3.0. The process water locations are classified as: Pit Water, PLS, Stormwater, Seeps/Springs and Retention Ponds.

The leach stockpiles are also shown in Figure 3.3 and are listed in Table 3.0 along with a description of their operational status.

Leach Stockpiles No. 1A, 1B, 2, 2A, 3, and the East Main Pit Stockpile are currently active.

The stockpiles contain an estimated 1.1 billion gallons of leach solution in a process recirculation system. The pits and ponds provide runoff collection, system surge capacity, and overall water system control. The pits and ponds contain an estimated 0.7 billion gallons. The recirculation leach water in the stockpiles and associated ponds, tanks and pipelines must be eliminated. The water contained in the pits will continue to be contained and is not part of this process solution elimination study. The estimates of inventoried process water are assumed to be accurate within plus or minus 25 percent. Actual inventory fluctuates with seasonal variations in precipitation and other climatic conditions such as temperature and humidity and with the production goals of the SXEW plant.

3.1 POST-MINING PROCESS WATER MANAGEMENT

Tyrone has submitted a Closure/Closeout Plan, *End of Year 2001 through Year 2008 Closure/Closeout Plan, Tyrone Mine, March 2001* (M3, 2001) and revised in May and July, 2001 (CCP). Included in the CCP is Table 5-11, Post-Mining Water Management and Water Treatment Flow Rates. See table at end of this section. Table 5-11 has been revised several times, the latest revision in accordance with the hearing officer findings and rulings from the May 2002 public hearing for the proposed Supplemental Discharge Permit for Closure of the Tyrone Mine (DP-1341).

Table 5-11 is an estimated 100-year schedule of various water flows that occur at the Tyrone Mine Facility. The table generally projects the inflow of impacted waters that will report to the proposed water treatment facility. As a component of the general water management/treatment plan, the evaporation system water flow rates are included in Table 5-11. The evaporation system flows are projected for five year duration, consistent with the requirements of this study. This study will incorporate the data presented in Table 5-11.

3.2 PROPOSED ELIMINATION SYSTEM ALTERNATIVE

3.2.1 General Treatment Description

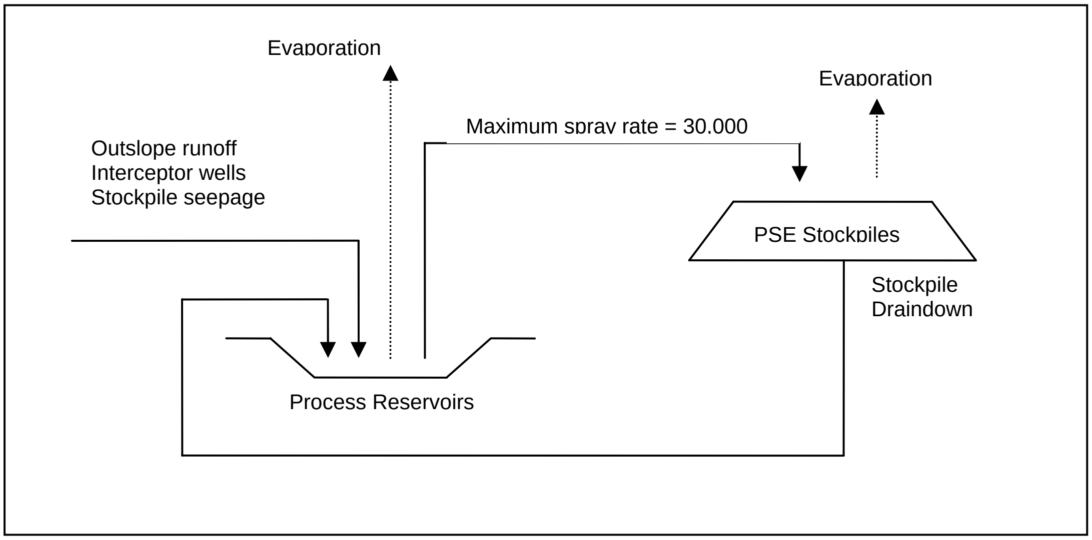
As described in the CCP, Tyrone proposed the use of a water treatment plant comprised of conventional lime precipitation coupled with nano-filtration for post-mining treatment of waters that may not meet the standards of Section 20.6.2.3103 NMAC (WTP). The proposed WTP is to commence operation within one year of Cessation of Operation of the SXEW plant. The process solution elimination system is expected to operate immediately following Cessation of Operation and treat (eliminate) as much of the process water as possible during the first five years of closure. The elimination system is to be designed to handle approximately 1.1 billion gallons of process water that is assumed to be present in storage tanks, pipelines, solution ponds and leach stockpiles. Along with the inventory of process water, the elimination system will also be used to treat impacted water from stockpile runoff and seepage, water from groundwater remediation wells, and reject water from the nano-filtration phase of the WTP that is to begin operation at the beginning of the second year.

In the Hearing Officer's Report, in the matter of Phelps Dodge Tyrone, Inc.'s proposed Ground Water Supplemental Discharge Permit for Closure DP-1341, it is noted that, "The Bureau acknowledges that Tyrone submitted a proposal with two options, but did not propose a preferred option. Tyrone need not duplicate the planning already done, but the point of this condition (Condition 88) is to evaluate the most economically sound and cost effective method to address the enormous quantities of process solution in the leach circuit following closure".

As presented in the previous feasibility study (M3 2001), the elimination alternatives include evaporative measures to treat the inventoried process water. The process water has relatively high concentrations of TDS and metals and would be technically difficult and costly to treat using conventional water treatment methods. This study will further develop the previous work of the feasibility Study (M3 2001) and recommend a proposed solution elimination plan.

The process solution elimination system (PSE) consists of process reservoirs (ponds, tanks, etc), pumps, pipelines and a spray system. Draindown from the leach stockpiles and the various other impacted water sources are collected in the process reservoirs and pumped to the top of the 2A leach stockpile and sprayed through an irrigation network that is designed to maximize evaporation. The water that is not evaporated will infiltrate through the 2A leach stockpile and then recirculated through the PSE. A simplified flow diagram is shown in Figure 3.1

Figure 3.1 PSE Simplified Flow Diagram



Following cessation of the PSE operation at the end of year five, any remaining process water will be allowed to drain from the PSE stockpile into the surface reservoirs. The surface reservoirs then become holding ponds for feed to the WTP. Other sources of impacted water that were included in the PSE will be treated in the WTP.

3.2.2 Alternative 1

Alternative 1 is an evaporative system that utilizes forced evaporation to maximize the evaporation rate of the water distributed to the top surface of the 2A Leach Stockpile. With this alternative, evaporation of process water will be accomplished through evaporation from water droplets formed by spraying water through a system of irrigation spray nozzles (forced evaporation) and evaporation from wetted water surfaces (at the reservoir surface and at the wetted rock surfaces). Maximum system capacity will be 30,000 gallons per minute. The use of spray irrigation nozzles will maximize the wetted surface area, minimize pipeline construction while maintaining a water application rate of 0.01 to 0.02 gallons per minute per square foot of surface area. This application rate will minimize local ponding and prevent channeling and washout. Table 3.1 indicates the volume of water to be handled through the spray system, the annual drawdown of stored water, and the time to complete process solution elimination through surface and forced evaporation. Table 3.1.1 indicates the evaporation of solution from the surface of the ponds and impoundments and the time frame required to evaporate those ponded solutions.

3.2.3 Alternative 2

Alternative 1 is an evaporative system that utilizes forced evaporation to maximize the evaporation rate of the water distributed to the top surface of the 2A Leach Stockpile. With this alternative, evaporation of process water will be accomplished through evaporation from water droplets formed by spraying water through a system of irrigation spray nozzles (forced evaporation) and evaporation from wetted water surfaces (at the reservoir surface and at the wetted rock surfaces). Maximum system capacity will be 30,000 gallons per minute. The use of spray irrigation nozzles will maximize the wetted surface area, minimize pipeline construction while maintaining a water application rate of 0.01 to 0.02 gallons per minute per square foot of surface area. This application rate will minimize local ponding and prevent channeling and washout. Table 3.1 indicates the volume of water to be handled through the spray system, the annual drawdown of stored water, and the time to complete process solution elimination through surface and forced evaporation. Table 3.2.1 indicates the evaporation of solution from the surface of the ponds and impoundments and the time frame required to evaporate those ponded solutions.

3.3 ALTERNATIVE'S OPERATING PLANS

3.3.1 Alternative 1

The PSE will evaporate solutions pumped to the top surface of leach stockpile 2A. The SXEW feed pond will be the recirculation reservoir for the system. It will be the main collection and transfer point for water to and from the stockpiles. At the onset of the PSE, water will drain through all of the active leach stockpiles into their respective PLS ponds. Initially the draindown water will be transferred to SXEW feed pond. Once the level in each of the PLS ponds has stabilized to about one half of its capacity, that transfer can be discontinued. Water from the SXEW feed pond will then be transferred to the existing raffinate tanks. From the raffinate tanks the water will be pumped to the 2A and the 2-1 booster pumps. The 2A booster pump will transfer water to the distribution system on the 2A Stockpile. Water will drain through the 2A Stockpile and be pumped through the 2A- east pump and the 2A-West pump back to the SXEW feed pond to complete the recirculation loop. Figure 3.2 is a proposed flow diagram.

The area designated for evaporation of the process water on the top surface of the 2A stockpile, approximately 69 acres, will be outfitted with a distribution system of spray nozzles to irrigate the process water on the surface of the stockpile. The nozzles are to be capable of atomizing the water to produce a fine mist which will enhance the evaporation of the air born water. (Nozzle data in Appendix D) The wetted top surface of the stockpile will also evaporate the process water.

3.3.2 Alternative 2

The PSE will evaporate solutions pumped to the top surface of leach stockpile 2A. The SXEW feed pond will be the recirculation reservoir for the system. It will be the main collection and transfer point for water to and from the stockpiles. At the onset of the PSE, water will drain through all of the active leach stockpiles into their respective PLS ponds. Initially the draindown water will be transferred to SXEW feed pond. Once the level in each of the PLS ponds has stabilized to about one half of its capacity, that transfer can be discontinued. Water from the SXEW feed pond will then be transferred to the existing raffinate tanks. From the raffinate tanks the water will be pumped to the 2A and the 2-1 booster pumps. The 2A booster pump will transfer water to the distribution system on the 2A Stockpile. Water will drain through the 2A Stockpile and be pumped through the 2A- east pump and the 2A-West pump back to the SXEW feed pond to complete the recirculation loop. Figure 3.2 is a proposed flow diagram.

The area designated for evaporation of the process water on the top surface of the 2A stockpile, approximately 131 acres, will be outfitted with a distribution system of drip irrigation nozzles to irrigate the process water on the surface of the stockpile. The nozzles shall provide an even wetting of the stockpile top surface without creating localized ponding on the surface. Evaporation of the water will occur from the wetted stockpile rock surfaces. (Nozzle data in Appendix D)

3.3.3 Recirculation Schedule

For both alternatives, during the five year evaporation program, the process solution will be pumped at average monthly rates as shown in Tables 3.3 and 3.4. The tables estimate the volume of process solution evaporated and project the water in storage in monthly increments. The water balances includes the addition of 2654 gallons per minute for the first twelve months of operation of the PSE. The additional water is impacted water that is shown in Table 5-11.

Table 3.3, Alternative 1, assumes that during the first 12 months of operation the new spray nozzle distribution system is not in place and irrigation is accomplished through existing drip irrigation. During this period the evaporation loss used is 8 percent. The new spray system is assumed to be designed, purchased, installed and operational beginning in month thirteen. The evaporation loss from that point on is assumed to be 13 percent. Beginning in month 28 (1.2 years of recirculation and 1 year of drip irrigation) the evaporative loss will all be from any pond surfaces that remain. No recirculation pumping will be required.

3.3.4 Process Solution Water Quality

The quality of the process solutions is estimated to be the same as PLS that is currently collected at the base of the active leach stockpiles. Experience at other operating properties has indicated that when PLS solutions are recirculated through leach stockpiles without the addition of acid or raffinate to the PLS the quality of the PLS remains very much the same as the quality during normal operations. Changes in concentration and pH of the recirculated process solutions are not expected to adversely impact the operation of the evaporation system Part of the normal operating maintenance involves nozzle maintenance, top surface ripping and other measures to ensure optimal performance. The Tables 3.3 and 3.4 reflect the use of conservative evaporation loss which will compensate for any efficiency reduction experienced during the PSE operation.

Tyrone Process Solution Elimination Study

Table 3.0 - Current Operating Status of Solution Management System

Unit	Current Status
Savanah Stockpile	Waste Stockpile - Not Actively Leached
Upper Main Stockpile (Main Pit)	Waste Stockpile - Not Actively Leached
No. 1D Waste Stockpile	Waste Stockpile - Not Actively Leached
No. 1C Waste Stockpile	Waste Stockpile - Not Actively Leached
No. 2B Waste Stockpile	Waste Stockpile - Not Actively Leached
No. 3B Waste Stockpile	Waste Stockpile - Not Actively Leached
No. 1 Leach Stockpile	Inactive - Not Leached Since 1998
Gettysburg Pit Leach Stockpile (In Pit, Out Pit)	Inactive - Leach
No. 1A Leach Stockpile	Actively Leached
No. 1B Leach Stockpile	Actively Leached
No. 2 Leach Stockpile	Actively Leached
No. 2A Leach Stockpile	Actively Leached
No. 3 Leach Stockpile	Actively Leached
East Main Pit Leach Stockpile (No. 6B)	Actively Leached
No. 1 Leach Stockpile PLS Collection Impoundment	Process water storage/management
No. 1 Leach Stockpile Overflow Impoundment	Process water storage/management
No. 1A Leach Stockpile PLS Collection Impoundment	Process water storage/management
No. 1A Leach Stockpile Overflow Impoundment	Process water storage/management
No. 1B Leach Stockpile PLS Collection Impoundment	Process water storage/management
No. 1B Leach Stockpile Overflow Impoundment	Process water storage/management
No. 2 Leach Stockpile PLS Collection Impoundment	Process water storage/management
No. 2 Leach Stockpile Overflow Impoundment	Process water storage/management
No. 3 Leach Stockpile PLS Collection Impoundment	Process water storage/management
No. 3 Leach Stockpile Overflow Impoundment	Process water storage/management
SX/EW Feed Pond	Process water storage/management
Main Pit Lake/Sump	Process water storage/management
Copper Mountain Pit Lake/Sump	Process water storage/management
Gettysburg Pit Lake/Sump	Process water storage/management

Tyrone Process Solution Elimination Study

Table 3.1 - Impoundment/Pond Evaporation Schedule - Alternative 1

Location	Calculated Reservoir Water Surface Area (acres)	Estimated Capacity (Gallons)	Estimated Reservoir Volume at Start of Evaporation Program (gallons)	Average Annual Evaporation (gallons per year) (1)	Estimated Number of Years to Complete Evaporation
No. 1 Leach Stockpile PLS Collection Impoundment	0.031	200,000	100,000	50,000	2.0
No. 1 Leach Stockpile Overflow Impoundment					
No. 1A Leach Stockpile PLS Collection Impoundment	0.011	70,000	35,000	20,000	1.8
No. 1A Leach Stockpile Overflow Impoundment					
No. 1B Leach Stockpile PLS Collection Impoundment	0.011	70,000	35,000	20,000	1.8
No. 1B Leach Stockpile Overflow Impoundment					
No. 2 Leach Stockpile PLS Collection Impoundment	0.246	1,600,000	880,000	430,000	2.0
No. 3 Leach Stockpile PLS Collection Impoundment	1.537	10,000,000	4,690,000	2,670,000	1.8
No. 3 Leach Stockpile Overflow Impoundment	0.003	20,000	10,000	10,000	1.0
SX/EW Feed Pond	0.154	1,000,000	500,000	270,000	1.9
Total	1.99	12,960,000	6,250,000	3,110,000	

Notes:
1. Average Annual Evaporation calculated from historical annual evaporation rate of 64 inches per year over the estimated average surface area of the impoundment/pond.

Tyrone Process Solution Elimination Study

Table 3.1.1 - Stockpile Evaporation Schedule - Alternative 1

Location	Calculated Wetted Surface Area (acres)	Estimated Water Volume at Start of Evaporation Program (gallons)	Average Annual Evaporation (gallons per year)	Estimated Number of Years to Complete Evaporation
No. 1A Leach Stockpile	This area is not required for the evaporation system.			
No. 1B Leach Stockpile	This area is not required for the evaporation system.			
No. 2 Leach Stockpile	This area is not required for the evaporation system.		(1)	
No. 2 Leach Stockpile Spray Evaporation			(2)	
No. 2A Leach Stockpile	69.00		120,000,000 (1)	
No. 2A Leach Stockpile Spray Evaporation			788,400,000 (3)	
No. 3 Leach Stockpile	This area is not required for the evaporation system.			
East Main Pit Leach Stockpile (No. 6B)	This area is not required for the evaporation system.			
Total	69.00	1,075,000,000	908,400,000	1.2

Notes:
1. Average Annual Evaporation calculated from historical annual evaporation rate of 64 inches per year over the estimated average surface area wetted by spraying.
2. Average Annual Evaporation calculated from estimated annual evaporation rate of 5% of water sprayed through nozzles.
   (20,000 gpm x .05 x 1440 x 365)
3. Average Annual Evaporation calculated from estimated annual evaporation rate of 5% of water sprayed through nozzles.
   (10,000 gpm x .05 x 1440 x 365)

Tyrone Process Solution Elimination Study

Table 3.2 - Impoundment/Pond Evaporation Schedule - Alternative 2

Location	Calculated Reservoir Water Surface Area (acres)	Estimated Capacity (Gallons)	Estimated Reservoir Volume at Start of Evaporation Program (gallons)	Average Annual Evaporation (gallons per year) (1)	Estimated Number of Years to Complete Evaporation
No. 1 Leach Stockpile PLS Collection Impoundment	0.031	200,000	100,000	50,000	2.0
No. 1 Leach Stockpile Overflow Impoundment					
No. 1A Leach Stockpile PLS Collection Impoundment	0.011	70,000	35,000	20,000	1.8
No. 1A Leach Stockpile Overflow Impoundment					
No. 1B Leach Stockpile PLS Collection Impoundment	0.011	70,000	35,000	20,000	1.8
No. 1B Leach Stockpile Overflow Impoundment					
No. 2 Leach Stockpile PLS Collection Impoundment	0.246	1,600,000	880,000	430,000	2.0
No. 3 Leach Stockpile PLS Collection Impoundment	1.537	10,000,000	4,690,000	2,670,000	1.8
No. 3 Leach Stockpile Overflow Impoundment	0.003	20,000	10,000	10,000	1.0
SX/EW Feed Pond	0.154	1,000,000	500,000	270,000	1.9
Total	1.99	12,960,000	6,250,000	3,110,000	

Notes:
1. Average Annual Evaporation calculated from historical annual evaporation rate of 64 inches per year over the estimated average surface area of the impoundment/pond.

Tyrone Process Solution Elimination Study

Table 3.2.1 - Stockpile Evaporation Schedule - Alternative 2

Location	Calculated Wetted Surface Area (acres)	Estimated Water Volume at Start of Evaporation Program (gallons)	Average Annual Evaporation (gallons per year)	Estimated Number of Years to Complete Evaporation
No. 1A Leach Stockpile	N/A			
No. 1A Leach Stockpile Spray Evaporation	N/A			
No. 1B Leach Stockpile	N/A			
No. 1B Leach Stockpile Spray Evaporation	N/A			
No. 2A Leach Stockpile	131.10		228,000,000 (1)	
No. 2A Leach Stockpile Spray Evaporation	N/A		(2)	
No. 2 Leach Stockpile	N/A			
No. 2 Leach Stockpile Spray Evaporation	N/A			
No. 3 Leach Stockpile	N/A			
No. 3 Leach Stockpile Spray Evaporation	N/A			
East Main Pit Leach Stockpile (No. 6B)	N/A			
East Main Pit Leach Stockpile (No. 6B) Spray Evaporation	N/A			
Total	131.10	1,075,000,000	228,000,000	4.7

Notes:
1. Average Annual Evaporation calculated from historical annual evaporation rate of 64 inches per year over the estimated average surface area wetted by emitter system.
2. Average Annual Evaporation due to water spray evaporation is assumed to be zero because existing emitter distribution system will be used.

