

**STATE OF NEW MEXICO
BEFORE THE WATER QUALITY CONTROL COMMISSION**

In the Matter of:)
)
)
)
PROPOSED AMENDMENT)
TO 20.6.2 NMAC (Copper Rule))
)

No. WQCC 12-01(R)

EXHIBIT GRASS – 2

**STATE OF NEW MEXICO
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EXHIBIT GRASS – 2



Copper Leach Facilities

Presentation to Technical Committee to
Copper Rules Advisory Committee by
Freeport-McMoRan
3/1/2012



Introduction

- Definitions
- New Facility Design
- Existing and In-Pit Leach Pads
- Closure Requirements



Copper Leach Facility Features

- Leaching
 - The process of recovering copper from leach ore by percolating an acidic solution through rock to dissolve copper into solution
- Leach ore
 - The mined copper-bearing rock to be leached
- Stockpile or Heap
 - Where the leach ore is placed to be leached
 - Normally the rock stays in place after leaching, but sometimes leached rock is removed from a heap and replaced with new leach ore (dynamic heap)
- Leach Pad
 - An engineered, typically lined, base on which the stockpile or heap is placed



Copper Leach Facility Features

- Raffinate
 - The acidic solution, typically recycled from the SX-EW plant, placed on the top of a stockpile or heap to percolate through and leach copper
- Pregnant leach solution, or PLS
 - The copper-bearing solution recovered from the bottom of the stockpile or heap after leaching
- SX-EW Plant
 - The solution extraction/electrowinning plant
 - Solution extraction enriches PLS through mixing with an organic and phase separation in the SX tankhouse
 - The enriched PLS, now called electrolyte, is sent to the electrowinning tank house where the dissolved copper is plated onto pure copper cathodes in the electrowinning tankhouse



Copper Leach Facility Features

- Headwall
 - A structure, typically concrete, where PLS is collected from the bottom of a stockpile or heap
- Raffinate pond or tank
 - A flow-through impoundment or tank where raffinate is briefly stored before it is sent by pipeline to the leach stockpile or heap
- PLS pond or tank
 - A flow-through impoundment or tank where PLS is stored after it is collected from the stockpile or heap and before it enters the SX-EW plant
- Process water pipeline
 - A pipeline, typically constructed from high-density polyethylene, or HDPE, that carries raffinate from the SX plant to the stockpile or heap for application, or that carries PLS from the stockpile or heap to the SX plant



Copper Leach Facility Features

- Pump station
 - Pumps that move raffinate or PLS through the process
- Sump
 - A containment structure, typically concrete, that is part of the pipeline system to convey process solutions
- Makeup water
 - Water added to raffinate to make up for water lost during the process, primarily due to ore uptake and evaporation
- Makeup acid
 - Sulfuric acid added to raffinate or to electrolyte to maintain the proper pH for the process



Michael Grass Resume

- BS and MS in Geological Engineering
- Registered Professional Engineer (Civil) and Geologist
- 14 years experience in engineering practice
- Construction Level Heap Leach Pad Designs
 - Arizona – Safford and Morenci (Stargo MFL)
 - Nevada – North Peak Expansion
 - Mexico – Penasquito and Piedras Verdes
- Feasibility Heap Leach Pad Designs
 - Arizona – Morenci (Southwest MFL)
 - Nevada – Reona Heap Leach Pad
 - Mexico – Dolores
- Other Heap Leach Pad Designs
 - Chile – Elenita and Sierra Gorda
 - Mexico – Los Filos



Objective of Design for New Leach Facilities

- Protect ground water from discharges of process and other solutions from copper leach facilities
 - Enhance solution recovery
 - Maintain slope stability
 - Provide adequate solution storage capacity



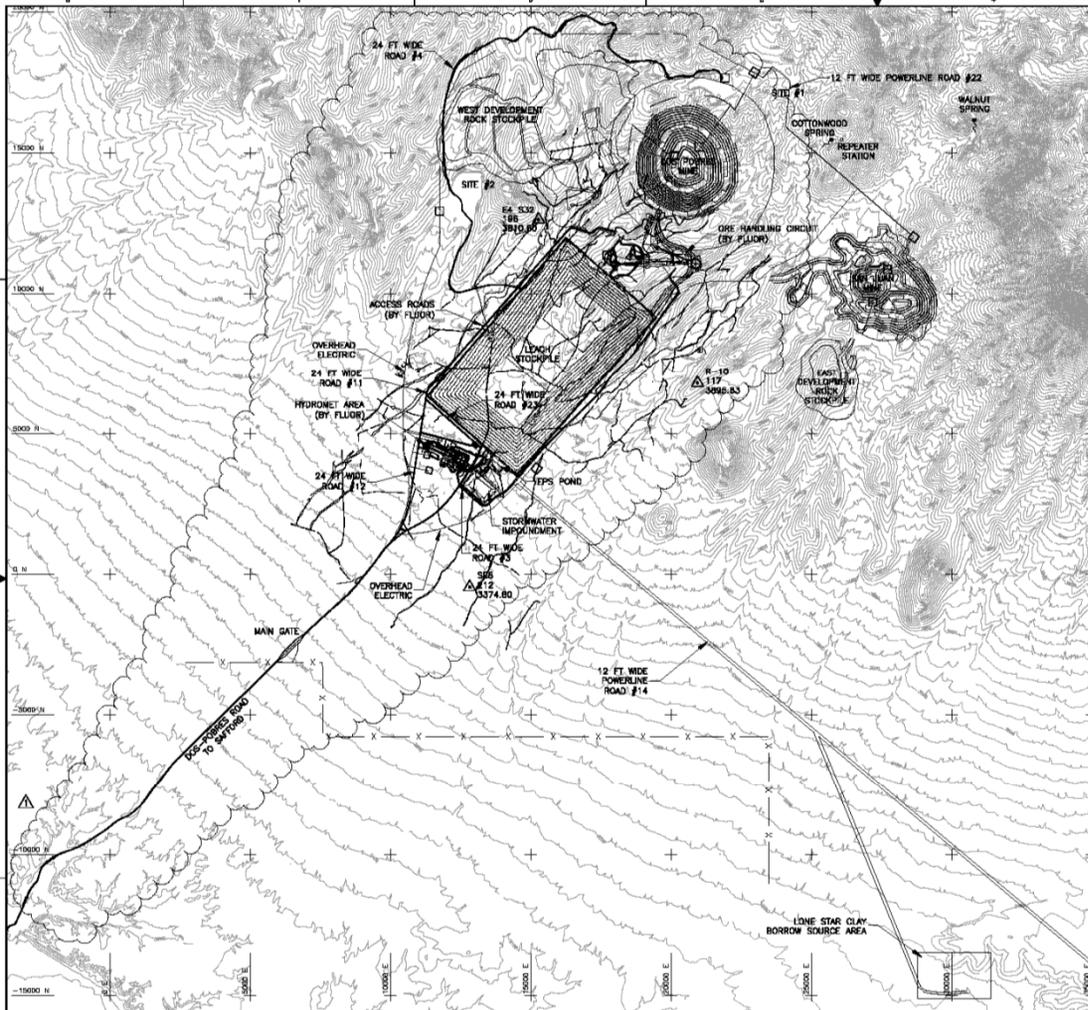
Potential Sources of Ground Water Impacts

- Process solutions escaping from
 - stockpiles/heels, pads and headwalls
 - Raffinate and PLS ponds and tanks
 - Raffinate and PLS pipeline systems (including pump stations and sumps)
 - SX-EW tankhouses



Methods of Ground Water Protection

- Proper design, engineering, construction and operation of leach system components and features to contain solutions during operations
 - Including construction within hydrologic containment
- Proper closure of facilities to minimize discharges of process solutions and leachate during and following closure



GENERAL LEGEND

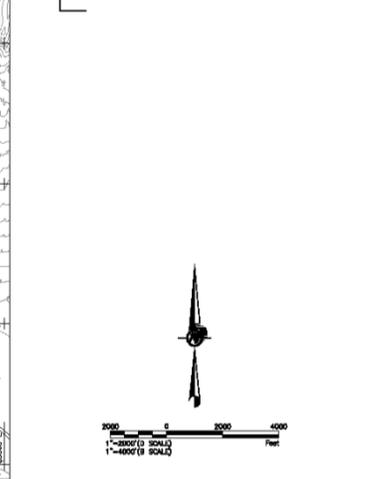
- 3600 --- EXISTING GROUND CONTOUR (FT AMSL)
- X --- ROADS
- - - FENCELINE
- ~ ~ ~ SPRING
- △ SURVEY BENCHMARK
- △ 212 3374.80 SURVEY BENCHMARK NUMBER ELEVATION
- 3600 --- REGRADED CONTOURS (FT AMSL)
- GRADE BREAK
- ◆ 2065 SURVEY CONTROL POINT
- ELECTRICAL SUBSTATION LOCATION
- ▶ SLOPE INDICATOR
- 3 H:1 V or 3:1 J 3 HORIZONTAL TO 1 VERTICAL SLOPE
- GRADE INDICATOR
- END OF PIPE (TERMINAL)
- CONTINUOUS PIPE
- BREAK IN PIPE
- BREAK IN DIMENSION
- HOLD
- DETAIL CALLOUT
- DETAIL ID
- DRAWING SHEET LOCATION
- CROSS-SECTION CALLOUT
- SECTION ID
- DRAWING SHEET LOCATION

HATCH LEGEND

- [Hatch] ANCHOR TRENCH FILL
- [Hatch] COMPACTED COMMON FILL
- [Hatch] CONCRETE
- [Hatch] FINE OVERLIER FILL
- [Hatch] GEONET
- [Hatch] LCRS FILL
- [Hatch] LINER BEDDING FILL
- [Hatch] ORE
- [Hatch] PIPE BEDDING FILL
- [Hatch] PIPE ZONE FILL
- [Hatch] PREPARED SUBGRADE
- [Hatch] REFRAP
- [Hatch] ROADBASE
- [Hatch] ROM OVERLIER FILL
- [Hatch] TANK PAD ASPHALT
- [Hatch] UNDERLIER FILL

LIST OF ABBREVIATIONS

- EPS Excess Process Solution
- HLF Heap Leach Facility
- LCRS Leak Collection and Recovery System
- CMP Corrugated Metal Pipe
- HDPE High Density Polyethylene
- LDPE Linear Low Density Polyethylene
- PCPE Perforated Corrugated Polyethylene
- MAX. Maximum
- MIN. Minimum
- OD Outside Diameter
- ID Inside Diameter
- N.T.S. Not to Scale
- TYP. Typical
- EL. Elevation
- FT Feet
- IN Inches
- AMSL Above Mean Sea Level



REV.	DATE	DESCRIPTION	DESIGNED BY	APPROVED BY	DATE	DESCRIPTION	DESIGNED BY	APPROVED BY	DATE	REFERENCE CHANGE
1	12/05/06	ISSUED FOR CONSTRUCTION	PHD	PHD	12/05/06	Final	PHD	PHD	12/05/06	West Development Rock Stockpile by Phelps Dodge
2	01/09/07	CHANGED RESULT FOR CONSTRUCTION	PHD	PHD	01/09/07	Access Roads	PHD	PHD	01/09/07	Access Roads by Fluor
3	01/09/07	CHANGED RESULT FOR CONSTRUCTION	PHD	PHD	01/09/07	Survey	PHD	PHD	01/09/07	Survey Benchmarks
4	01/09/07	CHANGED RESULT FOR CONSTRUCTION	PHD	PHD	01/09/07	One Handling Circuit	PHD	PHD	01/09/07	One Handling Circuit by Fluor
5	01/09/07	CHANGED RESULT FOR CONSTRUCTION	PHD	PHD	01/09/07	Facilities	PHD	PHD	01/09/07	Facilities by Fluor
6	01/09/07	CHANGED RESULT FOR CONSTRUCTION	PHD	PHD	01/09/07	Topographic	PHD	PHD	01/09/07	Topographic base map with 25' contour intervals provided by Phelps Dodge

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DESIGNED BY	JFL	CHECKED BY	JWR
DRAWN BY	MJC	DATE PLOTTED	12/05/06
PROJECT NO.	DAK	DATE	12/08/06

DD 0000-21-103

PHELPS DODGE SAFFORD INC.