Table 3-3. PSE Water Management Flow Rates

2-Year Water Handling Plan Alternative 1

Month	(1) Evaporation System Flow Rate (gpm)	(2) Evaporation System Water Loss	(3) Spray Hours per Month	(4) Evaporation Rate (gpm)	(5) Evaporated Volumn (gallons)	(6) Impacted Water Included in Evaporation System Flow (gpm)	(7) Water Addition Volume to System (gallons)	(8) Water In Storage at Start of Period (gallons)	(9) Water In Storage at End of Period (gallons)
									1,400,490,000
1	30,000	8.00%	744	2,400	107,136,000	2,654	118,475,000	1,400,490,000	1,411,829,000
2	30,000	8.00%	672	2,400	96,768,000	2,654	107,009,000	1,411,829,000	1,422,070,000
3	30,000	8.00%	744	2,400	107,136,000	2,654	118,475,000	1,422,070,000	1,433,409,000
4	30,000	8.00%	720	2,400	103,680,000	2,654	114,653,000	1,433,409,000	1,444,382,000
5	30,000	8.00%	744	2,400	107,136,000	2,654	118,475,000	1,444,382,000	1,455,721,000
6	30,000	8.00%	720	2,400	103,680,000	2,654	114,653,000	1,455,721,000	1,466,694,000
7	30,000	8.00%	744	2,400	107,136,000	2,654	118,475,000	1,466,694,000	1,478,033,000
8	30,000	8.00%	744	2,400	107,136,000	2,654	118,475,000	1,478,033,000	1,489,372,000
9	30,000	8.00%	720	2,400	103,680,000	2,654	114,653,000	1,489,372,000	1,500,345,000
10	30,000	8.00%	744	2,400	107,136,000	2,654	118,475,000	1,500,345,000	1,511,684,000
11	30,000	8.00%	720	2,400	103,680,000	2,654	114,653,000	1,511,684,000	1,522,657,000
12	30,000	8.00%	744	2,400	107,136,000	2,654	118,475,000	1,522,657,000	1,533,996,000
13	30,000	13.00%	744	3,900	174,096,000	5	223,000	1,533,996,000	1,360,123,000
14	30,000	13.00%	672	3,900	157,248,000	5	202,000	1,360,123,000	1,203,077,000
15	30,000	13.00%	744	3,900	174,096,000	5	223,000	1,203,077,000	1,029,204,000
16	30,000	13.00%	720	3,900	168,480,000	5	216,000	1,029,204,000	860,940,000
17	15,000	13.00%	744	1,950	87,048,000	5	223,000	860,940,000	774,115,000
18	15,000	13.00%	720	1,950	84,240,000	5	216,000	774,115,000	690,091,000
19	15,000	13.00%	744	1,950	87,048,000	5	223,000	690,091,000	603,266,000
20	15,000	13.00%	744	1,950	87,048,000	5	223,000	603,266,000	516,441,000
21	15,000	13.00%	720	1,950	84,240,000	5	216,000	516,441,000	432,417,000
22	15,000	13.00%	744	1,950	87,048,000	5	223,000	432,417,000	345,592,000
23	15,000	13.00%	720	1,950	84,240,000	5	216,000	345,592,000	261,568,000
24	15,000	13.00%	744	1,950	87,048,000	5	223,000	261,568,000	174,743,000
25	15,000	13.00%	744	1,950	87,048,000	5	223,000	174,743,000	87,918,000
26	10,000	13.00%	672	1,300	52,416,000	5	202,000	87,918,000	35,704,000
27	7,000	13.00%	658	910	35,901,000	5	197,000	35,704,000	0
28	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0
32	0	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	0	0	0
34	0	0	0	0	0	0	0	0	0
35	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0
37	0	0	0	0	0	0	0	0	0
38	0	0	0	0	0	0	0	0	0
39	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0
41	0	0	0	0	0	0	0	0	0
42	0	0	0	0	0	0	0	0	0
43	0	0	0	0	0	0	0	0	0
44	0	0	0	0	0	0	0	0	0
45	0	0	0	0	0	0	0	0	0
46	0	0	0	0	0	0	0	0	0
47	0	0	0	0	0	0	0	0	0
48	0	0	0	0	0	0	0	0	0
49	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0
51	0	0	0	0	0	0	0	0	0
52	0	0	0	0	0	0	0	0	0
53	0	0	0	0	0	0	0	0	0
54	0	0	0	0	0	0	0	0	0
55	0	0	0	0	0	0	0	0	0
56	0	0	0	0	0	0	0	0	0
57	0	0	0	0	0	0	0	0	0
58	0	0	0	0	0	0	0	0	0
59	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0

Table 3.3 - Continued

Notes to calculation in Table:

(1) During the mining and copper leaching operations approximately 30,000 gpm of water is circulated through the copper production system. After cessation of the mining operation, the leaching operation will stop. However continued operation of the water application system as an evaporation system will deplete the leach system water contained in storage. The flow rate of the evaporation system can be as high as the flow rate during leaching operation and it will be reduced as the water in storage is depleted.

(2) "Evaporation System Water Loss" (EWL) is estimated to be 8% of the evaporation system flow rate during the period of construction of a spray evaporation system. The 8% rate is the rate experienced by operating the existing circulation system. The "EWL" is estimated to be 13% after start-up of the spray evaporation system.

(3) Spray Hours Per Month = days/month x 24 hours/day (365 days per year)

(4) "Evaporation Rate" = Evaporation System Flow Rate (1) x "EWL" (2)

(5) "Evaporated Volume" = Evaporation Rate (4) x Spray Hours per Month (3) x 60 minutes/hour

(6) For Year-1, Impacted Water will be included in the evaporation system.
For Year-2 through Year-5, water pumped from the groundwater remediation wells (5 gpm) will be included in the evaporation system (just as it is included in process circulation currently), the remaining Impacted Water In-Flow (2,654 gpm - 5 gpm year) will be included in the flow rate to a Water Treatment Plant

(7) Water addition volume = Flow rate in Column (6) x Spray hours per month (3) x 60 minutes/hour

(8) Water in storage at start of period is the volume of water in storage remaining after operation of the previous period.

(9) Water in Storage at the end of a monthly period in the schedule.
Initial "Water in Storage" (WIS) = water in pit (500,000,000 gallons) plus water in stockpile impoundments and ponds (6,250,000 gallons) plus "Average Circulated Inventory" (ACI).

"Average Circulated Inventory" (ACI) is calculated based on experience with leach operation:
When raffinate application is stopped, PLS flow rate from stockpiles diminishes to 10% of the full flow rate in 45 days.
Also, when raffinate application is stopped, 90% of the PLS drain-down from stockpiles is achieved in 45 days.
Make-up water requirement = 8% of Raffinate Flow Rate during leaching.
(Therefore 92% of the Raffinate Flow Rate reports to PLS.)
For an initial raffinate flow rate of 30,000 gallons per minute, the ACI is calculated as follows:

$$\text{ACI} = \frac{((30{,}000 \times 92\%) - (10\% \times (30{,}000 \times 92\%)) \times 60 \text{ min/hr} \times 24 \text{ hr/day} \times 45 \text{ day drain-down cycle} \times 50\% \text{ average flow rate factor}}{90\% \text{ of the PLS drain-down}}$$

ACI = 894,240,000 gallons

And the initial water in storage can be calculated as follows:
Initial "Water in Storage" = (500,000,000 + 6,250,000 + 894,240,000) gallons = 1,400,490,000 gallons.

The volumn of WIS decreases as a result of calculating the difference between the initial WIS plus the water in-flows minus water out-flows (through evaporation or water treatment).

For example: WIS Period 2 = (WIS Period 1) + (Water Addition Volume (7)) - (Evaporated Volume (5))
= 1,411,829,000 + 107,009,000 - 96,768,000 = 1,422,070,000 gallons

Table 3-4. PSE Water Management Flow Rates
5-Year Water Handling Plan Alternative 2

Month	(1) Evaporation System Flow Rate (gpm)	(2) Evaporation System Water Loss	(3) Spray Hours per Month	(4) Evaporation Rate (gpm)	(5) Evaporated Volumn (gallons)	(6) Impacted Water Included in Evaporation System Flow (gpm)	(7) Water Addition Volume to System (gallons)	(8) Water In Storage at Start of Period (gallons)	(9) Water In Storage at End of Period (gallons)
									1,400,490,000
1	30,000	8.00%	744	2,400	107,136,000	2,654	118,475,000	1,400,490,000	1,411,829,000
2	30,000	8.00%	672	2,400	96,768,000	2,654	107,009,000	1,411,829,000	1,422,070,000
3	30,000	8.00%	744	2,400	107,136,000	2,654	118,475,000	1,422,070,000	1,433,409,000
4	30,000	8.00%	720	2,400	103,680,000	2,654	114,653,000	1,433,409,000	1,444,382,000
5	30,000	8.00%	744	2,400	107,136,000	2,654	118,475,000	1,444,382,000	1,455,721,000
6	30,000	8.00%	720	2,400	103,680,000	2,654	114,653,000	1,455,721,000	1,466,694,000
7	30,000	8.00%	744	2,400	107,136,000	2,654	118,475,000	1,466,694,000	1,478,033,000
8	30,000	8.00%	744	2,400	107,136,000	2,654	118,475,000	1,478,033,000	1,489,372,000
9	30,000	8.00%	720	2,400	103,680,000	2,654	114,653,000	1,489,372,000	1,500,345,000
10	30,000	8.00%	744	2,400	107,136,000	2,654	118,475,000	1,500,345,000	1,511,684,000
11	30,000	8.00%	720	2,400	103,680,000	2,654	114,653,000	1,511,684,000	1,522,657,000
12	30,000	8.00%	744	2,400	107,136,000	2,654	118,475,000	1,522,657,000	1,533,996,000
13	15,000	8.00%	744	1,200	53,568,000	5	223,000	1,533,996,000	1,480,651,000
14	15,000	8.00%	672	1,200	48,384,000	5	202,000	1,480,651,000	1,432,469,000
15	15,000	8.00%	744	1,200	53,568,000	5	223,000	1,432,469,000	1,379,124,000
16	15,000	8.00%	720	1,200	51,840,000	5	216,000	1,379,124,000	1,327,500,000
17	15,000	8.00%	744	1,200	53,568,000	5	223,000	1,327,500,000	1,274,155,000
18	15,000	8.00%	720	1,200	51,840,000	5	216,000	1,274,155,000	1,222,531,000
19	15,000	8.00%	744	1,200	53,568,000	5	223,000	1,222,531,000	1,169,186,000
20	15,000	8.00%	744	1,200	53,568,000	5	223,000	1,169,186,000	1,115,841,000
21	15,000	8.00%	720	1,200	51,840,000	5	216,000	1,115,841,000	1,064,217,000
22	15,000	8.00%	744	1,200	53,568,000	5	223,000	1,064,217,000	1,010,872,000
23	15,000	8.00%	720	1,200	51,840,000	5	216,000	1,010,872,000	959,248,000
24	15,000	8.00%	744	1,200	53,568,000	5	223,000	959,248,000	905,903,000
25	10,000	8.00%	744	800	35,712,000	5	223,000	905,903,000	870,414,000
26	10,000	8.00%	672	800	32,256,000	5	202,000	870,414,000	838,360,000
27	10,000	8.00%	744	800	35,712,000	5	223,000	838,360,000	802,871,000
28	10,000	8.00%	720	800	34,560,000	5	216,000	802,871,000	768,527,000
29	10,000	8.00%	744	800	35,712,000	5	223,000	768,527,000	733,038,000
30	10,000	8.00%	720	800	34,560,000	5	216,000	733,038,000	698,694,000
31	10,000	8.00%	744	800	35,712,000	5	223,000	698,694,000	663,205,000
32	10,000	8.00%	744	800	35,712,000	5	223,000	663,205,000	627,716,000
33	10,000	8.00%	720	800	34,560,000	5	216,000	627,716,000	593,372,000
34	10,000	8.00%	744	800	35,712,000	5	223,000	593,372,000	557,883,000
35	10,000	8.00%	720	800	34,560,000	5	216,000	557,883,000	523,539,000
36	10,000	8.00%	744	800	35,712,000	5	223,000	523,539,000	488,050,000
37	7,000	8.00%	744	560	24,998,400	5	223,000	488,050,000	463,274,600
38	7,000	8.00%	672	560	22,579,200	5	202,000	463,274,600	440,897,400
39	7,000	8.00%	744	560	24,998,400	5	223,000	440,897,400	416,122,000
40	7,000	8.00%	720	560	24,192,000	5	216,000	416,122,000	392,146,000
41	7,000	8.00%	744	560	24,998,400	5	223,000	392,146,000	367,370,600
42	7,000	8.00%	720	560	24,192,000	5	216,000	367,370,600	343,394,600
43	7,000	8.00%	744	560	24,998,400	5	223,000	343,394,600	318,619,200
44	7,000	8.00%	744	560	24,998,400	5	223,000	318,619,200	293,843,800
45	7,000	8.00%	720	560	24,192,000	5	216,000	293,843,800	269,867,800
46	7,000	8.00%	744	560	24,998,400	5	223,000	269,867,800	245,092,400
47	7,000	8.00%	720	560	24,192,000	5	216,000	245,092,400	221,116,400
48	7,000	8.00%	744	560	24,998,400	5	223,000	221,116,400	196,341,000
49	4,800	8.00%	744	380	16,963,200	5	223,000	196,341,000	179,600,800
50	4,800	8.00%	672	380	15,321,600	5	202,000	179,600,800	164,481,200
51	4,800	8.00%	744	380	16,963,200	5	223,000	164,481,200	147,741,000
52	4,800	8.00%	720	380	16,416,000	5	216,000	147,741,000	131,541,000
53	4,800	8.00%	744	380	16,963,200	5	223,000	131,541,000	114,800,800
54	4,800	8.00%	720	380	16,416,000	5	216,000	114,800,800	98,600,800
55	4,800	8.00%	744	380	16,963,200	5	223,000	98,600,800	81,860,600
56	4,800	8.00%	744	380	16,963,200	5	223,000	81,860,600	65,120,400
57	4,800	8.00%	720	380	16,416,000	5	216,000	65,120,400	48,920,400
58	4,800	8.00%	744	380	16,963,200	5	223,000	48,920,400	32,180,200
59	4,800	8.00%	720	380	16,416,000	5	216,000	32,180,200	15,980,200
60	4,800	8.00%	710	380	16,193,200	5	213,000	15,980,200	0

Table 3.4 - Continued

Notes to calculation in Table:

(1) During the mining and copper leaching operations approximately 30,000 gpm of water is circulated through the copper production system. After cessation of the mining operation, the leaching operation will stop. However continued operation of the water application system as an evaporation system will deplete the leach system water contained in storage. The flow rate of the evaporation system can be as high as the flow rate during leaching operation and it will be reduced as the water in storage is depleted.

(2) "Evaporation System Water Loss" (EWL) is estimated to be 8% of the evaporation system flow rate. The rate of water loss depends on the amount of surface area that is wetted where evaporation occurs.

(3) Spray Hours Per Month = days/month x 24 hours/day (365 days per year)

(4) "Evaporation Rate" = Evaporation System Flow Rate (1) x "EWL" (2)

(5) "Evaporated Volume" = Evaporation Rate (4) x Spray Hours per Month (3) x 60 minutes/hour

(6) For Year-1, Impacted Water will be included in the evaporation system.
For Year-2 through Year-5, water pumped from the groundwater remediation wells (5 gpm) will be included in the evaporation system (just as it is included in process circulation currently), the remaining Impacted Water In-Flow (2,654 gpm - 5 gpm year) will be included in the flow rate to a Water Treatment Plant

(7) Water addition volume = Flow rate in Column (6) x Spray hours per month (3) x 60 minutes/hour

(8) Water in storage at start of period is the volume of water in storage remaining after operation of the previous period.

(9) Water in Storage at the end of a monthly period in the schedule.
Initial "Water in Storage" (WIS) = water in pit (500,000,000 gallons) plus water in stockpile impoundments and ponds (6,250,000 gallons) plus "Average Circulated Inventory" (ACI).

"Average Circulated Inventory" (ACI) is calculated based on experience with leach operation:
When raffinate application is stopped, PLS flow rate from stockpiles diminishes to 10% of the full flow rate in 45 days.
Also, when raffinate application is stopped, 90% of the PLS drain-down from stockpiles is achieved in 45 days.
Make-up water requirement = 8% of Raffinate Flow Rate during leaching.
(Therefore 92% of the Raffinate Flow Rate reports to PLS.)
For an initial raffinate flow rate of 30,000 gallons per minute, the ACI is calculated as follows:

$$\text{ACI} = \frac{((30{,}000 \times 92\%) - (10\% \times (30{,}000 \times 92\%)) \times 60 \text{ min/hr} \times 24 \text{ hr/day} \times 45 \text{ day drain-down cycle} \times 50\% \text{ average flow rate factor}}{90\% \text{ of the PLS drain-down}}$$

ACI = 894,240,000 gallons

And the initial water in storage can be calculated as follows:
Initial "Water in Storage" = (500,000,000 + 6,250,000 + 894,240,000) gallons = 1,400,490,000 gallons.

The volumn of WIS decreases as a result of calculating the difference between the initial WIS plus the water in-flows minus water out-flows (through evaporation or water treatment).

For example: WIS Period 2 = (WIS Period 1) + (Water Addition Volume (7)) - (Evaporated Volume (5))
= 1,411,829,000 + 107,009,000 - 96,768,000 = 1,422,070,000 gallons

Table 5-11. Post Mining Process Water Management and Water Treatment Flow Rates

100-Year Water Handling Plan with Nanofiltration Water Treatment Plan

This table presents the water solution volumes and flow rates associated with a 100-year water handling plan. Identifed are:

1. System in-flow components of impacted water that must be handled and flow rates of the components,
2. A schedule for reduction of water in storage through operation of an evaporation system,
3. A schedule of water treatment plant operating rates that correspond to impacted water in-flow rates that require treatment, and
4. A schedule of flow rates of water available for beneficial use that result from commingling water from water treatment plant effluent, pit interceptor well water, and fresh water sources.

Notes to calculation in Table:

(1) During the mining and copper leaching operations approximately 30,000 gpm of water is circulated through the copper production system. After cessation of the mining operation, the leaching operation will stop. However continued operation of the water application system as an evaporation system will deplete the leach system water contained in storage. The flow rate of the evaporation system can be as high as the flow rate during leaching operation and it will be reduced as the water in storage is depleted.

(2) "Evaporation Sytem Water Water Loss" (EWL) is estimated to be 8% of the evaporation system flow rate. The rate of water loss depends on the amount of surface area that is wetted where evaporation occurs.
Evaporation System Water Loss = Evaporation System Flow Rate (1) x 8% x 60 min/hr x 24 hr/ day x 365 days/yr

(3) For Year-1, Total Combined Impacted Water In-flow (column-13) will be included in the evaporation sytem.
For Year-2 through Year-5, water pumped from the groundwater remediation wells (5 gpm) will be included in the evaporation system (just as it is included in process circulation currently), the remaining Total Combined Impacted Water In-Flow (column-13) will be included in the Flow Rate to Water Treatment Plant (column-14).

(4) Sources of water in-flow to the system related to the Main Pit groundwater and the estimated average flow rate. In-flow decreases as a result of pumping the pit interceptor wells (column-18) and due to cessation of leaching.
(ref.:DBS&A Main Pit groundwater in-flow modeling with intercept wells pumping.)

(5) Sources of water in-flow to the system related to the Gettysburg Pit groundwater and the estimated average flow rate. In-flow decreases as a result of pumping the pit interceptor wells (column-18) and due to cessation of leaching.
(ref.:DBS&A Gettysburg Pit groundwater in-flow modeling with intercept wells pumping.)

(6) Sources of water in-flow to the system related to the Main Pit storm water run-on and the estimated average flow rate.

(7) Sources of water in-flow to the system related to the Gettysburg Pit storm water run-on and the estimated average flow rate.

(8) Sources of water in-flow to the system related to the Copper Mountain Pit storm water run-on and the estimated average flow rate.

(9) Water in-flow to the system related to the residual draindown from the stockpiles and the estimated average flow rate. This flow event will not occur until cessation of water application to the stockpiles during operation of the evaporation system.

(10) Water in-flow to the system from the stockpile toe collections and the estimated average flow rate of each source. The flow volume for first five years will be included in the evaporation system flow rate. After the 5-year period, 150 gpm is estimated to be from seepage through stockpiles and 20 gpm is estimated to be run-off from uncovered stockpiles. The total flow rate from these two sources is 170 gpm in year-6 through year-100.
However, the flow rate schedule shown in this table is from the State of New Mexico.

(11) Water in-flow to the system from the Lower Oak Grove perched system and the estimated average flow rate. The flow volume for the first five years will be included in the evaporation system flow rate. After the 5-year period, 5 gpm is assumed to be the average flow rate from this source over a period of 10 years. At an average flow rate of 5 gpm, the estimated volume of water that is existing in this system will be depleted in about 5 years. However it has been assumed in this schedule that the additional 10 years of pumping will be required until water that naturally recharges this perched zone will meet standards.
However, the flow rate schedule shown in this table is from the State of New Mexico.

(12) Water inflow to the system from the groundwater remediation wells and the estimated average flow rate from this source. The flow volume for the first five years will be included in the evaporation system flow rate. After the 5-year period, the flow volume will be included in the feed to the Water Treatment Plant. The flow rate is estimated to be 250 gpm for the first 11 years, decreasing to 120 gpm for the next 10 years, and decreasing to 50 gpm for the next 10-year period. After this 31 year period, water from this source will be depleted.
However, the flow rate schedule shown in this table is from the State of New Mexico.

(13) "Combined Impacted Water In-Flow Rate" (CIW) is total of in-flows columns, column-4 through column-12.

(14) "Flow Rate to Water Treatment Plant" is the flow rate that is the basis for determining the WTP operating cost.
This flow rate number is the "Active In-Flows to WTP" (column-15) number rounded up.
Water treatment starts in Year-2 after cessation of operation.

(15) "Active Inflows to WTP" = (CIW (column-13)) - (Impacted Water Included in Evaporation System Flow Rate (column-3))
The WTP will treat impacted water minus water that will be removed through the evaporation system.

(16) Water in Storage at the end of a year in the schedule.
Initial "Water in Storage" (WIS) = water in pit (500,000,000 gallons) plus water in stockpile impoundments and ponds (6,250,000 gallons) plus "Average Circulated Inventory" (ACI).

"Average Circulated Inventory" (ACI) is calculated based on experience with leach operation:
When raffinate application is stopped, PLS flow rate from stockpiles diminishes to 10% of the full flow rate in 45 days.
Also, when raffinate application is stopped, 90% of the PLS drain-down from stockpiles is achieved in 45 days.
Make-up water requirement = 8% of Raffinate Flow Rate during leaching.
(Therefore 92% of the Raffinate Flow Rate reports to PLS.)
For an initial raffinate flow rate of 30,000 gallons per minute, the ACI is calculated as follows:

$$\text{ACI} = \frac{((30{,}000 \times 92\%) - (10\% \times (30{,}000 \times 92\%)) \times 60 \text{ min/hr} \times 24 \text{ hr/day} \times 45 \text{ day drain-down cycle} \times 50\% \text{ average flow rate factor}}{90\% \text{ of the PLS drain-down}}$$

ACI = 894,240,000 gallons

And the initial water in storage can be calculated as follows:
Initial "Water in Storage" = (500,000,000 + 6,250,000 + 894,240,000) gallons = 1,400,490,000 gallons.

The volumn of WIS decreases as a result of calculating the difference between the initial WIS plus the water in-flows minus water out-flows (through evaporation or water treatment).

For example: WIS Year 2 = (WIS Year-1) + (CIW (13) Year-2 x 60 min/hr x 24 hr/day x 365 days/yr) - (EWL (2) Year-2) - (Active In-flows to WTP (15) Year-2 x 60 min/hr x 24 hr/day x 365 days/yr)
= 1,531,364,400 + (2,563 x 60 x 24 x 365) - (756,864,000) - (2,313 x 60 x 24 x 365) =
= 905,900,400 gallons

(17) "Treated Water Flow Rate" (TWFR) is effluent from the Water Treatment Plant to beneficial use.

(18) "Pit Intercept Water Pumping Rate" (PIWPR) is the rate of pumping from interceptor wells to reduce the in-flow of groundwater to the pits.

(19) "Fresh Water Rate" (FWR) is the amount of fresh water that is planned to be commingled with TWFR and PIWPR.

(20) Water for beneficial use = TWFR + PIWPR + FWR

	Evaporation System Water Flow Rates			System Inflows - Impacted Water: Pit Water In-flows					Stockpile Water In-flows				Total	Water Treatment Schedule			Water For Beneficial Use				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	
Year	Evaporation System Flow Rate (gpm)	Evaporation System Water Loss (gallons per year)	Impacted Water Included In Evaporation System Flow Rate (gpm)	Main Pit Groundwater Inflow (gpm)	Gettysburg Pit Groundwater Inflow (gpm)	Main Pit Storm Water Run-on Inflow (gpm)	Gettysburg Pit Storm Water Run-on Inflow (gpm)	Copper Mt. Pit Storm Water Run-on Inflow (gpm)	Residual PLS Draindown (gpm)	Flow from Toe Collections (gpm)	Lower Oak Grove Perched System (gpm)	Pumping Rate of Groundwater Remediation Wells (gpm)	Combined Impacted Water In-flow Rate (gpm)	Flow Rate to Water Treatment Plant (gpm)	Active In-Flows to WTP (gpm)	**Water in Storage (gallons)**	Treated Water Flow Rate (gpm)	Pit Intercept Water Pumping Rate (gpm)	Fresh Water Rate (gpm)	Total Water Flow Rate to Beneficial Use (gpm)	Year
1	30,000	1,261,440,000	2,649	1,703	306	240	108	42	-	-	-	250	2,649	-	-	1,531,364,400	-	1,537	-	1,537	1
2	15,000	630,720,000	-	1,617	305	240	108	42	-	-	-	250	2,563	2,570	2,563	900,644,400	2,570	1,537	-	4,107	2
3	10,000	420,480,000	-	1,473	305	240	108	42	-	-	-	250	2,417	2,420	2,417	480,164,400	2,420	1,537	-	3,957	3
4	7,000	294,336,000	-	1,359	303	240	108	42	-	-	-	250	2,302	2,310	2,302	185,828,400	2,310	1,537	-	3,847	4
5	4,450	187,113,600	-	1,270	301	240	108	42	-	-	-	250	2,211	2,220	2,211	-	2,220	1,537	-	3,757	5
6				1,197	298	240	108	42	20	170	5	250	2,330	2,330	2,330	-	2,330	1,537	-	3,867	6
7				1,137	295	240	108	42	20	160	5	250	2,256	2,260	2,256	-	2,260	1,537	-	3,797	7
8				1,086	291	240	108	42	20	140	5	250	2,182	2,190	2,182	-	2,190	1,537	-	3,727	8
9				1,041	288	240	108	42	20	120	5	250	2,114	2,120	2,114	-	2,120	1,537	-	3,657	9
10				1,002	284	240	108	42	20	100	5	250	2,051	2,060	2,051	-	2,060	1,537	-	3,597	10
11				968	281	240	108	42	20	80	5	250	1,993	2,000	1,993	-	2,000	1,537	-	3,537	11
12				935	278	240	108	42	20	50	5	250	1,928	1,930	1,928	-	1,930	1,537	-	3,467	12
13				907	275	240	108	42	20	50	5	250	1,896	1,900	1,896	-	1,900	1,537	-	3,437	13
14				882	272	240	108	42	20	50	5	250	1,869	1,870	1,869	-	1,870	1,537	-	3,407	14
15				859	269	240	108	42	20	25	5	250	1,818	1,820	1,818	-	1,820	1,537	-	3,357	15
16				837	266	240	108	42	5	25	-	250	1,773	1,780	1,773	-	1,780	1,230	-	3,010	16
17				818	264	240	108	42	5	25	-	250	1,751	1,760	1,751	-	1,760	1,230	-	2,990	17
18				802	261	240	108	42	5	-	-	250	1,708	1,710	1,708	-	1,710	1,230	-	2,940	18
19				788	259	240	108	42	5	-	-	250	1,692	1,700	1,692	-	1,700	1,230	-	2,930	19
20				776	257	240	108	42	5	-	-	250	1,678	1,680	1,678	-	1,680	1,230	-	2,910	20
21				765	256	240	108	42	5	-	-	250	1,666	1,670	1,666	-	1,670	1,230	-	2,900	21
22				754	254	240	108	42	5	-	-	250	1,654	1,660	1,654	-	1,660	1,230	-	2,890	22
23				745	253	240	108	42	5	-	-	250	1,643	1,650	1,643	-	1,650	1,230	-	2,880	23
24				735	252	240	108	42	5	-	-	250	1,633	1,640	1,633	-	1,640	1,230	-	2,870	24
25				727	251	240	108	42	5	-	-	250	1,623	1,630	1,623	-	1,630	1,230	-	2,860	25
26				719	250	240	108	42	-	-	-	250	1,609	1,610	1,609	-	1,610	1,230	-	2,840	26
27				712	249	240	108	42	-	-	-	250	1,601	1,610	1,601	-	1,610	1,230	-	2,840	27
28				706	249	240	108	42	-	-	-	250	1,594	1,600	1,594	-	1,600	1,230	-	2,830	28
29				699	247	240	108	42	-	-	-	250	1,586	1,590	1,586	-	1,590	1,230	-	2,820	29
30				693	247	240	108	42	-	-	-	250	1,579	1,580	1,579	-	1,580	1,230	-	2,810	30
31				687	246	240	108	42	-	-	-	250	1,573	1,580	1,573	-	1,580	1,230	-	2,810	31
32				680	246	240	108	42	-	-	-	250	1,566	1,570	1,566	-	1,570	1,230	-	2,800	32
33				675	245	240	108	42	-	-	-	250	1,560	1,560	1,560	-	1,560	1,230	-	2,790	33
34				670	244	240	108	42	-	-	-	250	1,555	1,560	1,555	-	1,560	1,230	-	2,790	34
35				666	244	240	108	42	-	-	-	250	1,549	1,550	1,549	-	1,550	1,230	-	2,780	35
36				661	243	240	108	42	-	-	-	250	1,545	1,550	1,545	-	1,550	1,230	-	2,780	36
37				657	243	240	108	42	-	-	-	250	1,539	1,540	1,539	-	1,540	1,230	-	2,770	37
38				652	242	240	108	42	-	-	-	250	1,534	1,540	1,534	-	1,540	1,230	-	2,770	38
39				648	242	240	108	42	-	-	-	250	1,530	1,530	1,530	-	1,530	1,230	-	2,760	39
40				644	241	240	108	42	-	-	-	250	1,525	1,530	1,525	-	1,530	1,230	-	2,760	40
41				639	241	240	108	42	-	-	-	250	1,520	1,520	1,520	-	1,520	1,230	-	2,750	41
42				635	240	240	108	42	-	-	-	250	1,515	1,520	1,515	-	1,520	1,230	-	2,750	42
43				631	240	240	108	42	-	-	-	250	1,511	1,520	1,511	-	1,520	1,230	-	2,750	43
44				627	239	240	108	42	-	-	-	250	1,507	1,510	1,507	-	1,510	1,230	-	2,740	44
45				624	239	240	108	42	-	-	-	250	1,503	1,510	1,503	-	1,510	1,230	-	2,740	45
46				621	239	240	108	42	-	-	-	250	1,500	1,500	1,500	-	1,500	1,230	-	2,730	46
47				617	238	240	108	42	-	-	-	250	1,495	1,500	1,495	-	1,500	1,230	-	2,730	47
48				614	238	240	108	42	-	-	-	250	1,492	1,500	1,492	-	1,500	1,230	-	2,730	48
49				611	237	240	108	42	-	-	-	250	1,489	1,490	1,489	-	1,490	1,230	-	2,720	49
50				608	237	240	108	42	-	-	-	250	1,485	1,490	1,485	-	1,490	1,230	-	2,720	50
51				606	237	240	108	42	-	-	-	250	1,483	1,490	1,483	-	1,490	1,230	-	2,720	51
52				603	236	240	108	42	-	-	-	250	1,479	1,480	1,479	-	1,480	1,230	-	2,710	52
53				600	236	240	108	42	-	-	-	250	1,476	1,480	1,476	-	1,480	1,230	-	2,710	53
54				597	236	240	108	42	-	-	-	250	1,473	1,480	1,473	-	1,480	1,230	-	2,710	54
55				594	235	240	108	42	-	-	-	250	1,470	1,470	1,470	-	1,470	1,230	-	2,700	55
56				592	235	240	108	42	-	-	-	250	1,467	1,470	1,467	-	1,470	1,230	-	2,700	56
57				589	235	240	108	42	-	-	-	250	1,464	1,470	1,464	-	1,470	1,230	-	2,700	57
58				587	234	240	108	42	-	-	-	250	1,461	1,470	1,461	-	1,470	1,230	-	2,700	58
59				585	234	240	108	42	-	-	-	250	1,459	1,460	1,459	-	1,460	1,230	-	2,690	59
60				583	234	240	108	42	-	-	-	250	1,456	1,460	1,456	-	1,460	1,230	-	2,690	60
61				581	234	240	108	42	-	-	-	250	1,454	1,460	1,454	-	1,460	1,230	-	2,690	61
62				578	233	240	108	42	-	-	-	250	1,452	1,460	1,452	-	1,460	1,230	-	2,690	62
63				576	233	240	108	42	-	-	-	250	1,449	1,450	1,449	-	1,450	1,230	-	2,680	63
64				574	233	240	108	42	-	-	-	250	1,446	1,450	1,446	-	1,450	1,230	-	2,680	64
65				572	232	240	108	42	-	-	-	250	1,444	1,450	1,444	-	1,450	1,230	-	2,680	65
66				570	232	240	108	42	-	-	-	250	1,442	1,450	1,442	-	1,450	1,230	-	2,680	66
67				568	232	240	108	42	-	-	-	250	1,440	1,440	1,440	-	1,440	1,230	-	2,670	67
68				566	232	240	108	42	-	-	-	250	1,438	1,440	1,438	-	1,440	1,230	-	2,670	68
69				565	231	240	108	42	-	-	-	250	1,436	1,440	1,436	-	1,440	1,230	-	2,670	69
70				563	231	240	108	42	-	-	-	250	1,434	1,440	1,434	-	1,440	1,230	-	2,670	70
71				562	231	240	108	42	-	-	-	250	1,433	1,440	1,433	-	1,440	1,230	-	2,670	71
72				560	231	240	108	42	-	-	-	250	1,430	1,430	1,430	-	1,430	1,230	-	2,660	72
73				558	230	240	108	42	-	-	-	250	1,429	1,430	1,429	-	1,430	1,230	-	2,660	73
74				557	230	240	108	42	-	-	-	250	1,427	1,430	1,427	-	1,430	1,230	-	2,660	74
75				556	230	240	108	42	-	-	-	250	1,426	1,430	1,426	-	1,430	1,230	-	2,660	75
76				555	230	240	108	42	-	-	-	250	1,424	1,430	1,424	-	1,430	1,230	-	2,660	76
77				553	230	240	108	42	-	-	-	250	1,423	1,430	1,423	-	1,430	1,230	-	2,660	77
78				552	229	240	108	42	-	-	-	250	1,422	1,430	1,422	-	1,430	1,230	-	2,660	78
79				551	229	240	108	42	-	-	-	250	1,420	1,420	1,420	-	1,420	1,230	-	2,650	79
80				550	229	240	108	42	-	-	-	250	1,419	1,420	1,419	-	1,420	1,230	-	2,650	80
81				549	229	240	108	42	-	-	-	250	1,417	1,420	1,417	-	1,420	1,230	-	2,650	81
82				548	229	240	108	42	-	-	-	250	1,416	1,420	1,416	-	1,420	1,230	-	2,650	82
83				547	229	240	108	42	-	-	-	250	1,415	1,420	1,415	-	1,420	1,230	-	2,650	83
84				546	228	240	108	42	-	-	-	250	1,414	1,420	1,414	-	1,420	1,230	-	2,650	84
85				545	228	240	108	42	-	-	-	250	1,413	1,420	1,413	-	1,420	1,230	-	2,650	85
86				544	228	240	108	42	-	-	-	250	1,412	1,420	1,412	-	1,420	1,230	-	2,650	86
87				543	228	240	108	42	-	-	-	250	1,411	1,420	1,411	-	1,420	1,230	-	2,650	87
88				542	228	240	108	42	-	-	-	250	1,410	1,410	1,410	-	1,410	1,230	-	2,640	88
89				541	228	240	108	42	-	-	-	250	1,409	1,410	1,409	-	1,410	1,230	-	2,640	89
90				540	228	240	108	42	-	-	-	250	1,408	1,410	1,408	-	1,410	1,230	-	2,640	90
91				540	227	240	108	42	-	-	-	250	1,407	1,410	1,407	-	1,410	1,230	-	2,640	91
92				539	227	240	108	42	-	-	-	250	1,406	1,410	1,406	-	1,410	1,230	-	2,640	92
93				538	227	240	108	42	-	-	-	250	1,405	1,410	1,405	-	1,410	1,230	-	2,640	93
94				537	227	240	108	42	-	-	-	250	1,405	1,410	1,405	-	1,410	1,230	-	2,640	94
95				537	227	240	108	42	-	-	-	250	1,404	1,410	1,404	-	1,410	1,230	-	2,640	95
96				536	227	240	108	42	-	-	-	250	1,403	1,410	1,403	-	1,410	1,230	-	2,640	96
97				536	227	240	108	42	-	-	-	250	1,403	1,410	1,403	-	1,410	1,230	-	2,640	97
98				535	227	240	108	42	-	-	-	250	1,402	1,410	1,402	-	1,410	1,230	-	2,640	98
99				535	227	240	108	42	-	-	-	250	1,401	1,410	1,401	-	1,410	1,230	-	2,640	99
100				534	227	240	108	42	-	-	-	250	1,401	1,410	1,401	-	1,410	1,230	-	2,640	100

4 CAPITAL AND OPERATING COSTS

4.1 ALTERNATIVE 1 CAPITAL COSTS

A summary of the capital costs for implementation of this alternative is shown in Table 4.1. The capital cost assumes purchase of new pumps, pipelines and irrigation components. The system is designed for a maximum pumping capacity of 30,000 gallons per minute. Details of the estimate are in the Appendix B.