SAFFORD LEACH PROJECT DETAILED DESIGN

GENERAL SITE ARRANGEMENT

100% HEAP LEACH DESIGN

AS SHOWN 053-2538 DD 0000-103 1



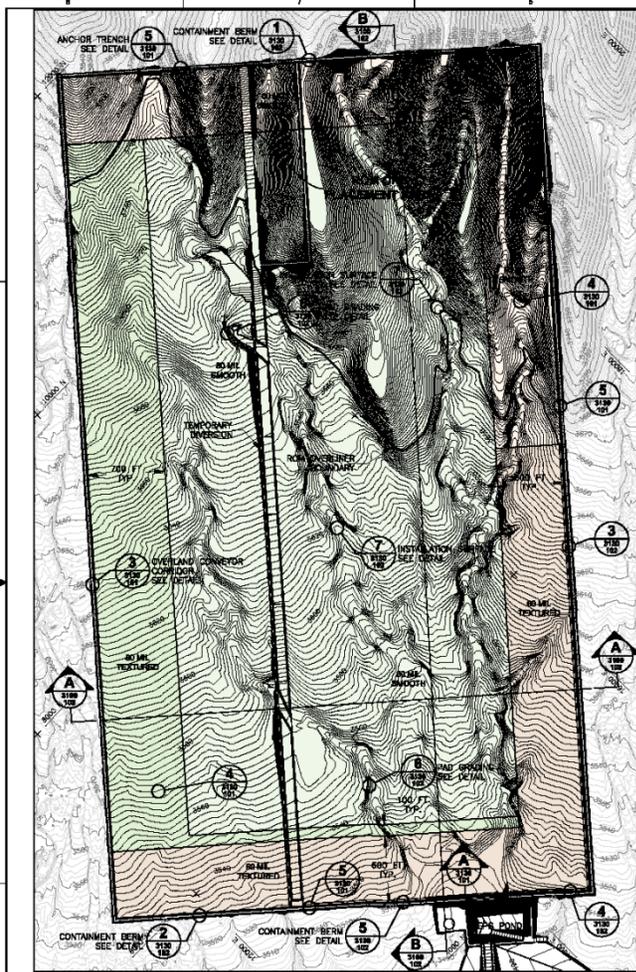




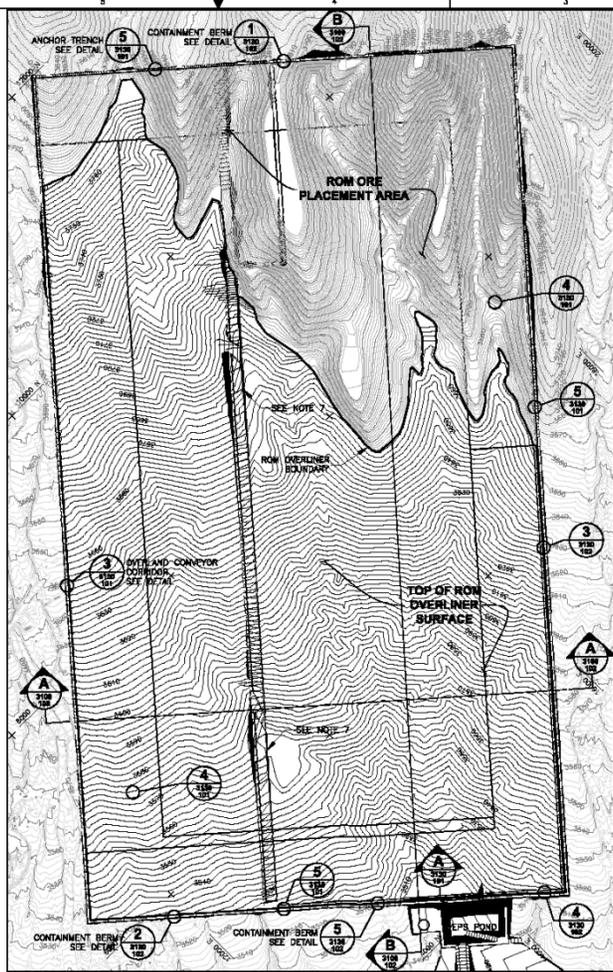


Leach Pad Liner System

- Single Composite Liner System
 - Prepared Subgrade
 - 12-inches of compacted low permeability soil ($<1 \times 10^{-6}$ cm/s)
 - 60 mil LLDPE geomembrane liner
 - 24 inches of overliner drain gravel



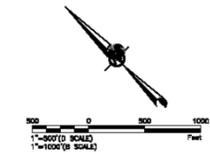
1 FINAL LINER GRADING PLAN
3100-107



2 FINAL TOP OF ROM OVERLINER GRADING PLAN
3100-108

- LEGEND**
- 3800 ——— EXISTING GROUND CONTOURS
 - 3800 ——— REGRADED CONTOURS
 - ROADS
 - ROM OVERLINER BOUNDARY
 - PHASE BOUNDARY
 - 60 MIL SMOOTH 60 MIL SMOOTH LLDFE GEOMEMBRANE LINER
 - 60 MIL TEXTURED 60 MIL TEXTURED LLDFE GEOMEMBRANE LINER
 - 60 MIL SMOOTH 80 MIL SMOOTH LLDFE GEOMEMBRANE LINER
 - 60 MIL TEXTURED 80 MIL TEXTURED LLDFE GEOMEMBRANE LINER
 - 1 3100-107 DETAIL CALLOUT
SECTION D DRAWING SHEET LOCATION
 - A 3100-108 CROSS-SECTION CALLOUT
SECTION D DRAWING SHEET LOCATION

- NOTES**
1. SURVEY CONTROL POINTS PROVIDED ON DRAWING 3100-104.
 2. LINER GRADING SURFACE IS TO TOP OF UNDERLINER.
 3. LINER GRADED SURFACE SLOPES NOT TO EXCEED 2.5H:1V.
 4. ENTIRE LEACH PAD FOOTPRINT AREA TO RECEIVE 1 FT MINIMUM THICKNESS OF LOW PERMEABILITY UNDERLINER AND 2 FT MINIMUM THICKNESS FINE OVERLINER.
 5. TOP OF ROM OVERLINER SURFACE REFLECTS 2 FT THICKNESS OF FINE OVERLINER OVERLAP WITH MINIMUM 2 FT THICKNESS OF ROM OVERLINER. ROM OVERLINER TO BE PLACED AT THICKNESS GREATER THAN 2 FT MINIMUM TO ACHIEVE 5X MAXIMUM SURFACE GRADE.
 6. FINAL ROM OVERLINER SURFACE SLOPES NOT TO EXCEED 5X IN ANY DIRECTION.
 7. PHASE 2 ROM OVERLINER SURFACE WILL OVERLAP THE PHASE 1 ORE OUTSLOPE AT TWO LOCATIONS TO MAINTAIN A MAXIMUM 5X SLOPE IN ANY DIRECTION.



DD 3100-21-107

REV.	DATE	REVISION DESCRIPTION	DESIGNER	APPROVED	CHK.	DATE	REVISION DESCRIPTION	DESIGNER	APPROVED	CHK.	DATE	REFERENCE CHANGE
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0	04/04/04	ISSUED FOR CONSTRUCTION	DAK	[Signature]	DAK							
C	04/06/04	REVISE DESIGN SUBMITTAL	DAK	[Signature]	DAK							
B	03/23/04	REVISE DESIGN REVIEW	DAK	[Signature]	DAK							
A	02/23/04	REVISE DESIGN REVIEW	DAK	[Signature]	DAK							

Golden Associates
TAMPA, FLORIDA

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DATE/TIME: 12/28/05

MINOR CHANGES: YES NO DATE FILED: YES NO MODEL UPDATED: YES NO

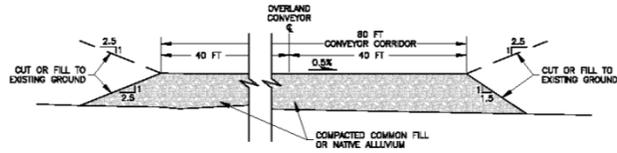
PHILIPS DODGE SAFFORD INC.
SAFFORD LEACH PROJECT DETAILED DESIGN

GRADING PLAN FOR THE FINAL HEAP LEACH FACILITY

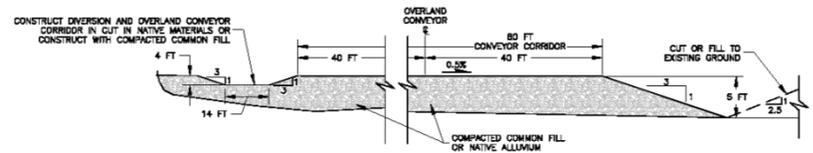
100% HEAP LEACH DESIGN

AS SHOWN 053-2538 DD 3100-107 1

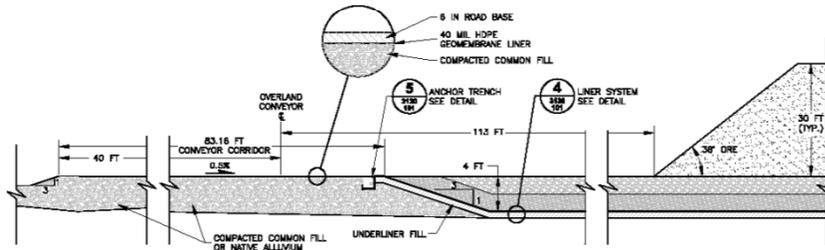
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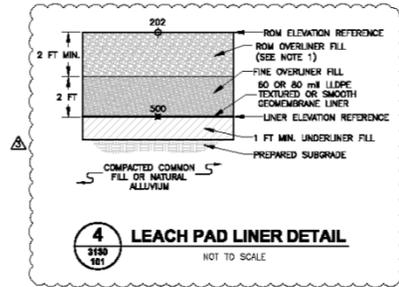
1 OVERLAND CONVEYOR CORRIDOR
STA. 0+00 TO 17+50
 NOT TO SCALE



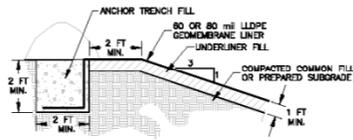
2 OVERLAND CONVEYOR CORRIDOR
STA. 17+50 TO 74+95.27
 NOT TO SCALE



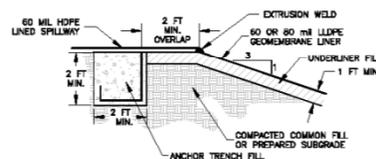
3 OVERLAND CONVEYOR CORRIDOR
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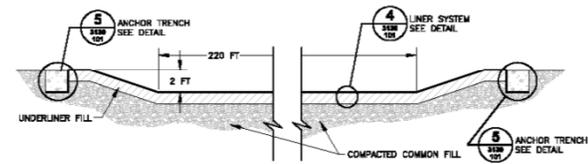
4 LEACH PAD LINER DETAIL
 NOT TO SCALE



5 PAD ANCHOR TRENCH DETAIL
 NOT TO SCALE



6 PAD ANCHOR TRENCH AT SPILLWAY DETAIL
 NOT TO SCALE



A SPILLWAY DETAIL
 NOT TO SCALE

NOTE
 1. ROM OVERLINER FILL THICKNESS TO VARY WITH A MINIMUM OF 2 FEET. FINAL THICKNESS WILL VARY TO CONFORM WITH GRADING PLAN.