Tyrone Process Solution Elimination Study
Table 4.1 - Capital Cost Schedule - Alternative 1 Evaporation System

Cost Item		
Direct Cost		
Pipe System	$	1,846,869
Pump System	$	3,486,523
Sub-Total Direct Cost	$	5,333,392
Indirect Cost	$	2,567,361
Total Constructed Cost	$	7,900,753

4.2 ALTERNATIVE 1 OPERATING COSTS

A summary of the operating costs is shown in Table 4.2. The basis of the operating cost estimating is the same as has been used in preparation of the CCP and financial assurance estimates for DP-1341. Details of the operating estimate are in the Appendix C.

Tyrone Process Solution Elimination Study
Table 4.2 - Operating Cost Schedule - Alterntive 1 Evaporation System

Cost Item	Annual Cost Year 1		Annual Cost Year 2	
Evaporation Operation				
Labor	$	104,500	$	20,900
Maintenance	$	30,000	$	6,000
Electric Power	$	3,631,500	$	624,300
Sub-Total Evaporation Operation	$	3,766,000	$	651,200
Contract Annual Site Maintenance				
Labor	$	5,900	$	1,200
Supplies & Equipment	$	3,600	$	1,600
Sub-Total Annual Site Modification	$	9,500	$	2,800
Total Annual Evaporation Operating Cost	$	3,775,500	$	654,000

4.3 ALTERNATIVE 2 CAPITAL COSTS

A summary of the capital costs for implementation of this alternative is shown in Table 4.3. The capital cost assumes purchase of new pumps, pipelines and irrigation components. The system is designed for a maximum pumping capacity of 30,000 gallons per minute. Details of the estimate are in the Appendix B.

Tyrone Process Solution Elimination Study

Table 4.3 - Capital Cost Schedule - Alternative 2 Evaporation System

Cost Item		
Direct Cost		
Pipe System …………	$	2,105,481
Pump System…………	$	3,486,523
Sub-Total Direct Cost	$	5,592,004
Indirect Cost	$	2,691,851
Total Constructed Cost	$	8,283,855

4.4 ALTERNATIVE 2 OPERATING COSTS

A summary of the operating costs is shown in Table 4.4. The basis of the operating cost estimating is the same as has been used in preparation of the CCP and financial assurance estimates for DP-1341. Details of the operating estimate are in the Appendix C.

Tyrone Process Solution Elimination Study

Table 4.4 - Operating Cost Schedule - Alternative 2 Evaporation System

Cost Item	Annual Cost Year 1	Annual Cost Year 2	Annual Cost Year 3	Annual Cost Year 4	Annual Cost Year 5
Evaporation Operation					
Labor	$ 104,500	$ 104,500	$ 104,500	$ 104,500	$ 73,200
Maintenance	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 21,000
Electric Power	$ 4,965,900	$ 3,777,200	$ 2,594,000	$ 1,410,900	$ 411,000
Sub-Total Evaporation Operation	$ 5,100,400	$ 3,911,700	$ 2,728,500	$ 1,545,400	$ 505,200
Contract Annual Site Maintenance					
Labor	$ 5,900	$ 5,900	$ 5,900	$ 5,900	$ 4,100
Supplies & Equipment	$ 3,600	$ 3,600	$ 3,600	$ 3,600	$ 2,900
Sub-Total Annual Site Modification	$ 9,500	$ 9,500	$ 9,500	$ 9,500	$ 7,000
Total Annual Evaporation Operating Co:	$ 5,109,900	$ 3,921,200	$ 2,738,000	$ 1,554,900	$ 512,200

5 RECOMMENDED ALTERNATIVE

Alternative 1 is recommended as the process solution elimination system to be implemented after Cessation of Operation of the SXEW plant. Alternative 1 requires the use of a smaller stockpile surface, takes advantage of higher evaporation loss rates and has a lower overall total cost.

6 REFERENCES

Tetra Tech EM Inc. (TTEMI), 2004. Cover Design Report 3X Tailing Impoundment, April 2004

New Mexico Environment Department (NMED). 2003a. Supplemental Discharge Permit for Closure DP-1341, Phelps Dodge Tyrone, Inc., Tyrone Mines Facility

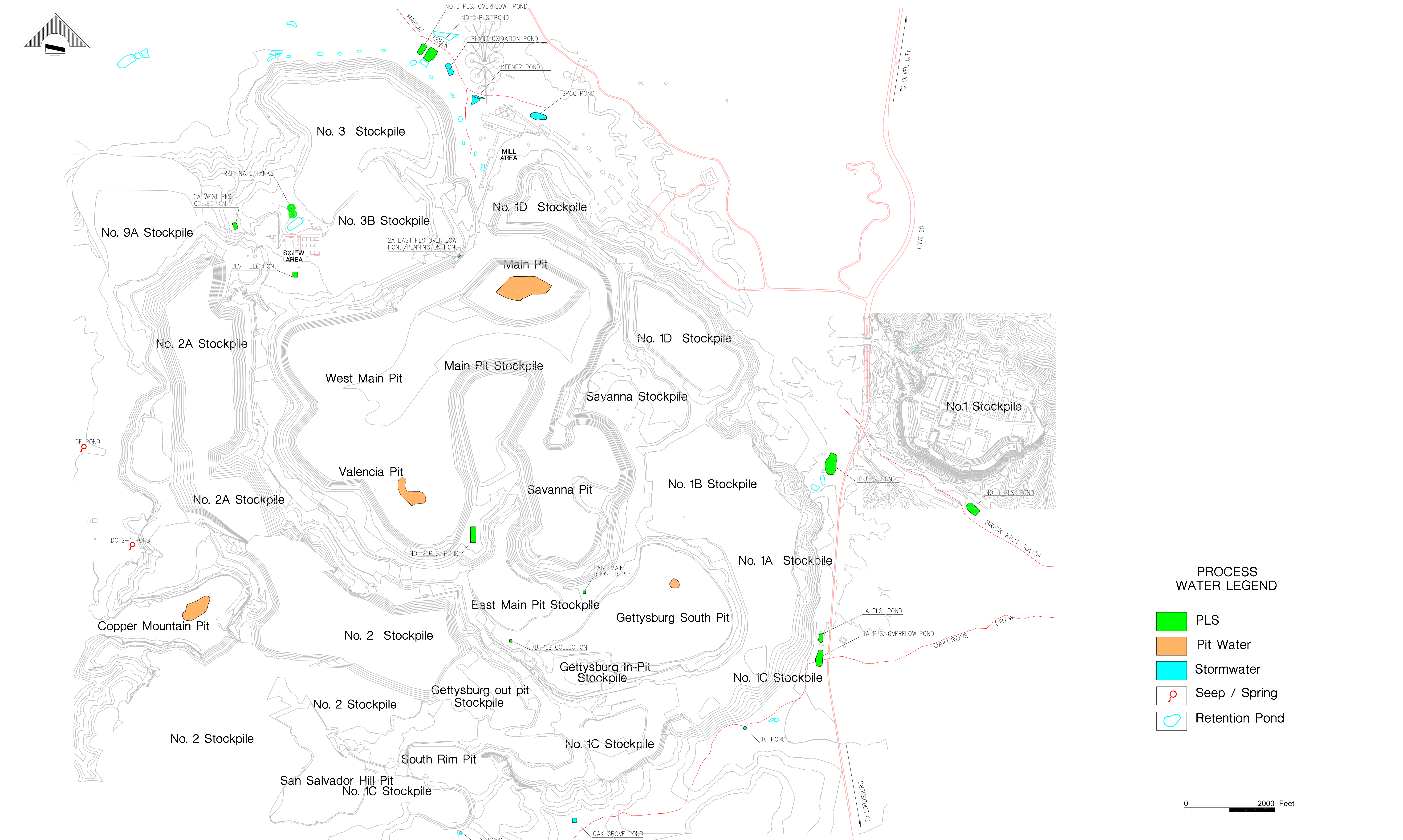
M3 Engineering (M3) 2001. End of Year 2001 through Year 2008 Closure/Closeout Plan, Tyrone Mine, March 2001. (M3, 2001).

M3 Engineering (M3) 2002. Feasibility Study, Solution Management of Process Water for Closure, Phelps Dodge Tyrone Inc., New Mexico. April 2002. (M3, 2002)

Daniel B. Stephens & Associates, Inc. (DBSA) Groundwater Study. 1997C.

APPENDIX A

LIST OF FIGURES



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SCALE: AS NOTED
DESIGNED BY AG 06/04
DRAWN BY C.R. 06/04
CHECKED BY A.G.
PROJECT MGR C.H.
CLIENT APPR.

M3 Engineering & Technology Corp.
Tucson, Arizona
Tel.(520)293-1488 Fax.(520)293-8349
Hermosillo, Sonora Mexico
Tel. 011-52-62-105400 Fax.011-52-62-105404

PHELPS DODGE TYRONE, INC.
PROCESS WATER LOCATIONS SITE PLAN
JOB NO. M3-PN02060
DWG NO. FIG. 3.0
REV NO. DATE 06/04

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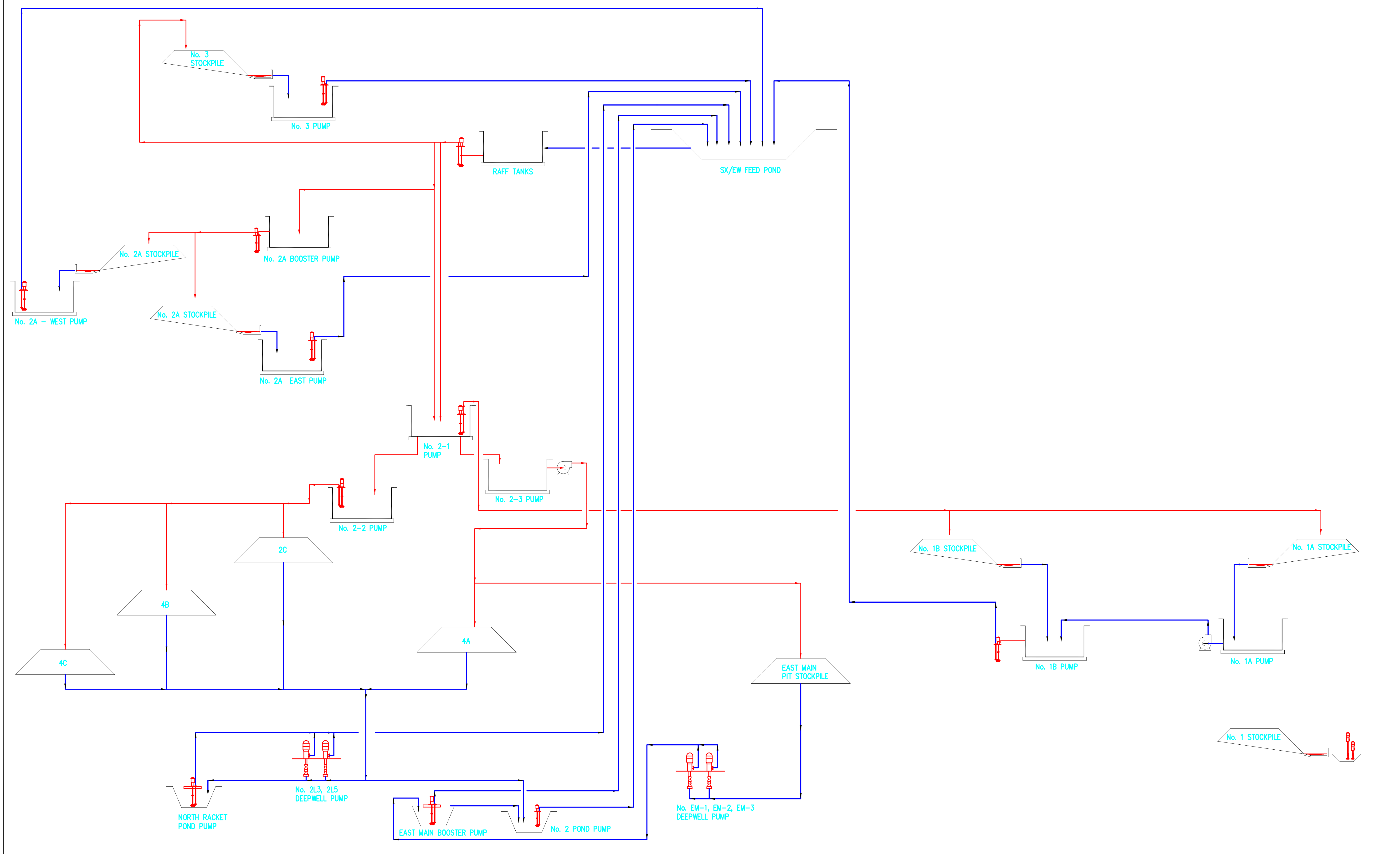

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DWG. NO.	TITLE	DWG. NO.	TITLE

REVISIONS						REVISIONS					
NO.	DESCRIPTION	BY	APP'D	DATE	CLIENT	NO.	DESCRIPTION	BY	APP'D	DATE	CLIENT

SCALE: NONE		DATE
DESIGNED BY	T.D.	06/04
DRAWN BY	P.R.	06/04
CHECKED BY		
PROJECT MGR		
CLIENT APPR.		

M3 Engineering & Technology Corp.
Tucson, Arizona
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Hermosillo, Sonora Mexico
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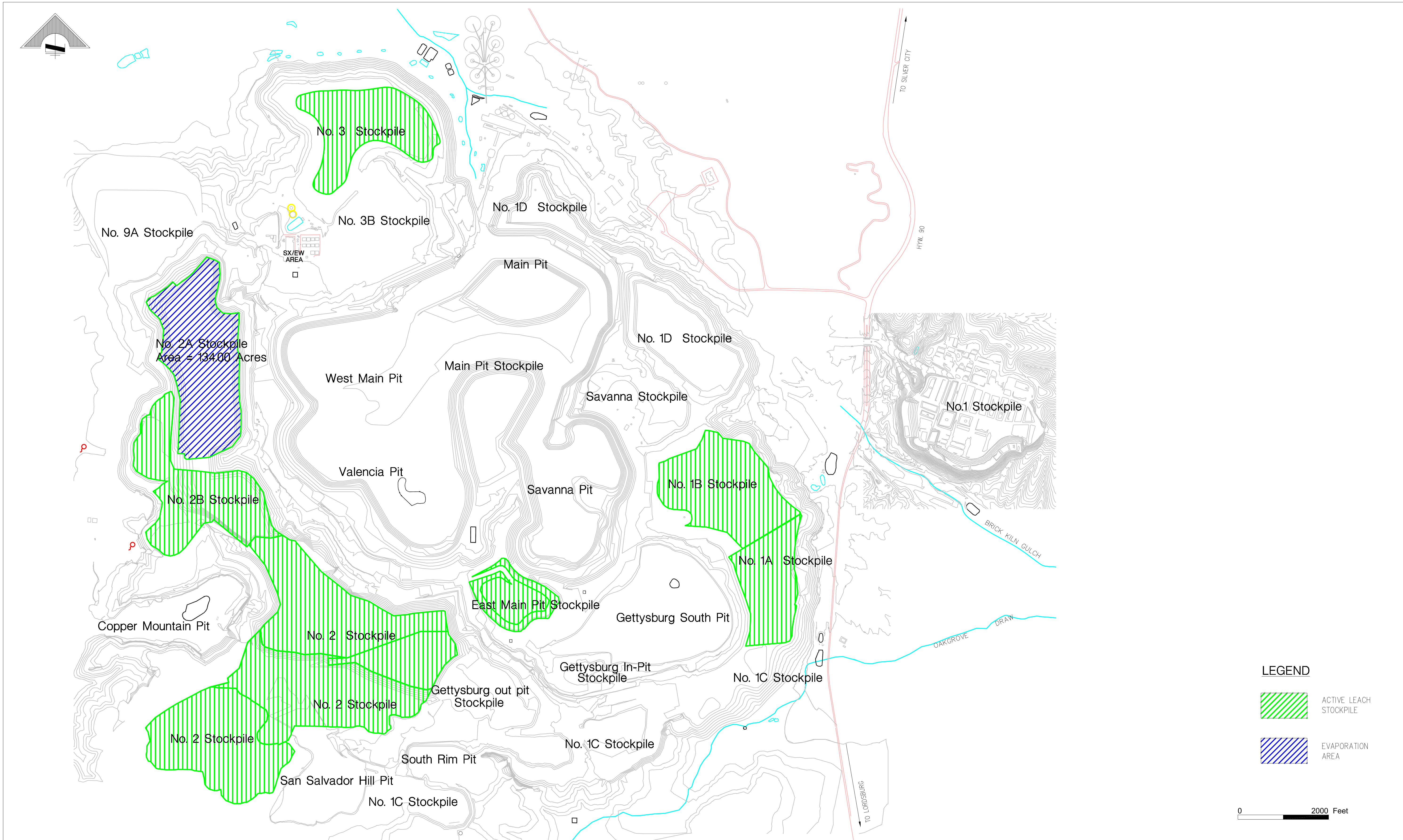
PHELPS DODGE TYRONE, INC.

SOLUTION MANAGEMENT

SYSTEM FLOW DIAGRAM

JOB NO. M3–PN02060
DWG NO. FIG. 3.2
REV NO.
DATE 06/04

NAME: P:\2002\02060\Civil\FIG 3.2.dwg LAST REV: LAST UPDATE: JUN 24, 2004 TIME: 7:52 AM BY: pr504 PLOT SCALE: 1:1



REFERENCES		REFERENCES		REVISIONS					REVISIONS				
DWG. NO.	TITLE	DWG. NO.	TITLE	NO.	DESCRIPTION	BY	APP'D	DATE	CLIENT	NO.	DESCRIPTION	BY	APP'D DATE CLIENT

SCALE: AS NOTED		DATE
DESIGNED BY	AG	06/04
DRAWN BY	C.R.	06/04
CHECKED BY	A.G.	
PROJECT MGR	C.H.	
CLIENT APPR.		

M3 Engineering & Technology Corp.
Tucson, Arizona
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PHELPS DODGE TYRONE, INC.

STOCKPILE
ACTIVE LEACH
PLAN

JOB NO. M3-PN02060
DWG NO.
FIG. 3.3
REV NO.
DATE 06/04

NAME: P:\2002\02060\Civil\FIG 3.3.dwg LAST REV: LAST UPDATE: JUN 24, 2004 TIME: 7:56 AM BY: pr504 PLOT SCALE: 1:1

APPENDIX B
CAPITAL COST ESTIMATE

1.0 Capital Costs

This section addresses capital cost estimates for the Process Solution Elimination System.

The following sub-sections address the general Basis of Capital Cost Estimate plus category unit specific bases to identify boundary conditions and any assumptions.

Backup material takeoff information and costing are contained at the end of this section for both estimates.

1.1 Basis of Capital Cost Estimate

- The following assumptions are used to determine the capital cost.
- All costs are in third quarter 2004 dollars.
- Construction access to the site will be available to the general contractor 24 hours per day, Sunday through Saturday.
- Labor rates are based on merit shop wages – 45 hour work weeks; i.e., 5 hours of overtime each week per worker.
- The estimate assumes that the project will be awarded to one general contractor per major unit of work and that only one mobilization will be required.
- The capital cost contingency included in this estimate is for the Scope of Work as defined. Contingency is not for items outside the Scope of Work.
- Owner will not supply any construction equipment (such as dozers or haul trucks or water trucks) to the project.
- Contractor will have trailer and lay down yard access near the construction site.
- Quantities estimated are based on computer-aided plans and sections using the best available drawings.

- All work will be performed by a third-party contractor engaged by the State of New Mexico through open competitive bid.

- There will be no excessively restrictive times of completion or liquidated damages specified in the contract documents.

- For indirect costs, the work is assumed to be part of the closure/closeout.