REV.	DATE	REVISION DESCRIPTION	DESIGNER	APPROVED	REV.	DATE	REVISION DESCRIPTION	DESIGNER	APPROVED	DETAIL	REFERENCE CHANGES
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B	02/02/06	ISSUED FOR CONSTRUCTION	MUG	JWR							
A	02/02/06	ISSUED FOR CONSTRUCTION	MUG	JWR							

DD 3130-21-101

Golden Associates
Tucson, Arizona

PHILIPS DODGE SAFFORD INC.
SAFFORD LEACH PROJECT DETAILED DESIGN

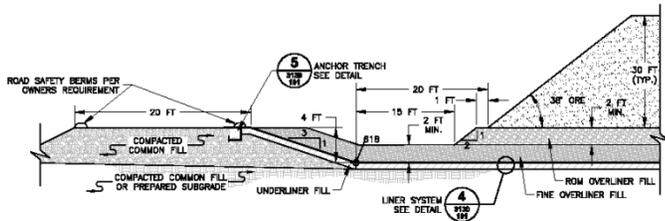
HEAP LEACH FACILITY DETAILS
(1 OF 2)

100% HEAP LEACH DESIGN

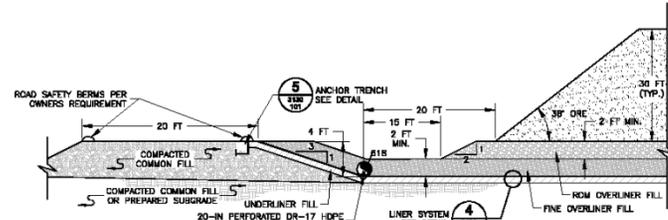
AS SHOWN 053-2538 DD 3130-101 3

CAD FILE No. 3130-101

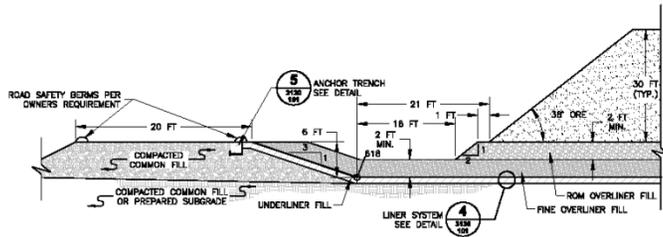




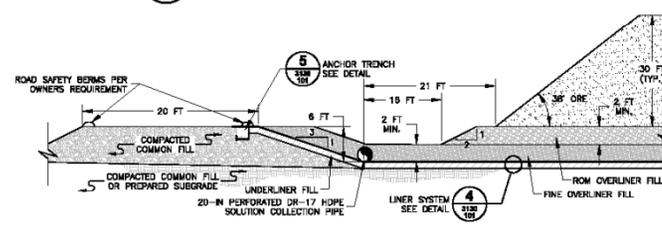
1 TYPICAL CONTAINMENT BERM DETAIL
3130-102
NOT TO SCALE



2 TYPICAL CONTAINMENT BERM DETAIL WITH SINGLE 20-IN HDPE PIPE
3130-102
NOT TO SCALE



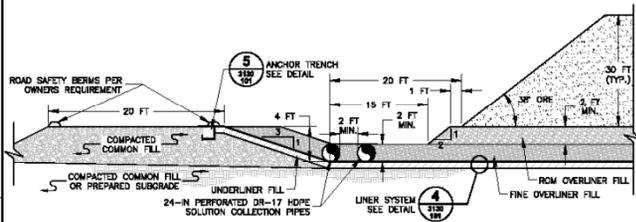
3 TYPICAL EAST CONTAINMENT BERM DETAIL
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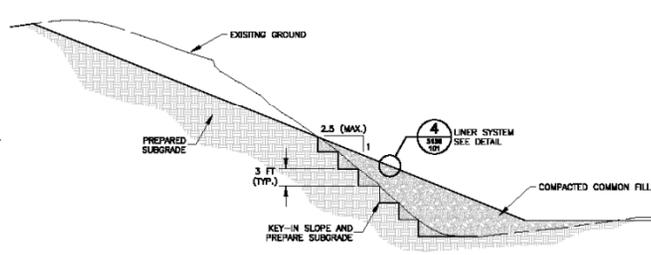
4 TYPICAL CONTAINMENT BERM DETAIL WITH SINGLE 20-IN HDPE PIPE
3130-102
NOT TO SCALE

NOTE

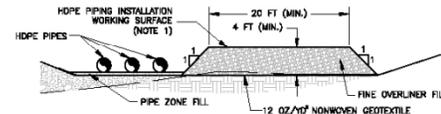
1. ROM OVERLINER FILL THICKNESS TO VARY WITH A MINIMUM OF 2 FEET. FINAL THICKNESS WILL VARY TO CONFORM WITH GRADING PLAN.



5 TYPICAL CONTAINMENT BERM DETAIL WITH 2 24-IN HDPE PIPES
3130-102
NOT TO SCALE



6 TYPICAL PAD GRADING DETAIL
3130-102
NOT TO SCALE



- NOTE:**
1) FINE OVERLINER FILL PLACED AS HOPE PIPE INSTALLATION WORKING SURFACE SHALL BE DECEED FOLLOWING INSTALLATION OF HDPE PIPES TO MINIMIZE COMPACTION INCURRED FROM TRAFFIC.

7 TYPICAL HDPE PIPING INSTALLATION SURFACE DETAIL
3130-102
NOT TO SCALE

DD|3130-21-102

NO.	DATE	REVISION DESCRIPTION	DES. CHK.	APPROVED	REV.	DATE	REVISION DESCRIPTION	DES. CHK.	APPROVED	DETAIL	REFERENCE CHANGE
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3	APPROX	ISSUE DESIGN SUBMITTAL	MJG	[Signature]							

Golder Associates
TAMPA, FLORIDA

PHILIPS DODGE SAFFORD INC.
SAFFORD LEACH PROJECT DETAILED DESIGN
HEAP LEACH FACILITY DETAILS
(2 OF 2)
100% HEAP LEACH DESIGN

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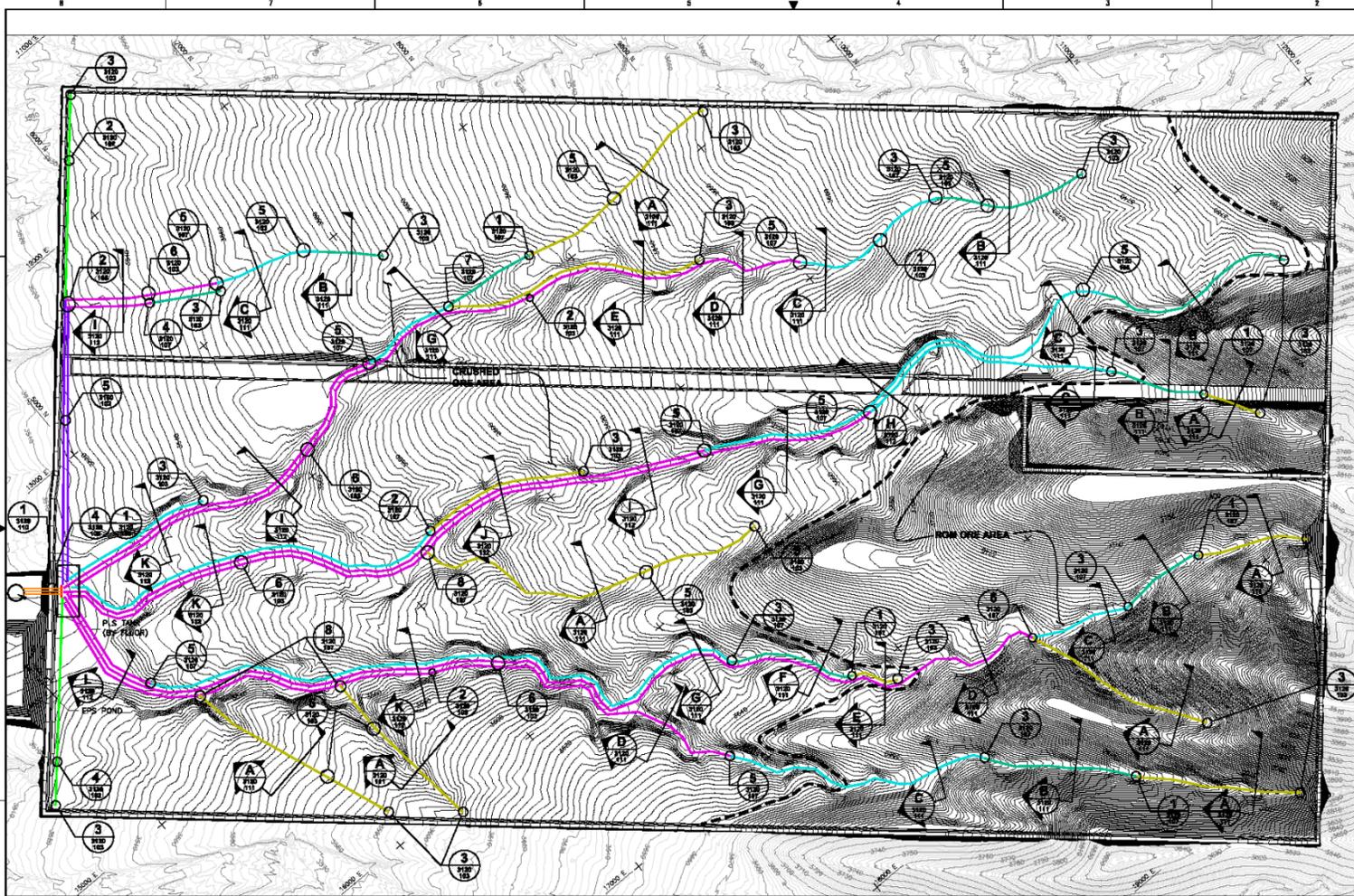
DATE: 12/08/06
SCALE: AS SHOWN
CADD FILE NO.: 3130-102





Solution Collection System

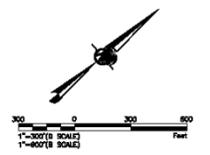
- Series of perforated pipes used to limit the hydrostatic head of solution on the liner system
- 4-inch lateral pipes installed on 20 foot centers convey solution to larger header pipes
- Header pipes convey flows to PLS Tank



LEGEND

- 3800 — EXISTING GROUND CONTOURS
- 3600 — REGRADED CONTOURS
- - - - - ROW BOUNDARY
- SECONDARY 12 INCH HDPE DR-11
- SECONDARY 16 INCH HDPE DR-11
- SECONDARY 20 INCH HDPE DR-11
- PRIMARY 24 INCH HDPE DR-11
- PRIMARY 20 INCH HDPE DR-17
- PRIMARY 24 INCH HDPE DR-17
- MANHOLE 48 INCH HDPE DR-17
- OUTLET PIPE 30 INCH HDPE DR-17

- NOTES**
- 4 IN DIA. N-12 PIPE TERTIARY PIPES NOT SHOWN FOR CLARITY. TERTIARY PIPES TO BE PLACED IN A MINIMUM GRADE OF 1% WITH NOMINAL SPACING OF 20 FT.
 - TERTIARY PIPES NOT TO BE PLACED IN ROW ORE AREA.
 - COORDINATES FOR PIPE FITTING LOCATIONS PROVIDED FOR PHASE 1 ONLY. SEE DRAWING NUMBER 3120-102.