- Hourly rates used for these estimates were obtained from a third-party contractor who is regularly engaged in heavy construction contracting and are as follows:

Classification	Straight Time	Overtime
Carpenter – 01	32.57	45.05
Carpenter – 03	29.85	41.08
Carpenter – Foreman	36.39	55.80
Concrete Finisher – 01	24.24	33.74
Concrete Finisher – 02	25.43	35.48
Driver – 01	20.07	27.61
Driver – 02	21.19	29.23
Driver – 03	22.89	31.70
Driver – 04	27.44	38.30
Foreman – 01	28.96	40.24
Foreman – 02	30.37	42.29
Foreman – 03	32.49	45.37
Ironworker – 02	20.42	27.84
Ironworker – 03	23.49	32.33
Ironworker – 04	25.41	35.14
Ironworker – 05	28.10	39.06
Ironworker – 06	30.02	41.87
Laborer – 01	15.17	20.49
Laborer – 02	17.42	23.76
Laborer – 03	20.25	27.86
Laborer – 04	23.07	41.87
Millwright – 02	19.01	25.74
Millwright – 03	21.82	29.82
Millwright – 04	23.57	32.38
Millwright – 05	26.03	35.95
Millwright – 06	27.78	38.50
Operator – 01	22.82	31.60
Operator – 02	27.10	37.82
Operator – 03	28.55	39.92

Pipefitter – 02	18.74	25.33
Pipefitter – 03	21.50	29.34
Pipefitter – 04	23.22	31.85
Pipefitter – 05	25.63	35.36
Pipefitter – 06	27.35	37.86
CLERK	16.56	22.47
ENGINEER	32.46	--
CRAFT SUPERINTENDENT	47.41	--

Per Diem, if applicable, shall be added at $3.75 per hour.

1.2 Capital Cost Estimate Parameters – Direct Costs:

The following direct capital cost parameters were used to develop the estimate.

- Direct costs include labor costs including payroll burden, field supervision, materials of construction, equipment rental costs, equipment operating costs and subcontracted costs.

- Labor cost includes the wages the worker earns, the payroll taxes and insurance paid by the contractor, allowance for fringe benefits including holidays, vacation, sick time, medical insurance, subsistence, clothing allowances, etc and small tools.

- Field supervision includes the wages and benefits for the field supervisory crew, field offices including furniture and equipment and transportation.

- Materials of construction include the materials that become part of the facility as well as the consumable supplies that are used to build the facility.

- Equipment rental cost includes the costs to rent equipment from third-party rental houses and the ownership cost of contractor owned equipment such as depreciation, taxes, interest cost and insurance.

- Equipment operating costs include fuel, lubrication, tires, repair parts, maintenance labor, repair labor, shop operating costs, filters, ground engaging tools.

- Subcontracts are the costs to other contractors to perform specialized tasks that the prime or general contractor lacks the expertise or ability to perform. These costs include the same direct costs as above and also the subcontractor overhead and profit.

1.3 Capital Cost Estimate Parameters – Indirect Costs:

1.3.1 Mobilization and Demobilization

- Allowance for moving construction equipment to and from the job site.

- Costs are a function of equipment size, weight, distance shipped.

- In that this is a performance bond estimate, a single mobilization is assumed. Mobilization is calculated at 1.5% of direct cost.

1.3.2 Contingency Allowances

- Only to cover unforeseeable or unanticipated costs not already included in the assumptions used to estimate the given scope of work.

- Contingency does not include allowance for items outside of scope.

- Contingency is calculated as a fixed percentage of total direct costs and can vary with size of project from 10% to 2%; i.e., small to large projects.

- 2% has been used for this estimate.

1.3.3 Engineering Redesign Costs

- In the event of bond forfeiture, the conditions and assumptions used in the permit application will be reviewed.

- Some aspects of the site conditions and assumptions used at the time of the bond issue may have changed and an engineering redesign may be necessary.

- 2.5 to 6% of total direct costs is a baseline estimate. Percentages outside this range will include an explanation.

- 4.5% is used for this estimate.

1.3.4 Profit & Overhead

- Work is performed by a third party. This is the allowance for the third-party contractor's profit and overhead. Profit and overhead are calculated separately.

1.3.5 Profit Margin

- 30% for small jobs to 3% for very large jobs of total direct costs is a baseline estimate.

- Actual costs estimates for required profit margin to accept/bid the work will be a function of the financial conditions of available contractors at the time of the work.

- 4% is used for this estimate.

1.3.6 Overhead

- 5% to 7% of total direct costs is a minimum baseline estimate. 20% is more common.

- Costs of equipment, labor and materials not already included in the estimate. Normally these include:
  - Temporary storage
  - Temporary office equipment and facilities
  - Temporary utilities
  - Insurance
  - Taxes (Gross Receipts not included)
  - Security
  - Permits
  - Supervisor pickups
  - Project supervision
  - Temporary building equipment maintenance
  - Equipment maintenance overhead

- 21% is used for this estimate.

1.3.7 Construction Management/Cost Control Fee

- Costs of hiring third-party inspection and supervision of contractor reclamation work.

- Items considered additional costs include such things as dam inspections.

- 5% is used for this estimate.

- Major indirect costs have been assumed as follows:
  - Engineering Redesign
    4.5% Total Constructed Cost
  - Const. Mgmt/Project Controls
    5% Total Constructed Cost
  - Mob. and Demob.
    1.5% Total Constructed Cost
  - Contingency
    2% Total Constructed Cost
  - Profit
    4% Total Constructed Cost
  - Overhead
    21% Total Constructed Cost

- A budget will be included for the State of New Mexico:
  - Reclamation Mgmt. Fee
    2% Total Constructed Cost

2.0 <u>Operating Costs</u>

2.1 Labor

The labor force requirements for the options have been developed based on experience from similar operations.

The direct unit labor costs (employee salaries) for operating labor have been assigned based on current labor cost experienced at existing facilities for specified job descriptions.

The direct costs (employee salaries) of supervisory labor have been estimated to be 20 percent of total operating labor and or maintenance labor based on typical industry experience.

Mandated and voluntary employee benefits have been estimated to be 30 percent of the direct labor cost based on typical industry experience.

The labor force schedule has been derived from an operating schedule based on 24-hour per day, 7-day per week operation and based on typical industry experience.

An allowance of 5 percent of base hours worked per year has been included for non-exempt employees overtime based on typical industry experience. Overtime pay has been calculated at 1.5 times the base rate.

2.2 Electric Power

The electric power cost has been calculated from the estimated power draw of water handling equipment.

An electric power unit rate of $0.055 per kilowatt-hour has been applied to the calculated power draw to determine electric power cost. The unit rate is based on the expected long term rate for low power consumers.

2.3 Maintenance Parts & Supplies

Plant maintenance cost is allocated at 2 percent of total construction cost. Total construction cost of operating system was assumed to be $3,000,000 for the purpose of including a comprehensive allocation for maintenance. The total maintenance allocation is further apportioned to 50 percent for materials and supplies and 50 percent to maintenance labor based on typical industry experience.

Capital Cost Summary Table	Process Solution Elimination System Alternate 1
Tyrone	
Stockpiles	
Tails Ponds	
Pits	
Process Solution Elimination	$7,900,753
Disturbed Areas	
Total	$7,900,753

Process Solution Elimination System		Alternate 1
4	Process Solution Elimination	
A	Continued use	
	HDPE Pipeline w/Nozzles	$1,846,869
	Recirculation Pumps	$3,486,523
	Subtotal	$5,333,392
	Total Direct Cost	$5,333,392
	Indirect Cost	
	Engineering Redesign @4.5%	$240,003
	Construction Management/Project Controls @5%	$266,670
	Mobilization and Demobilization 1.5%	$80,001
	Contingency @2%	$106,668
	Profit @4%	$213,336
	Overhead @21%	$1,120,012
	Storm Water Prevention Plan @0.0%	$0
	Reclamation Monitoring Fee @2%	$106,668
	Gross Receipts Tax @ 5.8125	$434,005
	Total Cost	$7,900,753
	Process Solution Elimination	$7,900,753

Piping

Alternate 1

		Quantity	Unit Cost	Total Cost
HDPE Pipeline w/Nozzles				
24" SDR 17 HDPE Pipe	lf	16000	74.459	$1,191,344
Flange Adpators w/Backup Rings 24"	ea	8	1644.16	$13,153
24" Bolt & Gasket Sets	ea	8	1004.1	$8,033
2" Saddles	ea	160	$47.49	$7,598
2" Nozzles	ea	160	$69.49	$11,118
				$0
Contractor Indirect Cost				$615,623
Total w/Indirect Cost				$1,846,869

Replacement Pumps for Water Recirculation System

	Connected Horsepower	Flow gpm	Head ft	Pump Cost ea	Motor Cost ea	Total w/motor ea	Installation ea	Total ea
Raff Tank Pump 1	900	7500	350	$136,200	$68,312	$204,512	$1,848	$206,360
Raff Tank Pump 2	900	7500	350	$136,200	$68,312	$204,512	$1,848	$206,360
Raff Tank Pump 3	900	7500	350	$136,200	$68,312	$204,512	$1,848	$206,360
Raff Tank Pump 4	900	7500	350	$136,200	$68,312	$204,512	$1,848	$206,360
No. 2A Booster 1	500	1800	250	$37,800	$14,892	$52,692	$1,848	$54,540
No. 2A Booster 2	500	1800	250	$37,800	$14,892	$52,692	$1,848	$54,540
No. 2A Booster 3	500	1800	250	$37,800	$14,892	$52,692	$1,848	$54,540
No. 2-1 Pump 1	500	1800	250	$37,800	$14,892	$52,692	$1,848	$54,540
No. 2-1 Pump 2	500	1800	250	$37,800	$14,892	$52,692	$1,848	$54,540
No. 2-1 Pump 3	500	1800	250	$37,800	$14,892	$52,692	$1,848	$54,540
No. 2-1 Pump 4	500	1800	250	$37,800	$14,892	$52,692	$1,848	$54,540
No. 2-2 Pump 1	500	1800	250	$37,800	$14,892	$52,692	$1,848	$54,540
No. 2-2 Pump 2	500	1800	250	$37,800	$14,892	$52,692	$1,848	$54,540
No. 2-2 Pump 3	500	1800	250	$37,800	$14,892	$52,692	$1,848	$54,540
No. 2-2 Pump 4	500	1800	250	$37,800	$14,892	$52,692	$1,848	$54,540
No. 2-3 Pump 1	500	1800	250	$37,800	$14,892	$52,692	$1,848	$54,540
No. 2-3 Pump 2	500	1800	250	$37,800	$14,892	$52,692	$1,848	$54,540
No. 2-3 Pump 3	500	1800	250	$37,800	$14,892	$52,692	$1,848	$54,540
No. 2-3 Pump 4	500	1800	250	$37,800	$14,892	$52,692	$1,848	$54,540
Feed Pond Booster Pump 1	400	1800	250	$37,800	$14,892	$52,692	$1,848	$54,540
Feed Pond Booster Pump 2	400	1800	250	$37,800	$14,892	$52,692	$1,848	$54,540
No. 1A PLS Pump 1	200	1250	200	$20,100	$9,816	$29,916	$1,848	$31,764
No. 1A PLS Pump 2	200	1250	200	$20,100	$9,816	$29,916	$1,848	$31,764
No. 1A PLS Pump 3	200	1250	200	$20,100	$9,816	$29,916	$1,848	$31,764
No. 1B PLS Pump 1	500	1800	250	$37,800	$14,892	$52,692	$1,848	$54,540
No. 1B PLS Pump 2	500	1800	250	$37,800	$14,892	$52,692	$1,848	$54,540
No. 1B PLS Pump 3	500	1800	250	$37,800	$14,892	$52,692	$1,848	$54,540
No. 1B PLS Pump 4	150	1250	200	$20,100	$9,816	$29,916	$1,848	$31,764
No. 1B PLS Pump 5	150	1250	200	$20,100	$9,816	$29,916	$1,848	$31,764
Acid Mixing Pump 1	400			$0		$0		$0
Acid Mixing Pump 2	400			$0		$0		$0
Acid Mixing Pump 3	400			$0		$0		$0
No. 2A-East PLS Pump 1	500	1800	350	$37,800	$29,614	$67,414	$1,848	$69,262
No. 2A-East PLS Pump 2	500	1800	350	$37,800	$29,614	$67,414	$1,848	$69,262
No. 2A-East PLS Pump 3	500	1800	350	$37,800	$29,614	$67,414	$1,848	$69,262
No. 2A-West PLS Pump 1	500	1800	350	$37,800	$29,614	$67,414	$1,848	$69,262
No. 2A-West PLS Pump 2	500	1800	350	$37,800	$29,614	$67,414	$1,848	$69,262
No. 2A-West PLS Pump 3	500	1800	350	$37,800	$29,614	$67,414	$1,848	$69,262
North Racket PLS Pond Pump 1	500	1500	500	$33,300	$49,835	$83,135	$1,848	$84,983
North Racket PLS Pond Pump 2	500	1500	500	$33,300	$49,835	$83,135	$1,848	$84,983
No. 2L3 Deepwell Pump	600	1800	500	$43,000	Incl	$43,000	$3,464	$46,464
No. 2L5 Deepwell Pump	600	1800	500	$43,000	Incl	$43,000	$3,464	$46,464
No.2 PLS Pond Pump 1	500	1250	500	$33,300	$29,614	$62,914	$1,848	$64,762
No.2 PLS Pond Pump 2	500	1250	500	$33,300	$29,614	$62,914	$1,848	$64,762
No.2 PLS Pond Pump 3	500	1250	500	$33,300	$29,614	$62,914	$1,848	$64,762
No.2 PLS Pond Pump 4	500	1250	500	$33,300	$29,614	$62,914	$1,848	$64,762
No. EM-1 Deepwell Pump	200	1800	500	$43,000	Incl	$43,000	$3,464	$46,464
No. EM-2 Deepwell Pump	200	1800	500	$43,000	Incl	$43,000	$3,464	$46,464
No. EM-3 Deepwell Pump	200	1800	500	$43,000	Incl	$43,000	$3,464	$46,464
East Main Booster Pump	500	1800	350	$37,800	$29,614	$67,414	$1,848	$69,262
No.3 PLS Pump 1	500	1000	500	$21,600	$29,614	$51,214	$1,848	$53,062
No.3 PLS Pump 2	500	1000	500	$21,600	$29,614	$51,214	$1,848	$53,062
No.3 PLS Pump 3	500	1000	500	$21,600	$29,614	$51,214	$1,848	$53,062
No.3 PLS Pump 4	500	1000	500	$21,600	$29,614	$51,214	$1,848	$53,062
No.3 PLS Pump 5	500	1000	500	$21,600	$29,614	$51,214	$1,848	$53,062
Total				$2,188,700	$1,193,662	$3,382,362	$104,161	$3,486,523

Capital Cost Summary Table	Process Solution Elimination System Alternate 2
Tyrone	
Stockpiles	
Tails Ponds	
Pits	
Process Solution Elimination	$8,283,855
Disturbed Areas	
Total	$8,283,855

Process Solution Elimination System		Alternate 2
4	Process Solution Elimination	
A	Continued use	
	HDPE Pipeline w/Nozzles	$2,105,481
	Recirculation Pumps	$3,486,523
	Subtotal	$5,592,004
	Total Direct Cost	$5,592,004
	Indirect Cost	
	Engineering Redesign @4.5%	$251,640
	Construction Management/Project Controls @5%	$279,600
	Mobilization and Demobilization 1.5%	$83,880
	Contingency @2%	$111,840
	Profit @4%	$223,680
	Overhead @21%	$1,174,321
	Storm Water Prevention Plan @0.0%	$0
	Reclamation Monitoring Fee @2%	$111,840
	Gross Receipts Tax @ 5.8125	$455,049
	Total Cost	$8,283,855
	Process Solution Elimination	$8,283,855

Piping

Alternate 2

		Quantity	Unit Cost	Total Cost
HDPE Pipeline w/Nozzles				
24" SDR 17 HDPE Pipe	lf	16000	74.459	$1,191,344
Flange Adpators w/Backup Rings 24"	ea	8	1644.16	$13,153
24" Bolt & Gasket Sets	ea	8	1004.1	$8,033
8" SDR 17 HDPE Pipe	lf	14400	$12.46	$179,424
Bowsmith Tubing	lf	180000	$0.07	$11,700
				$0
Contractor Indirect Cost				$701,827
Total w/Indirect Cost				$2,105,481

Replacement Pumps for Water Recirculation System

	Connected Horsepower	Flow gpm	Head ft	Pump Cost ea	Motor Cost ea	Total w/motor ea	Installation ea	Total ea
Raff Tank Pump 1	900	7500	350	$136,200	$68,312	$204,512	$1,848	$206,360
Raff Tank Pump 2	900	7500	350	$136,200	$68,312	$204,512	$1,848	$206,360
Raff Tank Pump 3	900	7500	350	$136,200	$68,312	$204,512	$1,848	$206,360
Raff Tank Pump 4	900	7500	350	$136,200	$68,312	$204,512	$1,848	$206,360
No. 2A Booster 1	500	1800	250	$37,800	$14,892	$52,692	$1,848	$54,540
No. 2A Booster 2	500	1800	250	$37,800	$14,892	$52,692	$1,848	$54,540
No. 2A Booster 3	500	1800	250	$37,800	$14,892	$52,692	$1,848	$54,540
No. 2-1 Pump 1	500	1800	250	$37,800	$14,892	$52,692	$1,848	$54,540
No. 2-1 Pump 2	500	1800	250	$37,800	$14,892	$52,692	$1,848	$54,540
No. 2-1 Pump 3	500	1800	250	$37,800	$14,892	$52,692	$1,848	$54,540
No. 2-1 Pump 4	500	1800	250	$37,800	$14,892	$52,692	$1,848	$54,540
No. 2-2 Pump 1	500	1800	250	$37,800	$14,892	$52,692	$1,848	$54,540
No. 2-2 Pump 2	500	1800	250	$37,800	$14,892	$52,692	$1,848	$54,540
No. 2-2 Pump 3	500	1800	250	$37,800	$14,892	$52,692	$1,848	$54,540
No. 2-2 Pump 4	500	1800	250	$37,800	$14,892	$52,692	$1,848	$54,540
No. 2-3 Pump 1	500	1800	250	$37,800	$14,892	$52,692	$1,848	$54,540
No. 2-3 Pump 2	500	1800	250	$37,800	$14,892	$52,692	$1,848	$54,540
No. 2-3 Pump 3	500	1800	250	$37,800	$14,892	$52,692	$1,848	$54,540
No. 2-3 Pump 4	500	1800	250	$37,800	$14,892	$52,692	$1,848	$54,540
Feed Pond Booster Pump 1	400	1800	250	$37,800	$14,892	$52,692	$1,848	$54,540
Feed Pond Booster Pump 2	400	1800	250	$37,800	$14,892	$52,692	$1,848	$54,540
No. 1A PLS Pump 1	200	1250	200	$20,100	$9,816	$29,916	$1,848	$31,764
No. 1A PLS Pump 2	200	1250	200	$20,100	$9,816	$29,916	$1,848	$31,764
No. 1A PLS Pump 3	200	1250	200	$20,100	$9,816	$29,916	$1,848	$31,764
No. 1B PLS Pump 1	500	1800	250	$37,800	$14,892	$52,692	$1,848	$54,540
No. 1B PLS Pump 2	500	1800	250	$37,800	$14,892	$52,692	$1,848	$54,540
No. 1B PLS Pump 3	500	1800	250	$37,800	$14,892	$52,692	$1,848	$54,540
No. 1B PLS Pump 4	150	1250	200	$20,100	$9,816	$29,916	$1,848	$31,764
No. 1B PLS Pump 5	150	1250	200	$20,100	$9,816	$29,916	$1,848	$31,764
Acid Mixing Pump 1	400			$0		$0		$0
Acid Mixing Pump 2	400			$0		$0		$0
Acid Mixing Pump 3	400			$0		$0		$0
No. 2A-East PLS Pump 1	500	1800	350	$37,800	$29,614	$67,414	$1,848	$69,262
No. 2A-East PLS Pump 2	500	1800	350	$37,800	$29,614	$67,414	$1,848	$69,262
No. 2A-East PLS Pump 3	500	1800	350	$37,800	$29,614	$67,414	$1,848	$69,262
No. 2A-West PLS Pump 1	500	1800	350	$37,800	$29,614	$67,414	$1,848	$69,262
No. 2A-West PLS Pump 2	500	1800	350	$37,800	$29,614	$67,414	$1,848	$69,262
No. 2A-West PLS Pump 3	500	1800	350	$37,800	$29,614	$67,414	$1,848	$69,262
North Racket PLS Pond Pump 1	500	1500	500	$33,300	$49,835	$83,135	$1,848	$84,983
North Racket PLS Pond Pump 2	500	1500	500	$33,300	$49,835	$83,135	$1,848	$84,983
No. 2L3 Deepwell Pump	600	1800	500	$43,000	Incl	$43,000	$3,464	$46,464
No. 2L5 Deepwell Pump	600	1800	500	$43,000	Incl	$43,000	$3,464	$46,464
No.2 PLS Pond Pump 1	500	1250	500	$33,300	$29,614	$62,914	$1,848	$64,762
No.2 PLS Pond Pump 2	500	1250	500	$33,300	$29,614	$62,914	$1,848	$64,762
No.2 PLS Pond Pump 3	500	1250	500	$33,300	$29,614	$62,914	$1,848	$64,762
No.2 PLS Pond Pump 4	500	1250	500	$33,300	$29,614	$62,914	$1,848	$64,762
No. EM-1 Deepwell Pump	200	1800	500	$43,000	Incl	$43,000	$3,464	$46,464
No. EM-2 Deepwell Pump	200	1800	500	$43,000	Incl	$43,000	$3,464	$46,464
No. EM-3 Deepwell Pump	200	1800	500	$43,000	Incl	$43,000	$3,464	$46,464
East Main Booster Pump	500	1800	350	$37,800	$29,614	$67,414	$1,848	$69,262
No.3 PLS Pump 1	500	1000	500	$21,600	$29,614	$51,214	$1,848	$53,062
No.3 PLS Pump 2	500	1000	500	$21,600	$29,614	$51,214	$1,848	$53,062
No.3 PLS Pump 3	500	1000	500	$21,600	$29,614	$51,214	$1,848	$53,062
No.3 PLS Pump 4	500	1000	500	$21,600	$29,614	$51,214	$1,848	$53,062
No.3 PLS Pump 5	500	1000	500	$21,600	$29,614	$51,214	$1,848	$53,062
Total				$2,188,700	$1,193,662	$3,382,362	$104,161	$3,486,523