DD 3120-21-101

REV.	DATE	REVISION DESCRIPTION	DES. CHK.	APPROVED	REV.	DATE	REVISION DESCRIPTION	DES. CHK.	APPROVED	DETAIL	REFERENCE CHANGE
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D	04/04/08	ISSUED FOR CONSTRUCTION	MJC	[Signature]							
C	04/04/08	ISSUED FOR CONSTRUCTION	MJC	[Signature]							
B	04/04/08	ISSUED FOR CONSTRUCTION	MJC	[Signature]							
A	04/04/08	ISSUED FOR CONSTRUCTION	MJC	[Signature]							

Golden Associates
Tomball, Australia

DESIGNED BY: JFL
CHECKED BY: MJC
DATE: 04/05

PROJECT: DAK
DATE: 12/08/05

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PHelps Dodge Safford Inc.
SAFFORD LEACH PROJECT DETAILED DESIGN

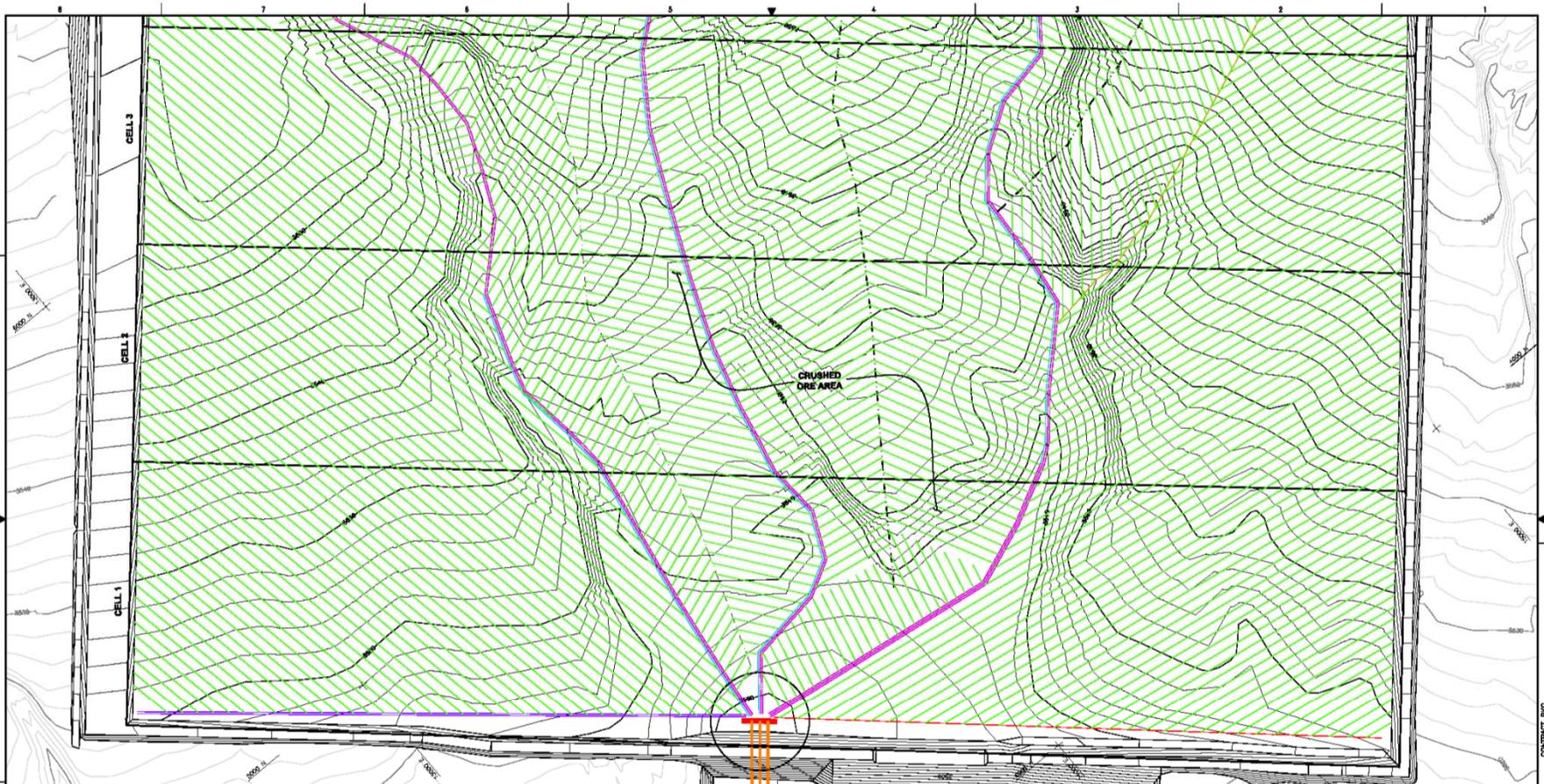
FINAL HEAP LEACH FACILITY SOLUTION COLLECTION PIPING LAYOUT PLAN

100% HEAP LEACH DESIGN

AS SHOWN 053-2538 DD 3120-101 1

CADD FILE No. 3120-101





LEGEND

- | | | | | | |
|-------------|--------------------------|---|------------------------------|---|-----------------------------|
| —3600 | EXISTING GROUND CONTOURS | — | SECONDARY 12 INCH HDPE DR-11 | — | PRIMARY 20 INCH HDPE DR-17 |
| —3600 | REGRADED CONTOURS | — | SECONDARY 16 INCH HDPE DR-11 | — | PRIMARY 24 INCH HDPE DR-17 |
| - - - - - | ROM BOUNDARY | — | SECONDARY 20 INCH HDPE DR-11 | — | MANIFOLD 48 INCH HDPE DR-17 |
| - · - · - · | DRAINAGE DIVIDE | — | PRIMARY 24 INCH HDPE DR-11 | — | MANIFOLD 30 INCH HDPE DR-17 |
| — | LATERAL 4 INCH PCPE | | | | |

NOTES

1. TERTIARY PIPES NOT TO BE PLACED IN ROM ORE AREA.

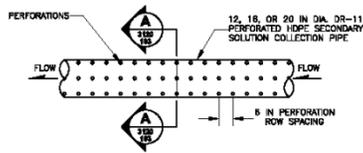
REV.	DATE	REVISION DESCRIPTION	DESIGNER	REFERENCE DRAWING
0		ISSUED FOR CONSTRUCTION		

		PHELPS DODGE SAFFORD INC. SAFFORD LEACH PROJECT DETAILED DESIGN	
PROJECT MANAGER JFL MJC	DESIGNER JWR MJC	DATE 12/05	SHEET NO. DD 3120-21-113
TITLE LATERAL PIPE LAYOUT PLAN (1 OF 4)		DATE 09/28/07	SCALE AS SHOWN
PROJECT NO. 053-2538		SHEET NO. DD 3120-113	TOTAL SHEETS 0

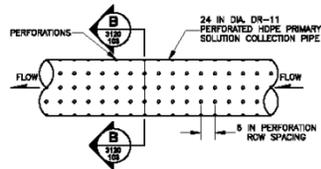
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DATE/TIME

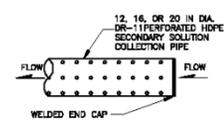
MANUAL CHANGES MADE - YES () NO (X) DWG. FILE UPDATED - YES () NO (X) MODEL UPDATED - YES () NO (X)



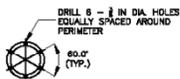
1 SECONDARY SOLUTION COLLECTION PIPE
 3120 103
 1"=40' (SCALE)
 1"=4' (B SCALE)



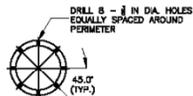
2 PRIMARY SOLUTION COLLECTION PIPE
 3120 103
 1"=40' (SCALE)
 1"=4' (B SCALE)



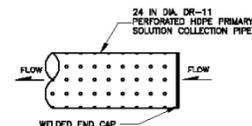
3 SECONDARY SOLUTION COLLECTION PIPE END CAP
 3120 103
 1"=40' (SCALE)
 1"=4' (B SCALE)



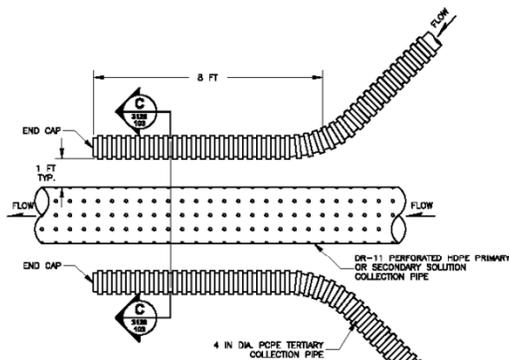
A SECONDARY SOLUTION COLLECTION PIPE PERFORATION DETAIL
 3120 103
 1"=40' (SCALE)
 1"=4' (B SCALE)



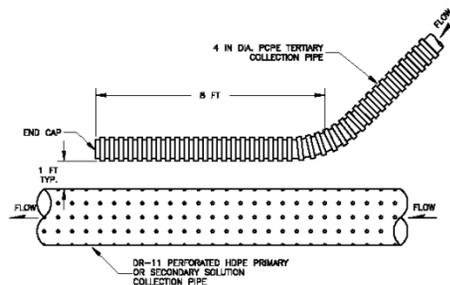
B PRIMARY SOLUTION COLLECTION PIPE PERFORATION DETAIL
 3120 103
 1"=40' (SCALE)
 1"=4' (B SCALE)



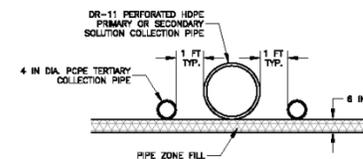
4 PRIMARY SOLUTION COLLECTION PIPE END CAP
 3120 103
 1"=40' (SCALE)
 1"=4' (B SCALE)



5 TYPICAL DOUBLE TERTIARY TO SECONDARY OR PRIMARY SOLUTION COLLECTION PIPE
 3120 103
 N.T.A.



6 TYPICAL SINGLE TERTIARY TO SECONDARY OR PRIMARY SOLUTION COLLECTION PIPE
 3120 103
 N.T.A.



C TYPICAL DOUBLE TERTIARY TO SECONDARY OR PRIMARY SOLUTION COLLECTION PIPE SECTION
 3120 103
 N.T.A.

NO.	DATE	REVISION DESCRIPTION	DES. ENG.	APPROVED	CHK. ENG.	REVISION DESCRIPTION	DES. ENG.	APPROVED	DELTA	REFERENCE CHANGE
1	05/20/06	ISSUED FOR CONSTRUCTION	MJC	[Signature]						
0	04/20/06	ISSUED FOR CONSTRUCTION	MJC	[Signature]						
0	04/20/06	ISSUED FOR CONSTRUCTION	MJC	[Signature]						
C	04/20/06	BASE DESIGN SUBMITTAL	JEL	[Signature]						
B	03/27/06	BASE DESIGN REVIEW	JEL	[Signature]						
A	02/02/06	CON DESIGN REVIEW	JEL	[Signature]						

DD 3120-21-103

Golder Associates
Tucson, Arizona

PHILIPS DOGGE SAFFORD INC.
SAFFORD LEACH PROJECT DETAILED DESIGN

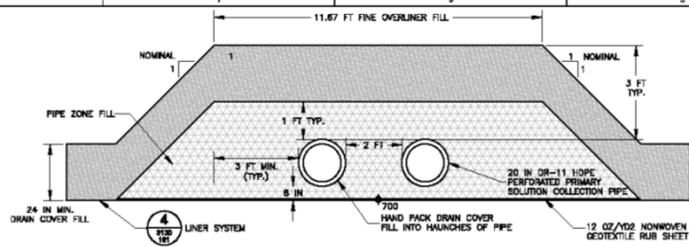
SOLUTION COLLECTION DETAILS
(1 OF 7)

100% HEAP LEACH DESIGN

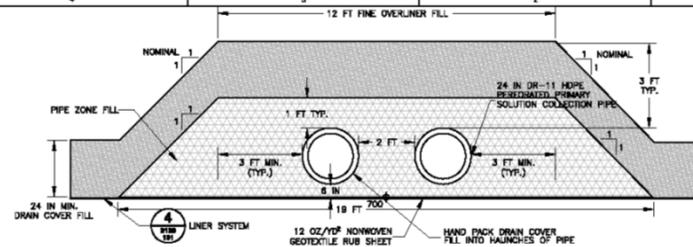
AS SHOWN 053-2538 DD 3120-103 1

CADD FILE No. 3120-103

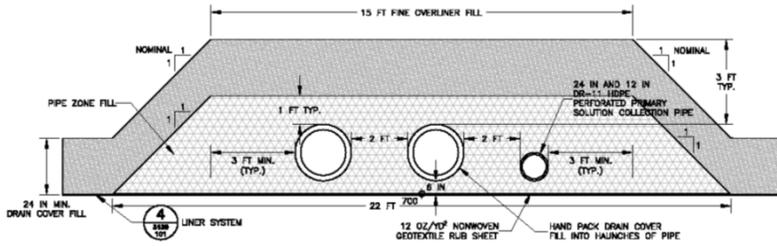
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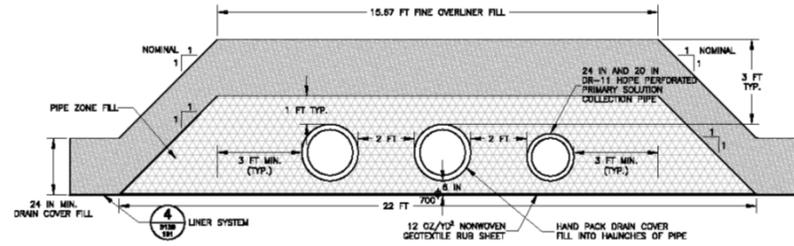
H
DOUBLE 20 IN HDPE PRIMARY SOLUTION COLLECTION PIPE OVERLINER DETAIL SECTION
 3120 112
 1"=2'(D SCALE)
 1"=4'(B SCALE)



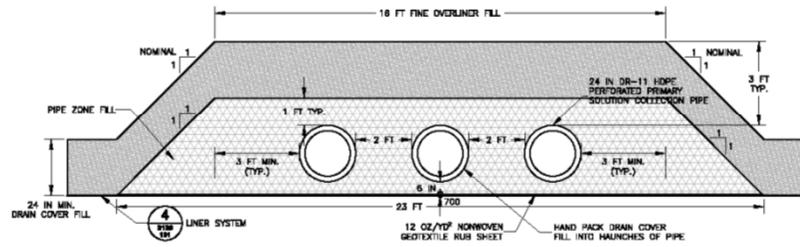
I
DOUBLE 24 IN HDPE PRIMARY SOLUTION COLLECTION PIPE OVERLINER DETAIL SECTION
 3120 112
 1"=2'(D SCALE)
 1"=4'(B SCALE)



J
DOUBLE 24 IN HDPE PRIMARY AND 12 IN HDPE SECONDARY SOLUTION COLLECTION PIPE OVERLINER DETAIL SECTION
 3120 112
 1"=2'(D SCALE)
 1"=4'(B SCALE)



K
DOUBLE 24 IN HDPE PRIMARY AND 20 IN HDPE SECONDARY SOLUTION COLLECTION PIPE OVERLINER DETAIL SECTION
 3120 112
 1"=2'(D SCALE)
 1"=4'(B SCALE)



L
TRIPLE 24 IN HDPE PRIMARY SOLUTION COLLECTION PIPE OVERLINER DETAIL SECTION
 3120 112
 1"=2'(D SCALE)
 1"=4'(B SCALE)

REV.	DATE	REVISION DESCRIPTION	DES. DATE	APPROVED	CHK.	DATE	REVISION DESCRIPTION	DES. DATE	APPROVED	CHK.	DATE	REFERENCE DRAWING
1		ISSUED FOR CONSTRUCTION										
0		ISSUED FOR CONSTRUCTION										
A		WORK ORDER SUBMITTAL										

Golder Associates
Tucson, Arizona

DD 3120-21-112

PHILIPS DODGE SAFFORD INC.
SAFFORD LEACH PROJECT DETAILED DESIGN

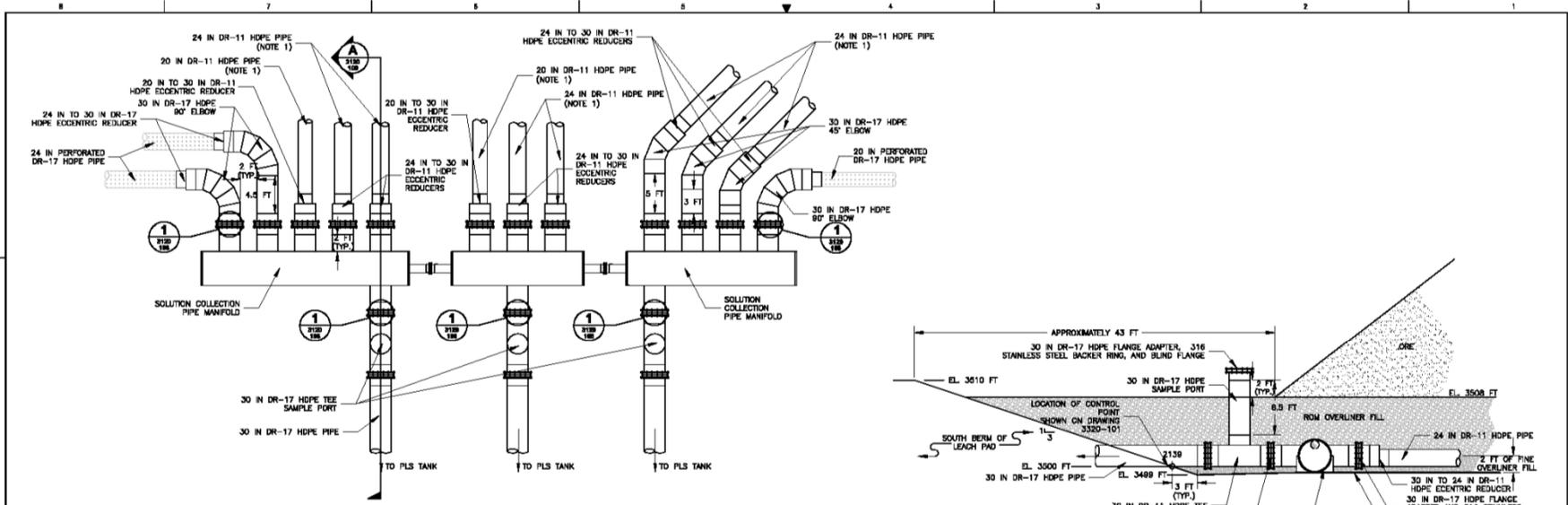
SOLUTION COLLECTION DETAILS
(7 OF 7)

100% HEAP LEACH DESIGN

AS SHOWN 053-2538 DD 3120-112 1

NOTES: THIS DRAWING HAS BEEN REVIEWED BY GOLDER ASSOCIATES AND IS AN INSTRUMENT OF SERVICE. THE REVIEW IS THE PROPERTY OF THE DRAWING AND PHILIPS DODGE SAFFORD INC. AND SHALL REMAIN THE PROPERTY OF PHILIPS DODGE SAFFORD INC. ANY REUSE OR MODIFICATION OF THIS DRAWING WITHOUT THE WRITTEN PERMISSION OF GOLDER ASSOCIATES IS PROHIBITED. THE USER SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE APPROPRIATE AGENCIES AND AUTHORITIES. THE USER SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE APPROPRIATE AGENCIES AND AUTHORITIES. THE USER SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE APPROPRIATE AGENCIES AND AUTHORITIES.





NOTE:
 1. INSTALL 100 MIL HDPE RUBSHEET UNDER MANIFOLD. RUBSHEET TO EXTEND 10 FT BEYOND FLANGE ADAPTERS AND ENDS OF 48 IN DIA. DR-17 HDPE PIPE.
 2. MANUFACTURER OF THE MANIFOLD TO PROVIDE SHOP DRAWINGS FOR OWNER'S AND ENGINEER'S APPROVAL PRIOR TO FABRICATION.

1 SOLUTION COLLECTION PIPE MANIFOLD PIPING DETAIL
 3128 1"=12'(8 SCALE)
 108 1"=12'(8 SCALE)

A MANIFOLD OUTLET PIPE SECTION
 3128 1"=12'(8 SCALE)
 108 1"=12'(8 SCALE)

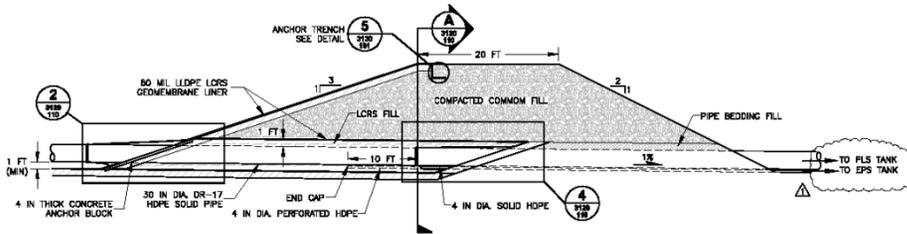
NOTE
 1. EXTEND NON-PERFORATED DR-11 HDPE PIPES 100 FT UPGRADIENT AND FUSION WELD TO PERFORATED DR-11 HDPE PIPES AS SHOWN ON DETAIL 3 ON DRAWING 3120-108 AND AS LOCATED ON DRAWING 3120-102 WITH CONTROL POINTS 1528, 1527, AND 1528.

REV.	DATE	REVISION DESCRIPTION	DESIGNER	APPROVED	CHK.	DATE	REVISION DESCRIPTION	DESIGNER	APPROVED	CHK.	DATE	REFERENCE CHANGE
1	05/06	ISSUED FOR CONSTRUCTION	MJC	[Signature]								
0	03/06	ISSUED FOR CONSTRUCTION	MJC	[Signature]								
A	03/06	ISSUE EXHIBIT SUBMITTAL	MJC	[Signature]								

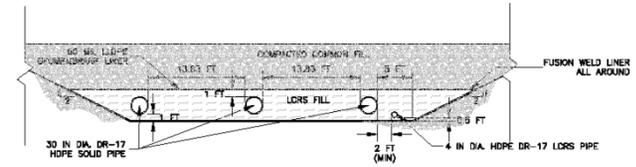
DESIGNED BY	MJC	DATE	JUN
DATE	MJC	DATE	MJC
EXAMINED	PPH	DATE	03/06
DATE	DAK	DATE	12/08/06
SCALE		DATE	

PROJECT NO.	053-2538	DATE	DD	3120-109	NO.	1
SCALE	AS SHOWN	PROJECT NO.	053-2538	DATE	DD	3120-109
CADD FILE NO.	3120-109					

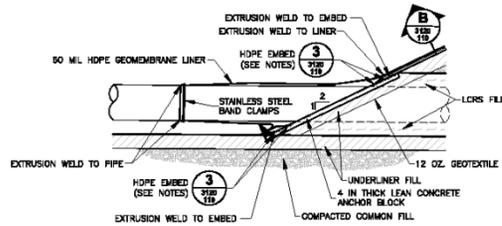




1 MANIFOLD OUTLET DETAIL (PROFILE)
 3/12/08 1/8" (1"=8" SCALE)
 1/10 1/8" (1"=8" SCALE)

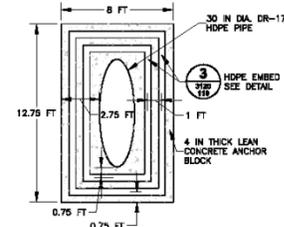


A MANIFOLD OUTLET DETAIL (SECTION)
 3/12/08 1/8" (1"=8" SCALE)
 1/10 1/8" (1"=8" SCALE)

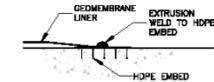


2 SINGLE LINER SINGLE PIPE BOOT DETAIL
 3/12/08 1/8" (1"=8" SCALE)
 1/10 1/8" (1"=8" SCALE)

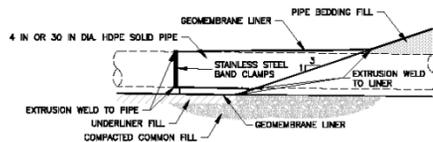
- INSTALLATION SEQUENCE:
1. EXTRUSION WELD 60 MIL HDPE LCRS LINER TO OUTER HDPE EMBED ON ALL SIDES.
 2. EXTRUSION WELD 60 MIL HDPE PAD LINER TO INNER HDPE EMBED ON ALL SIDES.
 3. INSTALL 60 MIL HDPE PIPE BOOT. EXTRUSION WELD TO 60 MIL HDPE PAD LINER AND HDPE PROCESS PIPE CLAMP BOOT TO PIPE WITH STAINLESS STEEL BAND CLAMPS 2 INCHES BACK FROM EXTRUSION WELD.