APPENDIX C

OPERATING COST ESTIMATE

Tyrone Process Solution Elimination Study

Table 4.2 - Operating Cost Schedule - Alterntive 1 Evaporation System

Cost Item	Annual Cost Year 1	Annual Cost Year 2
Evaporation Operation		
Labor	$ 104,500	$ 20,900
Maintenance	$ 30,000	$ 6,000
Electric Power	$ 3,631,500	$ 624,300
Sub-Total Evaporation Operation	$ 3,766,000	$ 651,200
Contract Annual Site Maintenance		
Labor	$ 5,900	$ 1,200
Supplies & Equipment	$ 3,600	$ 1,600
Sub-Total Annual Site Modification	$ 9,500	$ 2,800
Total Annual Evaporation Operating Cost	$ 3,775,500	$ 654,000

Tyrone Process Solution Elimination Study

Table 4.2.1 - Operating Cost Schedule - Alternative 1 Evaporation System

Cost Item Year 1	Number of Personnel	Hours per year	Hourly Rate	Hourly Salary Rate	Annual Salary basis			Annual Cost
Plant Labor								
Labor	2	2,080	12.5					$ 52,000
Maintenance Labor	1	2,080	18.0					$ 24,000
Operating & Maintenance Supervisor	Cost shared and accounted for in Closure/Closeout Staff							$ -
Overtime								$ 5,700
Mandated and Voluntary Labor Benefits								22,800
Sub-total Water Labor Cost								$ 104,500
Cost Item	Estimated Construction Cost	Labor Rate	M&S Rate					Annual Cost
Plant Maintenance								
Maintenance	$ 3,000,000	1.0%	1.0%					
Maintenance Material & Supplies								$ 30,000
Maintenance Labor								Included in Labor summary
Sub-total Maintenance Cost								$ 30,000
Subtotal Annual System Operation Cost								**$ 134,500**

Cost Item Year 2	Number of Personnel	Hours per year	Hourly Rate	Hourly Salary Rate	Annual Salary basis			Annual Cost
Plant Labor								
Labor	2	416	12.5					$ 10,400
Maintenance Labor	1	416	18.0					$ 4,800
Operating & Maintenance Supervisor	Cost shared and accounted for in Closure/Closeout Staff							$ -
Overtime								$ 1,100
Mandated and Voluntary Labor Benefits								4,600
Sub-total Water Labor Cost								$ 20,900
Cost Item	Estimated Construction Cost	Labor Rate	M&S Rate					Annual Cost
Plant Maintenance								
Maintenance	$ 3,000,000	1.0%	1.0%					
Maintenance Material & Supplies						For 0.2 year =		$ 6,000
Maintenance Labor								Included in Labor summary
Sub-total Maintenance Cost								$ 6,000
Subtotal Annual System Operation Cost								**$ 26,900**

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Table 4.2.2 - Operating Cost - Alternative 1 Evaporation System - Electric Power

Year 1 Cost Item	Equipment Number	Connected Horsepower	Connected Kilowatt	Full Load Current (%)	Oper Load @ Motor Eff (KW)	Operating Diversity Factor	Operating hrs/yr	Total (kW hr/yr)	Cost Per kW hr	Total Cost Per Year
Raff Tank Pump 1		900	671.1	75%	503.3	0.9500	8,322	4,188,858		
Raff Tank Pump 2		900	671.1	75%	503.3	0.9500	8,322	4,188,858		
Raff Tank Pump 3		900	671.1	75%	503.3	0.9500	8,322	4,188,858		
Raff Tank Pump 4		900	671.1	75%	503.3	0.1500	1,314	661,399		
No. 2A Booster 1		500	372.9	75%	279.6	0.9500	8,322	2,327,143		
No. 2A Booster 2		500	372.9	75%	279.6	0.9500	8,322	2,327,143		
No. 2A Booster 3		500	372.9	75%	279.6	0.1000	876	244,962		
No. 2-1 Pump 1		500	372.9	75%	279.6	0.0000	0	0		
No. 2-1 Pump 2		500	372.9	75%	279.6	0.0000	0	0		
No. 2-1 Pump 3		500	372.9	75%	279.6	0.0000	0	0		
No. 2-1 Pump 4		500	372.9	75%	279.6	0.0000	0	0		
No. 2-2 Pump 1		500	372.9	75%	279.6	0.9500	8,322	2,327,143		
No. 2-2 Pump 2		500	372.9	75%	279.6	0.9500	8,322	2,327,143		
No. 2-2 Pump 3		500	372.9	75%	279.6	0.9500	8,322	2,327,143		
No. 2-2 Pump 4		500	372.9	75%	279.6	0.9500	8,322	2,327,143		
No. 2-3 Pump 1		500	372.9	75%	279.6	0.9500	8,322	2,327,143		
No. 2-3 Pump 2		500	372.9	75%	279.6	0.9500	8,322	2,327,143		
No. 2-3 Pump 3		500	372.9	75%	279.6	0.9500	8,322	2,327,143		
No. 2-3 Pump 4		500	372.9	75%	279.6	0.9500	8,322	2,327,143		
Feed Pond Booster Pump 1		400	298.3	75%	223.7	0.0000	0	0		
Feed Pond Booster Pump 2		400	298.3	75%	223.7	0.0000	0	0		
No. 1A PLS Pump 1		200	149.1	75%	111.9	0.0620	543	60,751		
No. 1A PLS Pump 2		200	149.1	75%	111.9	0.0620	543	60,751		
No. 1A PLS Pump 3		200	149.1	75%	111.9	0.0000	0	0		
No. 1B PLS Pump 1		500	372.9	75%	279.6	0.0620	543	151,877		
No. 1B PLS Pump 2		500	372.9	75%	279.6	0.0620	543	151,877		
No. 1B PLS Pump 3		500	372.9	75%	279.6	0.0000	0	0		
No. 1B PLS Pump 4		150	111.9	75%	83.9	0.0000	0	0		
No. 1B PLS Pump 5		150	111.9	75%	83.9	0.0000	0	0		
Acid Mixing Pump 1		400	298.3	75%	223.7	0.0000	0	0		
Acid Mixing Pump 2		400	298.3	75%	223.7	0.0000	0	0		
Acid Mixing Pump 3		400	298.3	75%	223.7	0.0000	0	0		
No. 2A-East PLS Pump 1		500	372.9	75%	279.6	0.9500	8,322	2,327,143		
No. 2A-East PLS Pump 2		500	372.9	75%	279.6	0.9500	8,322	2,327,143		
No. 2A-East PLS Pump 3		500	372.9	75%	279.6	0.9500	8,322	2,327,143		
No. 2A-West PLS Pump 1		500	372.9	75%	279.6	0.0620	543	151,877		
No. 2A-West PLS Pump 2		500	372.9	75%	279.6	0.0620	543	151,877		
No. 2A-West PLS Pump 3		500	372.9	75%	279.6	0.0000	0	0		
North Racket PLS Pond Pump 1		500	372.9	75%	279.6	0.9500	8,322	2,327,143		
North Racket PLS Pond Pump 2		500	372.9	75%	279.6	0.9500	8,322	2,327,143		
No. 2L3 Deepwell Pump		600	447.4	75%	335.6	0.9500	8,322	2,792,572		
No. 2L5 Deepwell Pump		600	447.4	75%	335.6	0.9500	8,322	2,792,572		
No.2 PLS Pond Pump 1		500	372.9	75%	279.6	0.9500	8,322	2,327,143		
No.2 PLS Pond Pump 2		500	372.9	75%	279.6	0.9500	8,322	2,327,143		
No.2 PLS Pond Pump 3		500	372.9	75%	279.6	0.9500	8,322	2,327,143		
No.2 PLS Pond Pump 4		500	372.9	75%	279.6	0.9500	8,322	2,327,143		
No. EM-1 Deepwell Pump		200	149.1	75%	111.9	0.0620	543	60,751		
No. EM-2 Deepwell Pump		200	149.1	75%	111.9	0.0620	543	60,751		
No. EM-3 Deepwell Pump		200	149.1	75%	111.9	0.0000	0	0		
East Main Booster Pump		500	372.9	75%	279.6	0.0620	543	151,877		
No.3 PLS Pump 1		500	372.9	75%	279.6	0.0620	543	151,877		
No.3 PLS Pump 2		500	372.9	75%	279.6	0.0620	543	151,877		
No.3 PLS Pump 3		500	372.9	75%	279.6	0.0620	543	151,877		
No.3 PLS Pump 4		500	372.9	75%	279.6	0.0000	0	0		
No.3 PLS Pump 5		500	372.9	75%	279.6	0.0000	0	0		
Miscellaneous								1,294,636		
Sub-Total Annual Electric Power								66,026,500	$ 0.055	$3,631,500

Year 2 Cost Item	Equipment Number	Connected Horsepower	Connected Kilowatt	Full Load Current (%)	Oper Load @ Motor Eff (KW)	Operating Diversity Factor	Operating hrs/yr	Total (kW hr/yr)	Cost Per kW hr	Total Cost Per Year
Raff Tank Pump 1		900	671.1	75%	503.3	0.1900	1,644	827,503		
Raff Tank Pump 2		900	671.1	75%	503.3	0.1900	1,644	827,503		
Raff Tank Pump 3		900	671.1	75%	503.3	0.1900	1,644	827,503		
Raff Tank Pump 4		900	671.1	75%	503.3	0.0300	264	132,884		
No. 2A Booster 1		500	372.9	75%	279.6	0.1900	1,644	459,724		
No. 2A Booster 2		500	372.9	75%	279.6	0.1900	1,644	459,724		
No. 2A Booster 3		500	372.9	75%	279.6	0.0200	176	49,216		
No. 2-2 Pump 1		500	372.9	75%	279.6	0.2000	1,752	489,925		
No. 2-2 Pump 2		500	372.9	75%	279.6	0.2000	1,752	489,925		
No. 2-2 Pump 3		500	372.9	75%	279.6	0.2000	1,752	489,925		
No. 2-2 Pump 4		500	372.9	75%	279.6	0.2000	1,752	489,925		
No. 2-3 Pump 1		500	372.9	75%	279.6	0.2000	1,752	489,925		
No. 2-3 Pump 2		500	372.9	75%	279.6	0.2000	1,752	489,925		
No. 2-3 Pump 3		500	372.9	75%	279.6	0.2000	1,752	489,925		
No. 2-3 Pump 4		500	372.9	75%	279.6	0.2000	1,752	489,925		
No. 2A-East PLS Pump 1		500	372.9	75%	279.6	0.2000	1,752	489,925		
No. 2A-East PLS Pump 2		500	372.9	75%	279.6	0.2000	1,752	489,925		
No. 2A-East PLS Pump 3		500	372.9	75%	279.6	0.2000	1,752	489,925		
North Racket PLS Pond Pump 1		500	372.9	75%	279.6	0.2000	1,752	489,925		
North Racket PLS Pond Pump 2		500	372.9	75%	279.6	0.2000	1,752	489,925		
No. 2L3 Deepwell Pump		600	447.4	75%	335.6	0.2000	1,752	587,910		
No. 2L5 Deepwell Pump		600	447.4	75%	335.6	0.2000	1,752	587,910		
Miscellaneous								222,578		
Sub-Total Annual Electric Power								11,351,500	$ 0.055	$ 624,300

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Table 4.2.3 - Operating Cost - Alternative 1 Evaporation System - General Site Cost

Cost Item Year 1	Number of Personnel	Hours per year	Hourly Rate	Hourly Salary Rate	Annual Salary basis			Annual Cost
General Site Office Labor	Cost shared and accounted for in Closure/Closeout Staff							-
Cost Item	Number of Units	Hours per year	Hourly Rate					Annual Cost
Contract General Site Maintenance								
Foreman	1	40	$ 35.77					$ 1,400
Mechanic	1	40	$ 32.30					$ 1,300
Pipefitter/Welder	1	40	$ 27.35					$ 1,100
Electrician	1	40	$ 30.02					$ 1,200
Laborer	1	40	$ 23.07					$ 900
Equipment								
Welder	1	40	$ 6.03					$ 200
Pickup Truck	1	40	$ 7.53					$ 300
Contractor Overhead & Profit Allocation (23%)								$ 1,500
Mobilization and De-Mobilization								$ 1,100
New Mexico Gross Receipts Tax (5.5%)								$ 500
Sub-total Contract General Site Maintenance Cost								$ 9,500
Cost Item								Annual Cost
General Site Electric Power	Cost shared and accounted for in Closure/Closeout Staff							-
Cost Item								Annual Cost
General Site Office Expense								-
Cost Item								Annual Cost
General Site Service Expense	Cost shared and accounted for in Closure/Closeout Staff							-
Subtotal Annual General Site Management Cost								**$ 9,500**

Cost Item Year 2	Number of Personnel	Hours per year	Hourly Rate	Hourly Salary Rate	Annual Salary basis			Annual Cost
General Site Office Labor	Cost shared and accounted for in Closure/Closeout Staff							-
Cost Item	Number of Units	Hours per year	Hourly Rate					Annual Cost
Contract General Site Maintenance								
Foreman	1	8	$ 35.77					$ 300
Mechanic	1	8	$ 32.30					$ 300
Pipefitter/Welder	1	8	$ 27.35					$ 200
Electrician	1	8	$ 30.02					$ 200
Laborer	1	8	$ 23.07					$ 200
Equipment								
Welder	1	8	$ 6.03					$ -
Pickup Truck	1	8	$ 7.53					$ 100
Contractor Overhead & Profit Allocation (23%)								$ 300
Mobilization and De-Mobilization								$ 1,100
New Mexico Gross Receipts Tax (5.5%)								$ 100
Sub-total Contract General Site Maintenance Cost								$ 2,800
Cost Item								Annual Cost
General Site Electric Power	Cost shared and accounted for in Closure/Closeout Staff							-
Cost Item								Annual Cost
General Site Office Expense								-
Cost Item								Annual Cost
General Site Service Expense	Cost shared and accounted for in Closure/Closeout Staff							-
Subtotal Annual General Site Management Cost								**$ 2,800**

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Table 4.4 - Operating Cost Schedule - Alternative 2 Evaporation System

Cost Item	Annual Cost Year 1	Annual Cost Year 2	Annual Cost Year 3	Annual Cost Year 4	Annual Cost Year 5
Evaporation Operation					
Labor	$ 104,500	$ 104,500	$ 104,500	$ 104,500	$ 73,200
Maintenance	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 21,000
Electric Power	$ 4,965,900	$ 3,777,200	$ 2,594,000	$ 1,410,900	$ 411,000
Sub-Total Evaporation Operation	$ 5,100,400	$ 3,911,700	$ 2,728,500	$ 1,545,400	$ 505,200
Contract Annual Site Maintenance					
Labor	$ 5,900	$ 5,900	$ 5,900	$ 5,900	$ 4,100
Supplies & Equipment	$ 3,600	$ 3,600	$ 3,600	$ 3,600	$ 2,900
Sub-Total Annual Site Modification	$ 9,500	$ 9,500	$ 9,500	$ 9,500	$ 7,000
Total Annual Evaporation Operating Cost	$ 5,109,900	$ 3,921,200	$ 2,738,000	$ 1,554,900	$ 512,200

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Table 4.4.1 - Operating Cost Schedule - Alternative 2 Evaporation System - System Operation

Cost Item (Annual for Years 1 ,2, 3 and 4)	Number of Personnel	Hours per year	Hourly Rate	Hourly Salary Rate	Annual Salary basis			Annual Cost
Plant Labor								
Labor	2	2,080	12.5					$ 52,000
Maintenance Labor	1	2,080	18.0					$ 24,000
Operating & Maintenance Supervisor	Cost shared and accounted for in Closure/Closeout Staff							$ -
Overtime								$ 5,700
Mandated and Voluntary Labor Benefits								22,800
Sub-total Water Labor Cost								$ 104,500
Cost Item	Estimated Construction Cost	Labor Rate	M&S Rate					Annual Cost
Plant Maintenance								
Maintenance	$ 3,000,000	1.0%	1.0%					
Maintenance Material & Supplies								$ 30,000
Maintenance Labor								Included in Labor summary
Sub-total Maintenance Cost								$ 30,000
Subtotal Annual System Operation Cost								**$ 134,500**

Cost Item Year 5	Number of Personnel	Hours per year	Hourly Rate	Hourly Salary Rate	Annual Salary basis			Annual Cost
Plant Labor								
Labor	2	1,456	12.5					$ 36,400
Maintenance Labor	1	1,456	18.0					$ 16,800
Operating & Maintenance Supervisor	Cost shared and accounted for in Closure/Closeout Staff							$ -
Overtime								$ 4,000
Mandated and Voluntary Labor Benefits								16,000
Sub-total Water Labor Cost								$ 73,200
Cost Item	Estimated Construction Cost	Labor Rate	M&S Rate					Annual Cost
Plant Maintenance								
Maintenance	$ 3,000,000	1.0%	1.0%					
Maintenance Material & Supplies						For 0.7 year =		$ 21,000
Maintenance Labor								Included in Labor summary
Sub-total Maintenance Cost								$ 21,000
Subtotal Annual System Operation Cost								**$ 94,200**