B ANCHOR BLOCK EMBED SECTION
 3/12/08 1/8" (1"=8" SCALE)
 1/10 1/8" (1"=8" SCALE)



3 HDPE EMBED DETAIL
 3/12/08 0.5" (1/8" SCALE)
 1/10 0.5" (1/8" SCALE)



4 SINGLE LINER PIPE BOOT DETAIL
 3/12/08 1/8" (1"=8" SCALE)
 1/10 1/8" (1"=8" SCALE)

- INSTALLATION SEQUENCE:
1. INSTALL 60 MIL HDPE BOOT. EXTRUSION WELD TO 60 MIL HDPE LINER AND HDPE PROCESS PIPE CLAMP BOOT TO PIPE WITH STAINLESS STEEL BAND CLAMPS 2 INCHES IN BACK FROM EXTRUSION WELD.
 3. HAND PLACE PIPE ZONE FILL UNDER PROCESS PIPES ONCE WELDING AND BANDING ARE COMPLETE.

REV.	DATE	REVISION DESCRIPTION	DES. CHK.	APPROVED	REV.	DATE	REVISION DESCRIPTION	DES. CHK.	APPROVED	DETAIL	REFERENCE CHANGE
1	REVISION	ISSUED FOR CONSTRUCTION	MJC								
0	ISSUED	ISSUED FOR CONSTRUCTION	MJC								
A	ISSUED	ISSUED FOR CONSTRUCTION	MJC								

DD 3120-21-110

Golden Associates
 TULSA, OKLAHOMA

PHILIPS DODGE SAFFORD INC.
 SAFFORD LEACH PROJECT DETAILED DESIGN

SOLUTION COLLECTION DETAILS
 (5 OF 7)

100% HEAP LEACH DESIGN

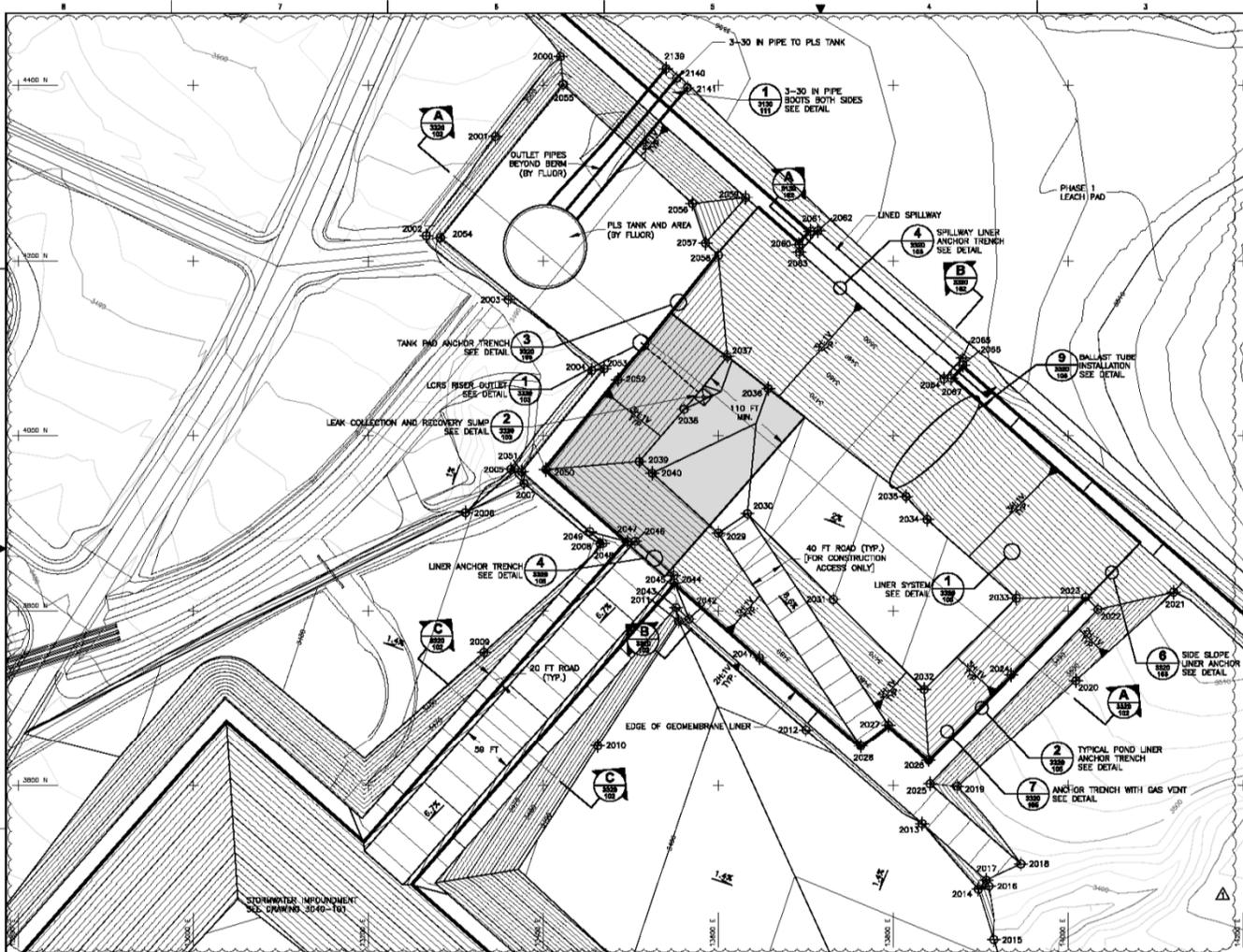
AS SHOWN 053-2538 DD 3120-110 1

CADD FILE No. 3120-110



Solution Conveyance

- Solution outside the heap is stored in either a PLS Tank or Process Pond
- Solution in the tank/pond is gravity fed or pumped to the SX/EW Plant
- Solution is conveyed in HDPE or stainless steel pipes with secondary containment



LEGEND

- 3500 EXISTING GROUND CONTOURS
- 3500 REGRADED CONTOURS
- ⊕ CONTROL POINT
- EDGE OF GEOMEMBRANE LINER
- ▭ 100 MIL GEOMEMBRANE PRIMARY LINER
- ▲ SLOPE INDICATOR
- ① DETAIL CALLOUT
DETAIL ID
DRAWING SHEET LOCATION
- ⊕ CROSS-SECTION CALLOUT
SECTION ID
DRAWING SHEET LOCATION

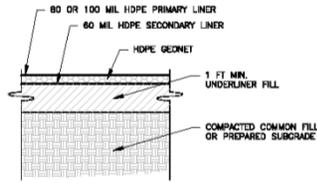
POND CONTROL POINTS

ID	NORTHING	EASTING	ELEV.
2000	4233.08	3425.58	3500.19
2001	4242.08	3425.58	3500.19
2002	4251.08	3425.58	3500.19
2003	4260.08	3425.58	3500.19
2004	4269.08	3425.58	3500.19
2005	4278.08	3425.58	3500.19
2006	4287.08	3425.58	3500.19
2007	4296.08	3425.58	3500.19
2008	4305.08	3425.58	3500.19
2009	4314.08	3425.58	3500.19
2010	4323.08	3425.58	3500.19
2011	4332.08	3425.58	3500.19
2012	4341.08	3425.58	3500.19
2013	4350.08	3425.58	3500.19
2014	4359.08	3425.58	3500.19
2015	4368.08	3425.58	3500.19
2016	4377.08	3425.58	3500.19
2017	4386.08	3425.58	3500.19
2018	4395.08	3425.58	3500.19
2019	4404.08	3425.58	3500.19
2020	4413.08	3425.58	3500.19
2021	4422.08	3425.58	3500.19
2022	4431.08	3425.58	3500.19
2023	4440.08	3425.58	3500.19
2024	4449.08	3425.58	3500.19
2025	4458.08	3425.58	3500.19
2026	4467.08	3425.58	3500.19
2027	4476.08	3425.58	3500.19
2028	4485.08	3425.58	3500.19
2029	4494.08	3425.58	3500.19
2030	4503.08	3425.58	3500.19
2031	4512.08	3425.58	3500.19
2032	4521.08	3425.58	3500.19
2033	4530.08	3425.58	3500.19
2034	4539.08	3425.58	3500.19
2035	4548.08	3425.58	3500.19
2036	4557.08	3425.58	3500.19
2037	4566.08	3425.58	3500.19
2038	4575.08	3425.58	3500.19
2039	4584.08	3425.58	3500.19
2040	4593.08	3425.58	3500.19
2041	4602.08	3425.58	3500.19
2042	4611.08	3425.58	3500.19
2043	4620.08	3425.58	3500.19
2044	4629.08	3425.58	3500.19
2045	4638.08	3425.58	3500.19
2046	4647.08	3425.58	3500.19
2047	4656.08	3425.58	3500.19
2048	4665.08	3425.58	3500.19
2049	4674.08	3425.58	3500.19
2050	4683.08	3425.58	3500.19
2051	4692.08	3425.58	3500.19
2052	4701.08	3425.58	3500.19
2053	4710.08	3425.58	3500.19
2054	4719.08	3425.58	3500.19
2055	4728.08	3425.58	3500.19
2056	4737.08	3425.58	3500.19
2057	4746.08	3425.58	3500.19
2058	4755.08	3425.58	3500.19
2059	4764.08	3425.58	3500.19
2060	4773.08	3425.58	3500.19
2061	4782.08	3425.58	3500.19
2062	4791.08	3425.58	3500.19
2063	4800.08	3425.58	3500.19
2064	4809.08	3425.58	3500.19
2065	4818.08	3425.58	3500.19
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2067	4836.08	3425.58	3500.19
2068	4845.08	3425.58	3500.19
2069	4854.08	3425.58	3500.19
2070	4863.08	3425.58	3500.19
2071	4872.08	3425.58	3500.19
2072	4881.08	3425.58	3500.19
2073	4890.08	3425.58	3500.19
2074	4899.08	3425.58	3500.19
2075	4908.08	3425.58	3500.19
2076	4917.08	3425.58	3500.19
2077	4926.08	3425.58	3500.19
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2081	4962.08	3425.58	3500.19
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2083	4980.08	3425.58	3500.19
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2092	5061.08	3425.58	3500.19
2093	5070.08	3425.58	3500.19
2094	5079.08	3425.58	3500.19
2095	5088.08	3425.58	3500.19
2096	5097.08	3425.58	3500.19
2097	5106.08	3425.58	3500.19
2098	5115.08	3425.58	3500.19
2099	5124.08	3425.58	3500.19
2100	5133.08	3425.58	3500.19
2101	5142.08	3425.58	3500.19
2102	5151.08	3425.58	3500.19
2103	5160.08	3425.58	3500.19
2104	5169.08	3425.58	3500.19
2105	5178.08	3425.58	3500.19
2106	5187.08	3425.58	3500.19
2107	5196.08	3425.58	3500.19
2108	5205.08	3425.58	3500.19
2109	5214.08	3425.58	3500.19
2110	5223.08	3425.58	3500.19
2111	5232.08	3425.58	3500.19
2112	5241.08	3425.58	3500.19
2113	5250.08	3425.58	3500.19
2114	5259.08	3425.58	3500.19
2115	5268.08	3425.58	3500.19
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2117	5286.08	3425.58	3500.19
2118	5295.08	3425.58	3500.19
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2124	5349.08	3425.58	3500.19
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2130	5403.08	3425.58	3500.19
2131	5412.08	3425.58	3500.19
2132	5421.08	3425.58	3500.19
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2149	5574.08	3425.58	3500.19
2150	5583.08	3425.58	3500.19
2151	5592.08	3425.58	3500.19
2152	5601.08	3425.58	3500.19
2153	5610.08	3425.58	3500.19
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2160	5673.08	3425.58	3500.19
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2169	5754.08	3425.58	3500.19
2170	5763.08	3425.58	3500.19
2171	5772.08	3425.58	3500.19
2172	5781.08	3425.58	3500.19
2173	5790.08	3425.58	3500.19
2174	5799.08	3425.58	3500.19
2175	5808.08	3425.58	3500.19
2176	5817.08	3425.58	3500.19
2177	5826.08	3425.58	3500.19
2178	5835.08	3425.58	3500.19
2179	5844.08	3425.58	3500.19
2180	5853.08	3425.58	3500.19
2181	5862.08	3425.58	3500.19
2182	5871.08	3425.58	3500.19
2183	5880.08	3425.58	3500.19
2184	5889.08	3425.58	3500.19
2185	5898.08	3425.58	3500.19
2186	5907.08	3425.58	3500.19
2187	5916.08	3425.58	3500.19
2188	5925.08	3425.58	3500.19
2189	5934.08	3425.58	3500.19
2190	5943.08	3425.58	3500.19
2191	5952.08	3425.58	3500.19
2192	5961.08	3425.58	3500.19
2193	5970.08	3425.58	3500.19
2194	5979.08	3425.58	3500.19
2195	5988.08	3425.58	3500.19
2196	5997.08	3425.58	3500.19
2197	6006.08	3425.58	3500.19
2198	6015.08	3425.58	3500.19
2199	6024.08	3425.58	3500.19
2200	6033.08	3425.58	3500.19
2201	6042.08	3425.58	3500.19
2202	6051.08	3425.58	3500.19
2203	6060.08	3425.58	3500.19
2204	6069.08	3425.58	3500.19
2205	6078.08	3425.58	3500.19
2206	6087.08	3425.58	3500.19
2207	6096.08	3425.58	3500.19
2208	6105.08	3425.58	3500.19
2209	6114.08	3425.58	3500.19
2210	6123.08	3425.58	3500.19
2211	6132.08	3425.58	3500.19
2212	6141.08	3425.58	3500.19
2213	6150.08	3425.58	3500.19
2214	6159.08	3425.58	3500.19
2215	6168.08	3425.58	3500.19
2216	6177.08	3425.58	3500.19
2217	6186.08	3425.58	3500.19
2218	6195.08	3425.58	3500.19
2219	6204.08	3425.58	3500.19
2220	6213.08	3425.58	3500.19
2221	6222.08	3425.58	3500.19
2222	6231.08	3425.58	3500.19
2223	6240.08	3425.58	3500.19
2224	6249.08	3425.58	3500.19
2225	6258.08	3425.58	3500.19
2226	6267.08	3425.58	3500.19
2227	6276.08	3425.58	3500.19
2228	6285.08	3425.58	3500.19
2229	6294.08	3425.58	3500.19
2230	6303.08	3425.58	3500.19
2231	6312.08	3425.58	3500.19
2232	6321.08	3425.58	3500.19
2233	6330.08	3425.58	3500.19
2234	6339.08	3425.58	3500.19
2235	6348.08	3425.58	3500.19
2236	6357.08	3425.58	3500.19
2237	6366.08	3425.58	3500.19
2238	6375.08	3425.58	3500.19
2239	6384		