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Table 4.4.2 - Operating Cost - Alternative 2 Evaporation System - Electric Power

Year 1 Cost Item	Equipment Number	Connected Horsepower	Connected Kilowatt	Full Load Current (%)	Oper Load @ Motor Eff (KW)	Operating Diversity Factor	Operating hrs/yr	Total (kW hr/yr)	Cost Per kW hr	Total Cost Per Year
Raff Tank Pump 1		900	671.1	75%	503.3	0.9500	8,322	4,188,858		
Raff Tank Pump 2		900	671.1	75%	503.3	0.9500	8,322	4,188,858		
Raff Tank Pump 3		900	671.1	75%	503.3	0.9500	8,322	4,188,858		
Raff Tank Pump 4		900	671.1	75%	503.3	0.1500	1,314	661,399		
No. 2A Booster 1		500	372.9	75%	279.6	0.9500	8,322	2,327,143		
No. 2A Booster 2		500	372.9	75%	279.6	0.9500	8,322	2,327,143		
No. 2A Booster 3		500	372.9	75%	279.6	0.1000	876	244,962		
No. 2-1 Pump 1		500	372.9	75%	279.6	0.9500	8,322	2,327,143		
No. 2-1 Pump 2		500	372.9	75%	279.6	0.9500	8,322	2,327,143		
No. 2-1 Pump 3		500	372.9	75%	279.6	0.9500	8,322	2,327,143		
No. 2-1 Pump 4		500	372.9	75%	279.6	0.9500	8,322	2,327,143		
No. 2-2 Pump 1		500	372.9	75%	279.6	0.9500	8,322	2,327,143		
No. 2-2 Pump 2		500	372.9	75%	279.6	0.9500	8,322	2,327,143		
No. 2-2 Pump 3		500	372.9	75%	279.6	0.9500	8,322	2,327,143		
No. 2-2 Pump 4		500	372.9	75%	279.6	0.9500	8,322	2,327,143		
No. 2-3 Pump 1		500	372.9	75%	279.6	0.9500	8,322	2,327,143		
No. 2-3 Pump 2		500	372.9	75%	279.6	0.9500	8,322	2,327,143		
No. 2-3 Pump 3		500	372.9	75%	279.6	0.9500	8,322	2,327,143		
No. 2-3 Pump 4		500	372.9	75%	279.6	0.9500	8,322	2,327,143		
Feed Pond Booster Pump 1		400	298.3	75%	223.7	0.0000	0	0		
Feed Pond Booster Pump 2		400	298.3	75%	223.7	0.0000	0	0		
No. 1A PLS Pump 1		200	149.1	75%	111.9	0.9500	8,322	930,857		
No. 1A PLS Pump 2		200	149.1	75%	111.9	0.9500	8,322	930,857		
No. 1A PLS Pump 3		200	149.1	75%	111.9	0.1000	876	97,985		
No. 1B PLS Pump 1		500	372.9	75%	279.6	0.9500	8,322	2,327,143		
No. 1B PLS Pump 2		500	372.9	75%	279.6	0.9500	8,322	2,327,143		
No. 1B PLS Pump 3		500	372.9	75%	279.6	0.1000	876	244,962		
No. 1B PLS Pump 4		150	111.9	75%	83.9	0.0000	0	0		
No. 1B PLS Pump 5		150	111.9	75%	83.9	0.0000	0	0		
Acid Mixing Pump 1		400	298.3	75%	223.7	0.0000	0	0		
Acid Mixing Pump 2		400	298.3	75%	223.7	0.0000	0	0		
Acid Mixing Pump 3		400	298.3	75%	223.7	0.0000	0	0		
No. 2A-East PLS Pump 1		500	372.9	75%	279.6	0.9500	8,322	2,327,143		
No. 2A-East PLS Pump 2		500	372.9	75%	279.6	0.9500	8,322	2,327,143		
No. 2A-East PLS Pump 3		500	372.9	75%	279.6	0.1000	876	244,962		
No. 2A-West PLS Pump 1		500	372.9	75%	279.6	0.9500	8,322	2,327,143		
No. 2A-West PLS Pump 2		500	372.9	75%	279.6	0.9500	8,322	2,327,143		
No. 2A-West PLS Pump 3		500	372.9	75%	279.6	0.1000	876	244,962		
North Racket PLS Pond Pump 1		500	372.9	75%	279.6	0.9500	8,322	2,327,143		
North Racket PLS Pond Pump 2		500	372.9	75%	279.6	0.9500	8,322	2,327,143		
No. 2L3 Deepwell Pump		600	447.4	75%	335.6	0.9500	8,322	2,792,572		
No. 2L5 Deepwell Pump		600	447.4	75%	335.6	0.9500	8,322	2,792,572		
No.2 PLS Pond Pump 1		500	372.9	75%	279.6	0.9500	8,322	2,327,143		
No.2 PLS Pond Pump 2		500	372.9	75%	279.6	0.9500	8,322	2,327,143		
No.2 PLS Pond Pump 3		500	372.9	75%	279.6	0.9500	8,322	2,327,143		
No.2 PLS Pond Pump 4		500	372.9	75%	279.6	0.9500	8,322	2,327,143		
No. EM-1 Deepwell Pump		200	149.1	75%	111.9	0.9500	8,322	930,857		
No. EM-2 Deepwell Pump		200	149.1	75%	111.9	0.9500	8,322	930,857		
No. EM-3 Deepwell Pump		200	149.1	75%	111.9	0.9500	8,322	930,857		
East Main Booster Pump		500	372.9	75%	279.6	0.9500	8,322	2,327,143		
No.3 PLS Pump 1		500	372.9	75%	279.6	0.9500	8,322	2,327,143		
No.3 PLS Pump 2		500	372.9	75%	279.6	0.9500	8,322	2,327,143		
No.3 PLS Pump 3		500	372.9	75%	279.6	0.9500	8,322	2,327,143		
No.3 PLS Pump 4		500	372.9	75%	279.6	0.9500	8,322	2,327,143		
No.3 PLS Pump 5		500	372.9	75%	279.6	0.9500	8,322	2,327,143		
Subtotal								99,013,822		
Adjusted Subtotal (Year 1 average power is 89.4 % of normal power due to decreasing solution inventory)								88,518,357		
Miscellaneous								1,770,367		
Sub-Total Annual Electric Power								90,288,700	$ 0.055	$4,965,900

Year 2 Cost Item	Equipment Number	Connected Horsepower	Connected Kilowatt	Full Load Current (%)	Oper Load @ Motor Eff (KW)	Operating Diversity Factor	Operating hrs/yr	Total (kW hr/yr)	Cost Per kW hr	Total Cost Per Year
Adjusted Subtotal (Year 2 average power is 68 % of normal power due to decreasing solution inventory)								67,329,399		
Miscellaneous								1,346,588		
Sub-Total Annual Electric Power								68,676,000	$ 0.055	$3,777,200

Year 3 Cost Item	Equipment Number	Connected Horsepower	Connected Kilowatt	Full Load Current (%)	Oper Load @ Motor Eff (KW)	Operating Diversity Factor	Operating hrs/yr	Total (kW hr/yr)	Cost Per kW hr	Total Cost Per Year
Adjusted Subtotal (Year 3 average power is 46.7 % of normal power due to decreasing solution inventory)								46,239,455		
Miscellaneous								924,789		
Sub-Total Annual Electric Power								47,164,200	$ 0.055	$2,594,000

Year 4 Cost Item	Equipment Number	Connected Horsepower	Connected Kilowatt	Full Load Current (%)	Oper Load @ Motor Eff (KW)	Operating Diversity Factor	Operating hrs/yr	Total (kW hr/yr)	Cost Per kW hr	Total Cost Per Year
Adjusted Subtotal (Year 4 average power is 25.4 % of normal power due to decreasing solution inventory)								25,149,511		
Miscellaneous								502,990		
Sub-Total Annual Electric Power								25,652,500	$ 0.055	$1,410,900

Year 4 Cost Item	Equipment Number	Connected Horsepower	Connected Kilowatt	Full Load Current (%)	Oper Load @ Motor Eff (KW)	Operating Diversity Factor	Operating hrs/yr	Total (kW hr/yr)	Cost Per kW hr	Total Cost Per Year
Adjusted Subtotal (Year 5 average power is 7.4 % of normal power due to decreasing solution inventory and partial year operation)								7,327,023		
Miscellaneous								146,540		
Sub-Total Annual Electric Power								7,473,600	$ 0.055	$ 411,000

Tyrone Process Solution Elimination Study

Table 4.2.3 - Operating Cost -Alternative 2 Evaporation System - General Site Cost

Cost Item (Annual for Years 1 ,2,3 and 4)	Number of Personnel	Hours per year	Hourly Rate	Hourly Salary Rate	Annual Salary basis	Annual Cost
General Site Office Labor	Cost shared and accounted for in Closure/Closeout Staff					-
Cost Item	Number of Units	Hours per year	Hourly Rate			Annual Cost
Contract General Site Maintenance						
Foreman	1	40	$ 35.77			$ 1,400
Mechanic	1	40	$ 32.30			$ 1,300
Pipefitter/Welder	1	40	$ 27.35			$ 1,100
Electrician	1	40	$ 30.02			$ 1,200
Laborer	1	40	$ 23.07			$ 900
Equipment						
Welder	1	40	$ 6.03			$ 200
Pickup Truck	1	40	$ 7.53			$ 300
Contractor Overhead & Profit Allocation (23%)						$ 1,500
Mobilization and De-Mobilization						$ 1,100
New Mexico Gross Receipts Tax (5.5%)						$ 500
Sub-total Contract General Site Maintenance Cost						$ 9,500
Cost Item						Annual Cost
General Site Electric Power	Cost shared and accounted for in Closure/Closeout Staff					-
Cost Item						Annual Cost
General Site Office Expense						-
Cost Item						Annual Cost
General Site Service Expense	Cost shared and accounted for in Closure/Closeout Staff					-
Subtotal Annual General Site Management Cost						**$ 9,500**

Cost Item Year 5	Number of Personnel	Hours per year	Hourly Rate	Hourly Salary Rate	Annual Salary basis	Annual Cost
General Site Office Labor	Cost shared and accounted for in Closure/Closeout Staff					-
Cost Item	Number of Units	Hours per year	Hourly Rate			Annual Cost
Contract General Site Maintenance						
Foreman	1	28	$ 35.77			$ 1,000
Mechanic	1	28	$ 32.30			$ 900
Pipefitter/Welder	1	28	$ 27.35			$ 800
Electrician	1	28	$ 30.02			$ 800
Laborer	1	28	$ 23.07			$ 600
Equipment						
Welder	1	28	$ 6.03			$ 200
Pickup Truck	1	28	$ 7.53			$ 200
Contractor Overhead & Profit Allocation (23%)						$ 1,000
Mobilization and De-Mobilization						$ 1,100
New Mexico Gross Receipts Tax (5.5%)						$ 400
Sub-total Contract General Site Maintenance Cost						$ 7,000
Cost Item						Annual Cost
General Site Electric Power	Cost shared and accounted for in Closure/Closeout Staff					-
Cost Item						Annual Cost
General Site Office Expense						-
Cost Item						Annual Cost
General Site Service Expense	Cost shared and accounted for in Closure/Closeout Staff					-
Subtotal Annual General Site Management Cost						**$ 7,000**

APPENDIX D

REFERENCE DATA

Climate

The climate in the Tyrone Mine area is semiarid, with annual evaporation exceeding annual precipitation. The average annual precipitation is approximately 16 inches, while the average annual evaporation from lakes and reservoirs is estimated to be approximately 94 inches. Most of the precipitation in the area falls during July through October in the form of rain during short, intense, thunderstorms. A limited snow pack forms at higher elevations in the winter and yields some runoff in the spring. However, the greatest precipitation can be expected during summer months when convective activity is at maximum.

Monthly precipitation is generally less than an inch each month from March through June, peaks in July and August at between 2 and 3 inches each month, and generally falls to less than 2 inches each month from September through February. Average monthly precipitation measured at the Tyrone Mine General Office between 1954 and 1998 ranges from a low of approximately 0.4 inches in April and May to a high of approximately 2.9 inches in July and August.

Evaporation data are available from Class A type evaporation pans operated by PDTI from 1985 to 1997 at the No. 1A stockpile, since 1990 at the No. 1 tailing pond, from 1990 until 1997 at the No. 3 tailing pond, and Bill Evans Lake. Average annual evaporation rates for the periods of record range from approximately 86 inches at Bill Evans Lake to 101 inches at the No. 3 tailing pond. Data from the station at the No. 1A stockpile indicate an average annual pan evaporation of approximately 90 inches with monthly averages ranging from a low of 2.83 inches in January to a high of 14.12 inches in June.

Daily maximum and minimum temperatures have been recorded at the Tyrone Mine General Office since 1982. Average daily maximum temperatures for the period from 1982 through 1998 range from about 49°F in December and January to about 86°F in June and July.

Table 2. Summary of Average Monthly and Annual Pan Evaporation for Stations at the Tyrone Mine

Station (elevation)	January	February	March	April	May	June	July	August	September	October	November	December	Annual
No. 1A Stockpile (1985-1995) (6,150 ft msl)													
Average (inches)	2.83	3.39	5.97	8.54	12.12	14.12	12.02	9.10	8.40	6.98	4.38	3.24	90.99
Years of record	10	11	10	10	10	11	11	10	11	11	10	11	10
No. 1 Tailing Pond (1990-1996) (5,750 ft msl)													
Average (inches)	3.38	3.60	6.77	10.97	13.44	14.87	12.47	10.07	8.21	7.38	4.33	2.97	98.46
Years of record	7	7	7	7	7	7	7	7	7	7	7	7	7
No. 3 Tailing Pond (1990-1994) (5,360 ft msl)													
Average (inches)	2.79	3.43	6.43	12.02	13.38	17.32	12.38	7.90	9.48	7.30	3.00	1.81	101.29
Years of record	4	4	3	4	5	5	5	5	5	5	5	5	3
Bill Evans Lake (1990-1996) (4,675 ft msl)													
Average (inches)	2.80	3.39	6.34	9.28	11.01	13.45	11.77	8.89	7.55	6.29	3.40	2.24	86.42
Years of record	7	7	7	7	7	7	7	7	7	7	7	7	7

Note: The full record for all stations is available in Appendix A.

3. New Mexico State University (index number 8535) is located approximately 100 miles east-southeast of the mine at an elevation of 3,881 ft msl and has records of precipitation, temperature, evaporation, and wind speed from 1918 through the present.

4. Santa Rita (index number 8095) is located approximately 20 miles east-northeast of the mine at an elevation of 6,312 ft msl and has evaporation records from 1913 through 1947 (Trauger, 1972).

The Santa Rita station maintained an elevated Colorado-type pan from approximately 1913 to 1947 (Trauger, 1972). This station reported an average annual evaporation rate of 94.7 inches at an elevation of 6,312 ft msl. Further, Trauger states that after applying a factor of 0.7 to the data to approximate evaporation losses from free water surfaces, the data closely approximate an estimated annual evaporation rate of 64 inches for pond and lake surfaces in the Grant County area. The New Mexico State University station reports an average annual evaporation rate of 93.85 inches at an elevation of 3,881 ft msl for its 61 years of record.

3.1.3 Soils and Vegetation

Topography has an important influence on the soils that develop and their associated vegetation types. Shallow soils, common to uplands and steep slopes, typically support a complex of trees, shrubs, and grasses. Deep soils, more common to gentle slopes and alluvial valleys, frequently support grasslands that are suited to rangeland uses. Sections 3.1 and 3.2 of the *Post Mining and Land Use and Waiver Evaluation* provides a more detailed description of the information summarized in this section (DBS&A, 1996i).

Numerous soil types exist in the Tyrone Mine area, and the vegetation varies accordingly. The most striking topographic sequence of soils, which includes the most frequently occurring soils on the mine property, can be described with four major mapping units (generally characterized by increasing elevation and steepness of slopes): the Manzano loam, the Lonti gravelly loam, the Gaddes-Santa Fe-Rock outcrop complex, and the Santa Fe-Rock outcrop. Plate 2 in the *Post-Mining Land Use and Waiver Evaluation* (DBS&A, 1996i) presents these four major soil

CENTER FOR IRRIGATION TECHNOLOGY

Conserving water, our essential resource

Irrigation Notes

California State University, Fresno, California 93740-0018

January 1988

Irrigation Systems and Water Application Efficiencies

By Kenneth H. Solomon

Water application efficiency is an irrigation concept that is very important both in system selection and design and in irrigation management. The ability of an irrigation system to apply water uniformly and efficiently to the irrigated area is a major factor influencing the agronomic and economic viability of the farming enterprise.

Attainable water application efficiencies vary greatly with irrigation system type and management, but the following ranges give some idea of the efficiencies that may be achieved with reasonable design management as shown in Table 1.

Irrigation efficiency can be divided into two components: water losses and uniformity of application. If either the water losses are large, or application uniformity is poor, efficiency will be low. Although both components of efficiency are influenced by system design and management, losses are predominantly affected by management, while uniformity is predominantly affected by system design.

Table 1. Water Application Efficiencies

Type of System	Attainable Efficiencies
Surface Irrigation	
Basin	80 - 90%
Border	70 - 85%
Furrow	60 - 75%
Sprinkler Irrigation	
Hand Move or Portable	65 - 75%
Traveling Gun	60 - 70%
Center Pivot & Linear Move	75 - 90%

Solid Set or Permanent	70 - 80%
Trickle Irrigation	
With Point Source Emitters	75 - 90%
With Line Source Products	70 - 85%

WATER LOSSES

Over-watering is probably the most significant cause of water loss in any irrigation system. No matter how well the system is designed, if more water is applied than can be beneficially used by the crop, efficiency will suffer. Thus, proper irrigation scheduling is important if high efficiencies are to be achieved. Other types of possible water losses are specific to the type of irrigation system used.

Aside from over-watering, the major losses associated with surface irrigation systems are direct evaporation from the wet soil surface, runoff losses, and seepage losses from water distribution ditches. Direct evaporation losses can be important when irrigating young orchard crops. Runoff losses can be virtually eliminated with return flow systems that capture the runoff water and direct it back to the originating field, or to other fields. The amount of seepage loss from unlined ditches will depend on soil characteristics and the extent of the ditch network, but may range from 10 to 15% of the supplied water. Seepage losses are eliminated with lined canals or pipe distribution systems.

The primary losses associated with sprinkler irrigation (other than those due to over-watering) are direct evaporation from wet soil surfaces, wind drift and evaporation losses from the spray, system drainage and leaks. Evaporation from the soil surface will depend upon irrigation frequency and the extent of bare soil between the plants to be irrigated. These losses can be high in young orchards. Some of the water "lost" to wind drift and evaporation from the sprinkler spray is not actually lost, since it substitutes for crop transpiration. Net losses in this case may be as low as 2-3%, to as high as 15-20% under extreme adverse conditions. Well maintained sprinkler systems should have leak and drainage losses below 1%, but poorly managed systems have shown losses of near 10%.

If not over-irrigated, trickle system losses should be low. Though a relatively small portion of the soil surface is wetted, the irrigation frequency is high, so there will be some loss due to evaporation from wet soil. With good management, losses due to leaks, system drainage, and flushing of filters and lateral lines should not exceed 1%.

BETE FOG NOZZLE, INC

FAX NUMBER (413) 772-6729
Telephone (413) 772-0846

TO: Owen Johnson
ADDRESS: OJONCO
FAX NO.:
YOUR REF: Moore Engineering
OUR REF: 6.9 900558

FAX FILE REF: 3259
DATE: May 15, 1990

PAGE: 1 OF: 5

Owen -

The TF-XPN series has performed quite well in such evaporative disposal applications. The large Free Passage allows for continuing operation under high solids loadong levels

The nozzle should be oriented to spray vertically upward to gain maximum residence time for the droplets to evaporate. The 90 degree spray angle achieves maximum vertical projection into the less saturated air layers. By installing the nozzle some feet above the pond surface, more residence time can also be gained. The effect of wind speed on spray drift should be taken into consideration.

The efficiency of a spray evaporation pond depends on environmental factors (geographic location, wind conditions), pond layout, number and spacing of nozzles, height of spray nozzles and liquid pressure. The pond layout should be rectangular (length = 2 to 4 times width) with the long side facing the prevailing wind direction.

Spray droplet size also has a major effect on the amount of evaporation. The recommended operating pressure should be between 30 and 60 psi, with the higher pressures giving smaller dropsizes.

The BETE TF Series gives the smallest dropsize of any direct pressure nozzle. In order to take maximum advantage of this small dropsize, there must be a minimum of 10 feet spacing between adjacent spray patterns to allow for air circulation.

In many applications the liquid being sprayed contains large solid particles that may plug the nozzle. The BETE TF-XPN Series provides a large Free Passage equal to the orifice diameter. This feature allows for a lower-maintenance operation.

Operated at 40 psi, the TF 32 XPN will flow at 42 GPM:

NOZZLE:	TF 32 XPN
PRESSURE (PSI):	40.00
FLOW (GPM):	42.00
D32	480
DV0.5	632
DV0.1	262
DV0.9	1157

A conservative estimate of evaporation rates is 5 to 10%

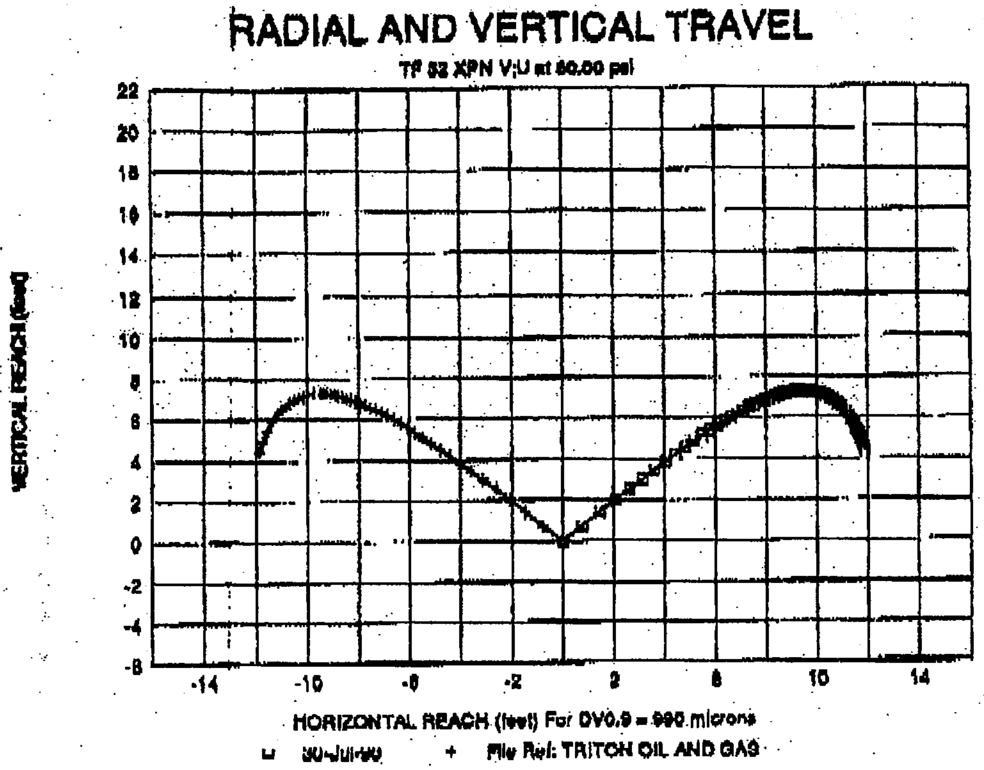
Vertical projection of the inner cone: ≈ 15'.

I am including a fact sheet on evaporative disposal ponds as well as coverage plots of the TF 32 XPN spraying vertically upward.

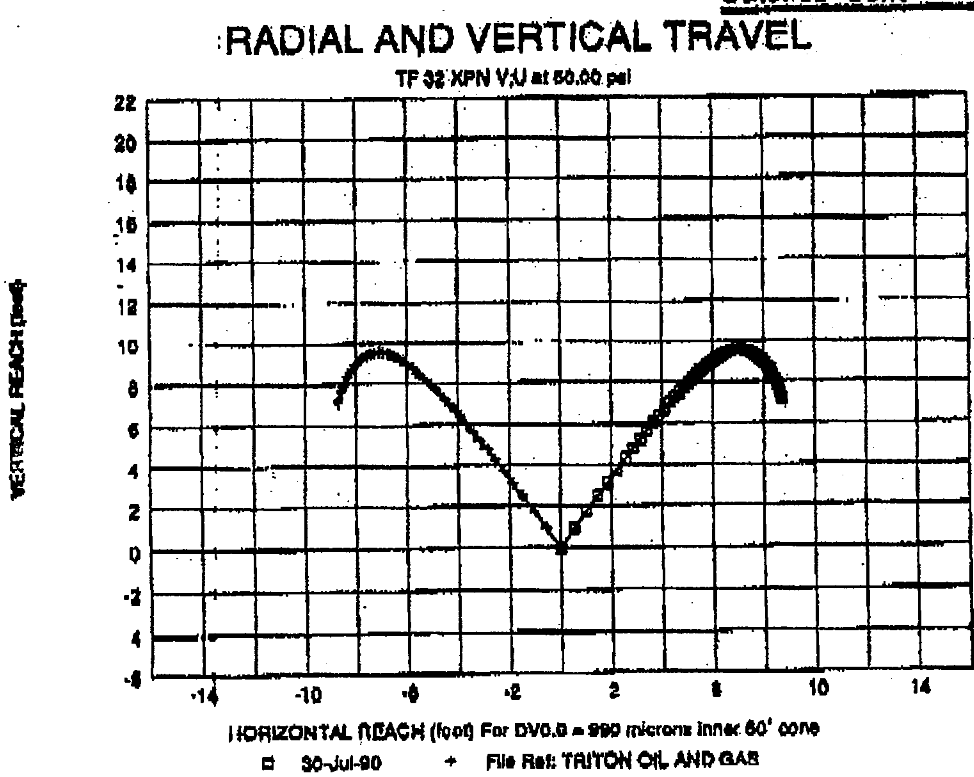
Regards,

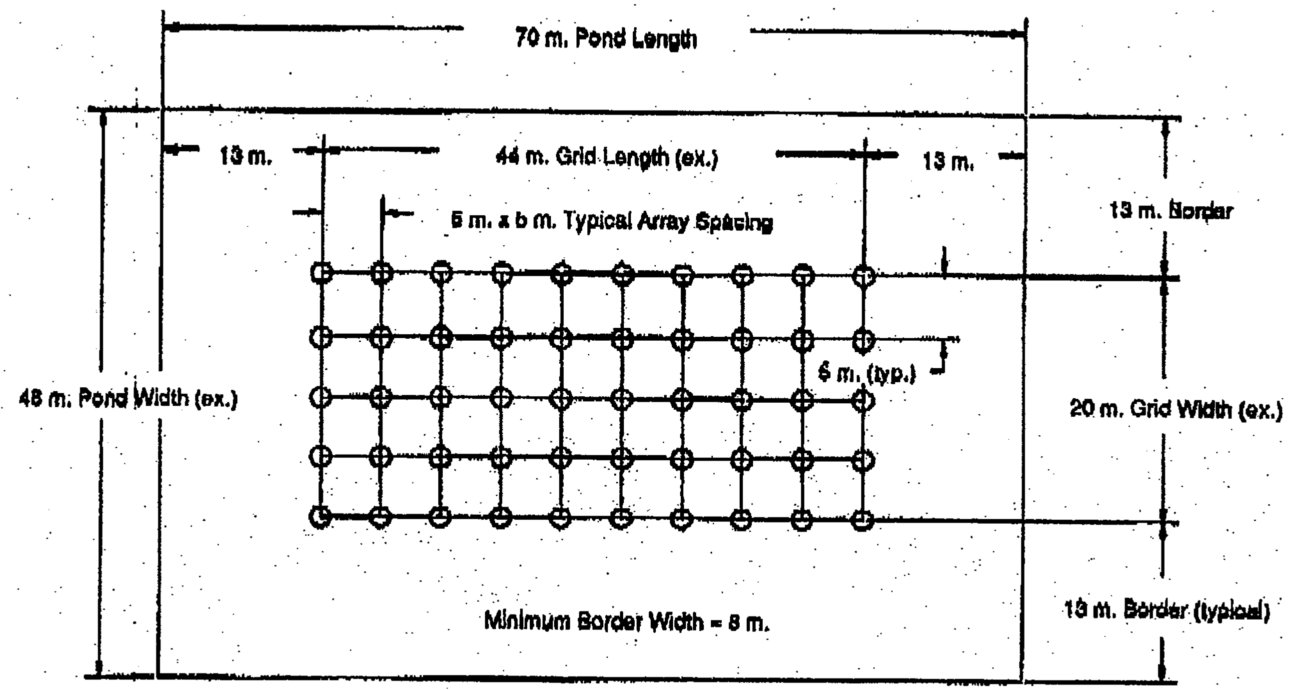
Jim Slavas

TF 32 XP



Spraying Vertically Upward at 60 psi
Outer 90° Cone





SUGGESTED SPRAY POND LAYOUT

FOR EVAPORATIVE DISPOSAL PONDS

SPRAY POND APPLICATION

- **RECOMMENDED NOZZLE: 3/4 TF 32 XPN**

- The nozzle should be oriented to spray vertically upward to gain maximum residence time for the droplets to evaporate. The 90 degree spray angle achieves maximum vertical projection into the less saturated air layers.

- By installing the nozzle one meter above the pond surface, more residence time can also be gained. The effect of wind speed on spray drift should be taken into consideration.

- The efficiency of a spray evaporation pond depends on environmental factors (geographic location, wind conditions), pond layout, number and spacing of nozzles, height of spray nozzles and liquid pressure.

- The pond layout should be rectangular (length = 2 to 4 times width) with the long side facing the prevailing wind direction.

- Spray droplet size also has a major effect on the amount of evaporation. The recommended operating pressure should be between 2.0 and 4.0 bar with the higher pressures giving smaller dropsizes.

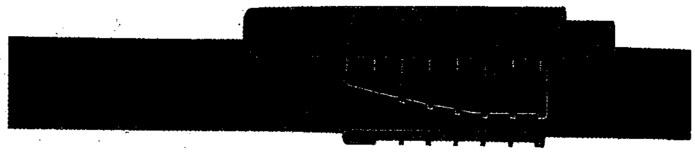
The BETE Difference

The BETE TF Series gives the smallest dropsize of any direct pressure nozzle. In order to take maximum advantage of this small dropsize, there must be a minimum of 3.0 meters spacing between adjacent spray patterns to allow for air circulation.

In many applications the liquid being sprayed contains large solid particles that may plug the nozzle. The BETE TF-XPN Series provides a large Free Passage equal to the orifice diameter. This feature allows for a lower-maintenance operation.

Gold Standard™

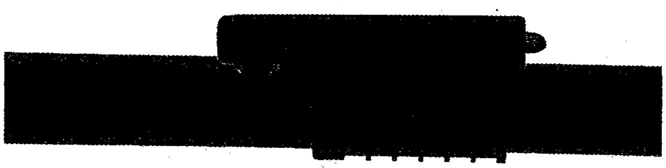
The preferred choice among mining operations where performance and reliability are the primary considerations. Gold Standard's unmatched performance provides dependable, low maintenance delivery of ore leaching solution. Utilizes Bowsmith's patented NonStop mechanism for virtually clog-free operation. Emitters are factory installed to your specifications.



Features	Benefits
NonStop® Self-Flushing Mechanism	• Most reliable product for clog-resistance. • Reduces costs associated with system maintenance. • Reliability allows for multiple reuse on leach pad operations. • Ideal for use in below ground installations. • External emitter design insures that solution drips at the emitter.
Top Quality Materials	• High quality materials insure reliable long-term performance. • Materials resistant to cyanide leaching solutions.
Factory Mounting	• Shur-Lok™ design for secure hose attachment. • Minimizes emitter snagging. • Also available in wraparound "Gripper" mounting.
Flexibility	• Choice of emitter flow rates, color-coded for easy identification. • Factory installed, external mounted emitters for customized emitter spacing. • Choice of a wide variety of hose diameters and wall thicknesses to meet user specifications.

Blackline™

A low cost alternative to the Gold Standard, Blackline is ideal for applications where single use or limited reuse is desired. Virtually clog-free under typical leaching conditions. For applications where water conditions are severe, filtration is recommended.



Features	Benefits
Tortuous Path Emitter Design	• Low cost alternative to Gold Standard. • Cost effective choice for single use or limited reuse systems. • External emitter design insures that solution drips at the emitter.
Factory Mounting	• Shur-Lok design for secure hose attachment. • Minimizes emitter snagging. • Also available in wraparound "Gripper" mounting.
Flexibility	• Choice of emitter flow rates, color-coded for easy identification. • Factory installed, external mounted emitters for customized emitter spacing. • Choice of a wide variety of hose diameters and wall thicknesses to meet user specifications.

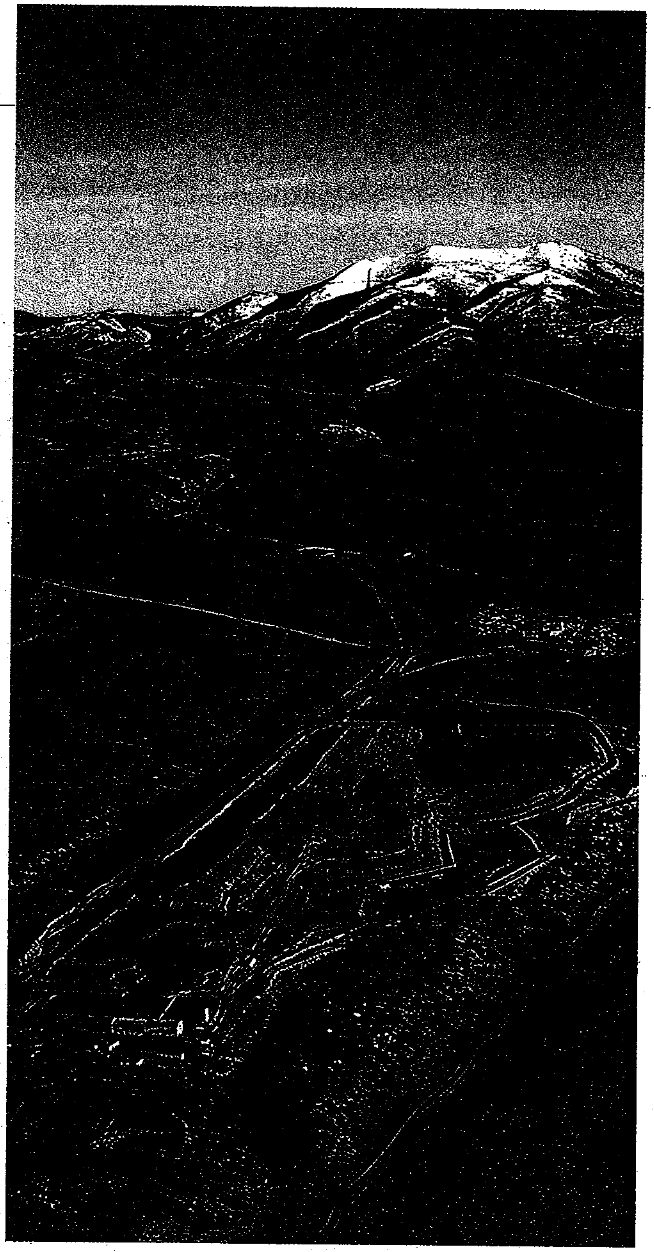
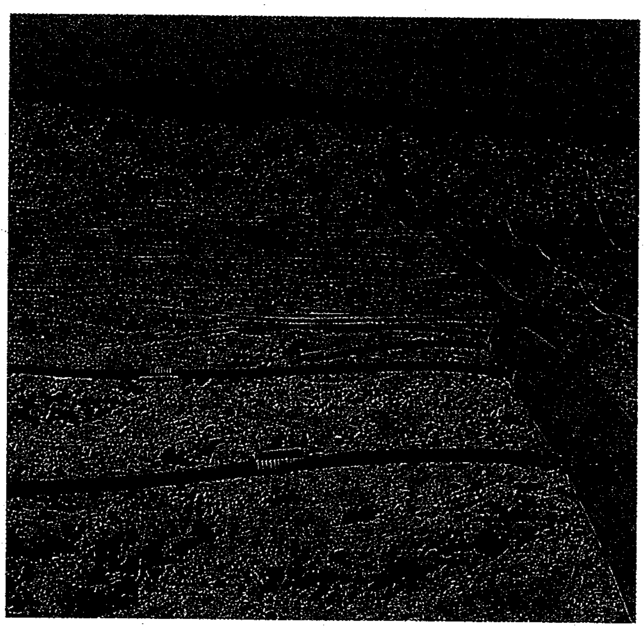


Photo courtesy Placer Dome, Inc.



Bowsmith Gold Standard Grippers in service.

Bowsmith, Inc. has been manufacturing precision water delivery equipment since its inception in 1971. The company's first development was the NonStop® "continuous self flushing" emitter, and over the years that concept has been developed and refined. Bowsmith products have earned a worldwide reputation for quality, durability and performance.

Gold Standard and Blackline Ore Leaching Systems

With the **Gold Standard** and **Blackline** Ore Leaching systems, Bowsmith can offer the mining industry field-proven solutions to heap leaching applications. Bowsmith quality in the field means more productive and profitable leaching operations, and less time spent maintaining and replacing equipment.

Use the Gold Standard system for unmatched clog-resistance in the emitter. Gold Standard is continuously self-cleaning, a big plus for use with cyanide solutions prone to scaling and other particulates.

Bowsmith's Blackline is a low priced alternative to Gold Standard. Intended for single use or limited reuse applications, the wide turbulent flow path flushes small particles readily, assuring clog-free operation.

Both Gold Standard and Blackline emitters are made of tough, engineering-grade polypropylene, highly resistant to cyanide solutions. Materials are all first-quality with maximum UV protection for longer life.

Bowsmith Premium Tubing

Either emitter design factory installed on Bowsmith Premium Tubing completes the Ore Leaching system. Factory installation insures precise emitter spacing to your specifications. Emitters stay locked in place during shipping and field installation and use. Machine installed emitters assure consistency and quality, eliminating poor hole punching that can lead to leaking emitters. Lower field labor costs involved with installation and maintenance mean lower overall operating costs.

Bowsmith Tubing is made from the highest quality Union Carbide-certified resins. This means maximum durability and UV resistance.

Bowsmith Service

In addition to the best quality products, Bowsmith offers its long-standing reputation for quality, integrity and service. The company stands behind its products. Our service really is the "Gold Standard" of the industry.

BOWSMITH® INC.

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Phone: (209) 592-9485 • Fax: (209) 592-2314