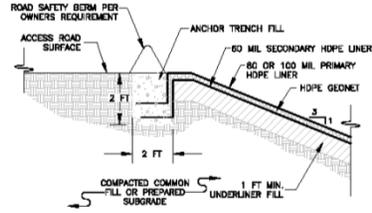


Process Pond Liner System

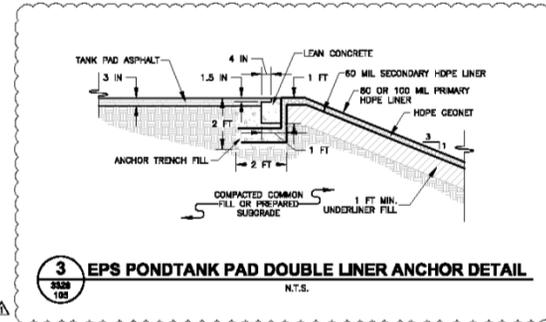
- Double Composite Liner System with Leak Collection and Recovery System
 - Prepared Subgrade
 - 12-inches of compacted low permeability soil ($<1 \times 10^{-6}$ cm/s)
 - 60 mil HDPE geomembrane liner
 - Geonet
 - 60 mil HDPE geomembrane liner



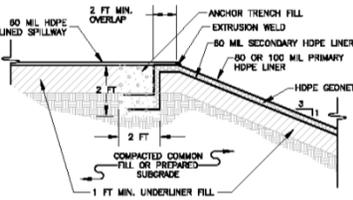
1 TYPICAL POND DOUBLE LINER DETAIL
 3320
 105 N.T.S.



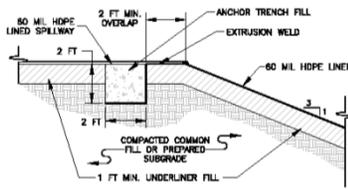
2 TYPICAL POND DOUBLE LINER ANCHOR DETAIL
 3320
 105 N.T.S.



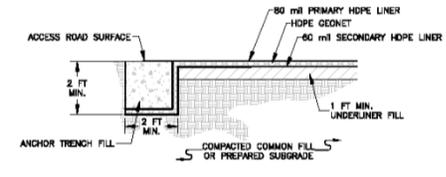
3 EPS POND/TANK PAD DOUBLE LINER ANCHOR DETAIL
 3320
 105 N.T.S.



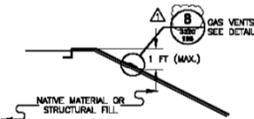
4 SPILLWAY DOUBLE LINER ANCHOR DETAIL
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 106 N.T.S.



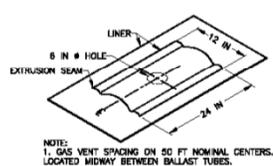
5 SPILLWAY SINGLE LINER ANCHOR DETAIL
 3320
 106 N.T.S.



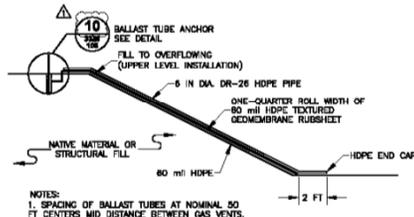
6 SIDE SLOPE DOUBLE LINER ANCHOR DETAIL
 3320
 106 N.T.S.



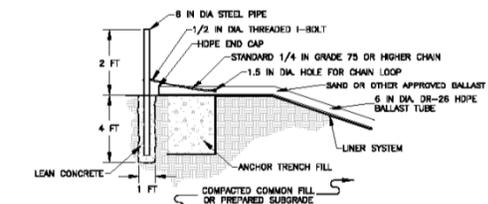
7 ANCHOR TRENCH WITH GAS VENT
 3320
 105 N.T.S.



8 GAS VENT DETAIL
 3320
 105 N.T.S.



9 TYPICAL BALLAST TUBE INSTALLATION
 3320
 105 N.T.S.



10 TYPICAL BALLAST TUBE ANCHOR
 3320
 105 N.T.S.

REV.	DATE	REVISION DESCRIPTION	DES. CHK.	APPROVED	REV.	DATE	REVISION DESCRIPTION	DES. CHK.	APPROVED	DATE	REFERENCE CHANGE
1	05/20/06	ISSUED FOR CONSTRUCTION	MJC	[Signature]							
0	03/06/06	ISSUED FOR CONSTRUCTION	MJC	[Signature]							
A	04/06/06	ISSUE DRAWING SUBMITTAL	MJC	[Signature]							

DD 3320-21-105

DESIGNED BY	MJC	CHECKED BY	NIL
DRAWN BY	MJC	DATE PLOTTED	03/06
DATE PLOTTED	03/06	SCALE	AS SHOWN

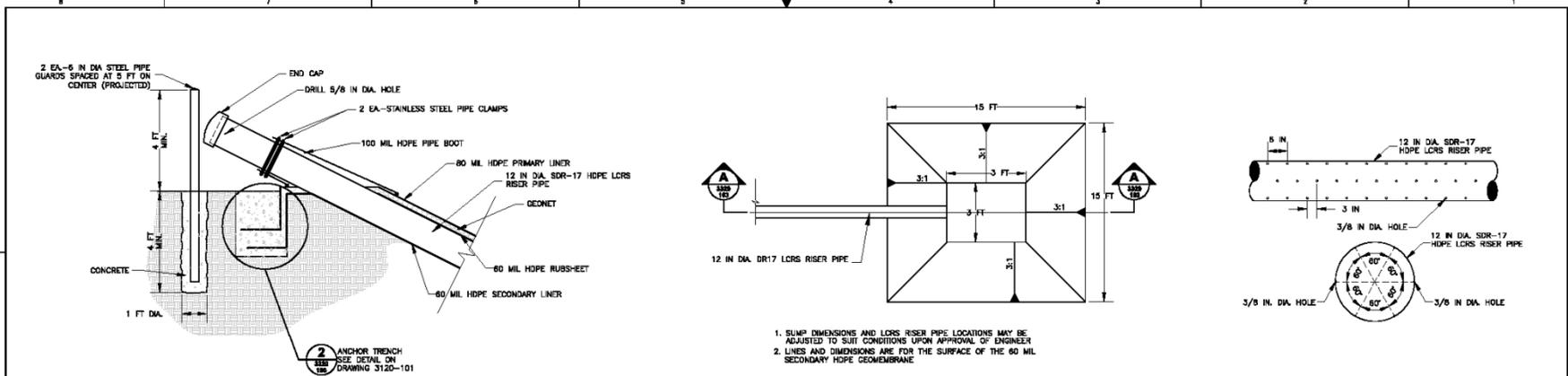
PHILIPS DODGE SAFFORD INC.
 SAFFORD LEACH PROJECT DETAILED DESIGN

EPS POND DETAILS

100% HEAP LEACH DESIGN

DATE PLOTTED: 05/23/06
 DRAWN BY: DD
 CHECKED BY: MJC
 SCALE: 3320-105
 SHEET NO: 1

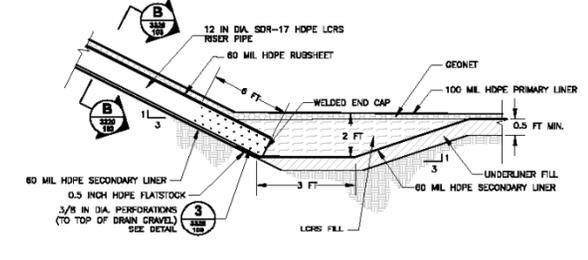
CADD FILE No. 3320-105



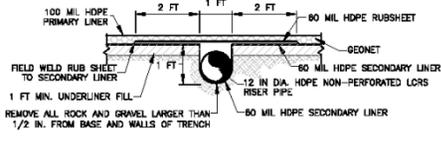
1 LEAK COLLECTION AND RECOVERY SYSTEM RISER OUTLET DETAIL
 3320 103 N.T.S.

2 LEAK COLLECTION AND RECOVERY SYSTEM SUMP DETAIL
 3320 103 N.T.S.

3 PIPE PERFORATION DETAIL
 3320 103 N.T.S.



A LEAK COLLECTION AND RECOVERY SYSTEM SUMP SECTION
 3320 103 N.T.S.



B RISER SECTION
 3320 103 N.T.S.

NO.	DATE	REVISION DESCRIPTION	DES. CHK.	APPROVED	REV. DATE	REVISION DESCRIPTION	DES. CHK.	APPROVED	DETAIL	REFERENCE CHANGE
1	05/20/06	ISSUED FOR CONSTRUCTION	MJC	[Signature]						
2	06/08/06	ISSUED FOR CONSTRUCTION	MJC	[Signature]						
3	06/08/06	ISSUED FOR CONSTRUCTION	MJC	[Signature]						
4	06/08/06	ISSUED FOR CONSTRUCTION	MJC	[Signature]						
5	06/08/06	ISSUED FOR CONSTRUCTION	MJC	[Signature]						
6	06/08/06	ISSUED FOR CONSTRUCTION	MJC	[Signature]						
7	06/08/06	ISSUED FOR CONSTRUCTION	MJC	[Signature]						
8	06/08/06	ISSUED FOR CONSTRUCTION	MJC	[Signature]						
9	06/08/06	ISSUED FOR CONSTRUCTION	MJC	[Signature]						
10	06/08/06	ISSUED FOR CONSTRUCTION	MJC	[Signature]						

DD 3320-103

		DESIGNED BY: JFL CHECKED BY: JWR DATE: 05/20/06 APPROVED: MJC EXPANDED: 12/05 DATE: 12/05/06	PHILIPS DODGE SAFFORD INC. SAFFORD LEACH PROJECT DETAILED DESIGN LEAK COLLECTION AND RECOVERY DETAILS 100% HEAP LEACH DESIGN
PROJECT NUMBER: DAK DATE: 12/08/06		SHEET NUMBER: 053-2538 DD DATE: 3320-103 NO. 1	CONTRACT PRICE: SHEET COUNT:

NOTES: THIS DRAWING HAS BEEN PREPARED BY GOLDER ASSOCIATES INC. AND IS AN INSTRUMENT OF SERVICE. THIS DRAWING IS THE PROPERTY OF THE ENGINEER AND PHILIPS DODGE SAFFORD INC. AND SHALL BE LOANED SOLELY FOR THE PROJECT AND SHALL NOT BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM, WITHOUT THE WRITTEN PERMISSION OF GOLDER ASSOCIATES INC. AND PHILIPS DODGE SAFFORD INC.

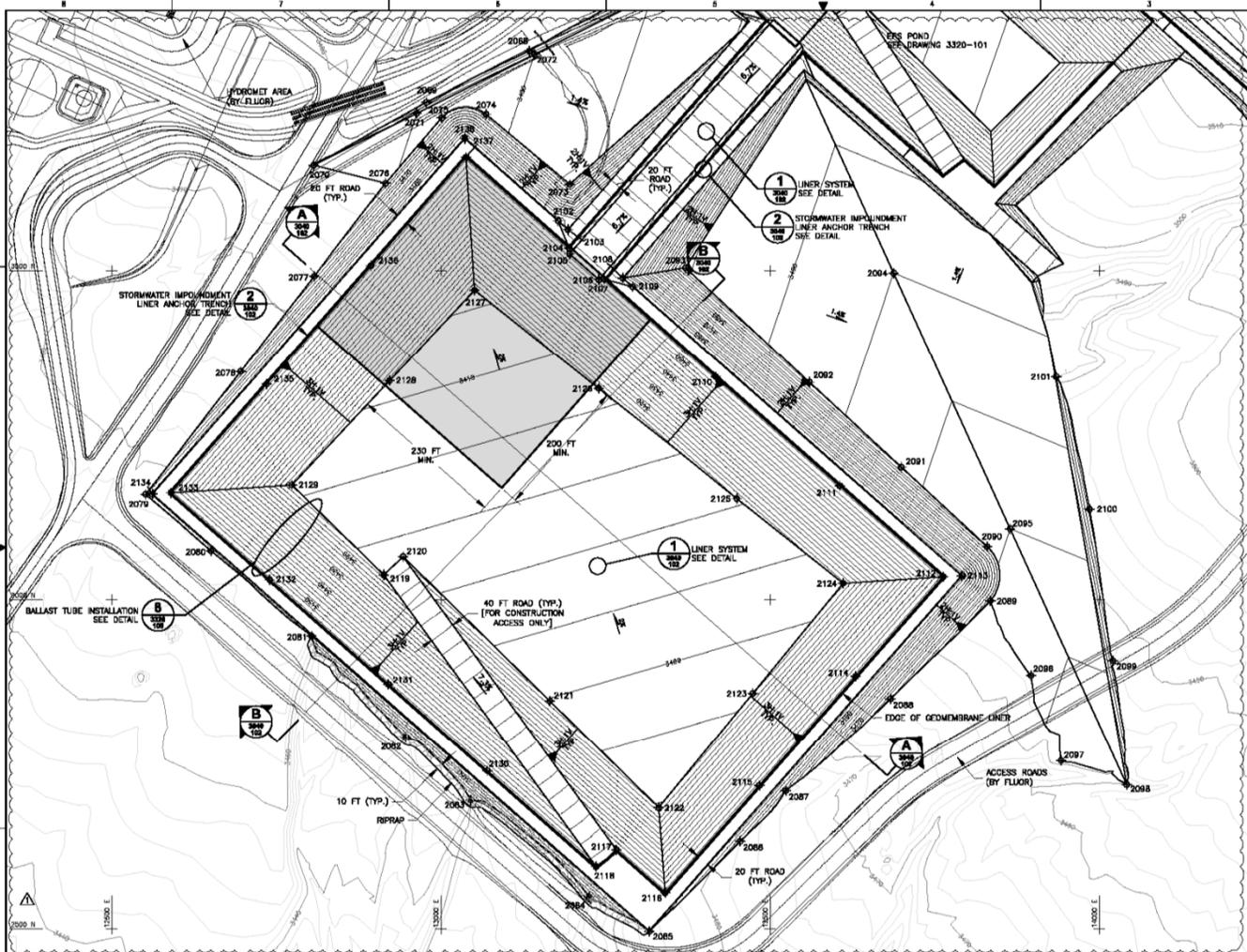
MINOR CHANGES MADE - YES NO
 DES. FILE UPDATED - YES NO
 DETAIL UPDATED - YES NO





Stormwater/Event Containment

- Designed to contain process flows in the event of process shutdown/power outage (24 hours)
- Contain the 100-yr, 24-hr design storm event
- Pumping system sufficient to evacuate pond as soon as practicable



LEGEND

- EXISTING GROUND CONTOURS
- REGRADED CONTOURS
- ◆ CONTROL POINT
- ROADS
- GRADE BREAK
- EDGE OF GEOMEMBRANE LINER
- ▨ 100 MIL GEOMEMBRANE LINER
- ▲ SLOPE INDICATOR
- 3H:1V or 3/11 3 HORIZONTAL TO 1 VERTICAL SLOPE
- ▲ GRADE INDICATOR
- DETAIL CALLOUT
- DRAWING SHEET LOCATION
- CROSS-SECTION CALLOUT
- SECTION ID
- DRAWING SHEET LOCATION

POND CONTROL POINTS

ID	NORTHING	EASTING	ELEV.	ID	NORTHING	EASTING	ELEV.
2068	1325.58	13175.28	3428.58	2119	13061.08	13238.78	3438.05
2069	1325.24	12978.58	3480.43	2120	13037.97	13253.44	3413.99
2070	1325.07	13008.99	3476.20	2121	13058.68	13245.73	3414.63
2071	1326.38	12943.44	3478.50	2122	13046.57	13185.83	3420.08
2072	1326.89	13009.00	3489.00	2123	13048.68	13235.00	3428.13
2073	1327.09	13195.85	3481.80	2124	13057.88	13273.84	3421.59
2074	1327.07	13098.79	3474.61	2125	13055.18	13251.52	3418.10
2075	1326.74	13091.17	3476.95	2126	13052.08	13229.89	3411.29
2076	1326.74	13091.17	3476.95	2127	13049.61	13207.24	3404.48
2077	1326.74	13091.17	3476.95	2128	13047.72	12996.02	3469.00
2078	1326.74	13091.17	3476.95	2129	13045.02	13008.00	3458.00
2079	1326.74	13091.17	3476.95	2130	13042.31	12976.17	3447.85
2080	1326.74	13091.17	3476.95	2131	13039.60	12944.34	3437.70
2081	1326.74	13091.17	3476.95	2132	13036.89	12912.51	3427.55
2082	1326.74	13091.17	3476.95	2133	13034.18	12880.68	3417.40
2083	1326.74	13091.17	3476.95	2134	13031.47	12848.85	3407.25
2084	1326.74	13091.17	3476.95	2135	13028.76	12817.02	3397.10
2085	1326.74	13091.17	3476.95	2136	13026.05	12785.19	3386.95
2086	1326.74	13091.17	3476.95	2137	13023.34	12753.36	3376.80
2087	1326.74	13091.17	3476.95	2138	13020.63	12721.53	3366.65
2088	1326.74	13091.17	3476.95	2139	13017.92	12689.70	3356.50
2089	1326.74	13091.17	3476.95	2140	13015.21	12657.87	3346.35
2090	1326.74	13091.17	3476.95	2141	13012.50	12626.04	3336.20
2091	1326.74	13091.17	3476.95	2142	13009.79	12594.21	3326.05
2092	1326.74	13091.17	3476.95	2143	13007.08	12562.38	3315.90
2093	1326.74	13091.17	3476.95	2144	13004.37	12530.55	3305.75
2094	1326.74	13091.17	3476.95	2145	13001.66	12498.72	3295.60
2095	1326.74	13091.17	3476.95	2146	12998.95	12466.89	3285.45
2096	1326.74	13091.17	3476.95	2147	12996.24	12435.06	3275.30
2097	1326.74	13091.17	3476.95	2148	12993.53	12403.23	3265.15
2098	1326.74	13091.17	3476.95	2149	12990.82	12371.40	3255.00
2099	1326.74	13091.17	3476.95	2150	12988.11	12339.57	3244.85
2100	1326.74	13091.17	3476.95	2151	12985.40	12307.74	3234.70
2101	1326.74	13091.17	3476.95	2152	12982.69	12275.91	3224.55
2102	1326.74	13091.17	3476.95	2153	12980.00	12244.08	3214.40
2103	1326.74	13091.17	3476.95	2154	12977.29	12212.25	3204.25
2104	1326.74	13091.17	3476.95	2155	12974.58	12180.42	3194.10
2105	1326.74	13091.17	3476.95	2156	12971.87	12148.59	3183.95
2106	1326.74	13091.17	3476.95	2157	12969.16	12116.76	3173.80
2107	1326.74	13091.17	3476.95	2158	12966.45	12084.93	3163.65
2108	1326.74	13091.17	3476.95	2159	12963.74	12053.10	3153.50
2109	1326.74	13091.17	3476.95	2160	12961.03	12021.27	3143.35
2110	1326.74	13091.17	3476.95	2161	12958.32	11989.44	3133.20
2111	1326.74	13091.17	3476.95	2162	12955.61	11957.61	3123.05
2112	1326.74	13091.17	3476.95	2163	12952.90	11925.78	3112.90
2113	1326.74	13091.17	3476.95	2164	12950.19	11893.95	3102.75
2114	1326.74	13091.17	3476.95	2165	12947.48	11862.12	3092.60
2115	1326.74	13091.17	3476.95	2166	12944.77	11830.29	3082.45
2116	1326.74	13091.17	3476.95	2167	12942.06	11798.46	3072.30
2117	1326.74	13091.17	3476.95	2168	12939.35	11766.63	3062.15

REV.	DATE	REVISION DESCRIPTION	DESIGNER	APPROVED	CHK.	DATE	REVISION DESCRIPTION	DESIGNER	APPROVED	CHK.	DATE	REFERENCE CHANGE
1	12/05	ISSUED FOR CONSTRUCTION	MJC	[Signature]								
0	12/05	ISSUED FOR CONSTRUCTION	MJC									
C	12/05	BASE DESIGN SUBMITTAL	MJC									
B	12/05	BASE DESIGN REVIEW	MJC									
A	12/05	CON DESIGN REVIEW	MJC									

DD 3040-21-101

PHILIPS DODGE SAFFORD INC.

SAFFORD LEACH PROJECT DETAILED DESIGN

STORMWATER IMPOUNDMENT PLAN

100% HEAP LEACH DESIGN

AS SHOWN 053-2538 DD 3040-101 1

CADD FILE NO. 3040-101

Golder Associates
Tucson, Arizona

NOTES: THIS DRAWING HAS BEEN PREPARED BY GOLDER ASSOCIATES INC. AND IS AN INSTRUMENT OF SERVICE. THE OWNERSHIP OF THE PROPERTY OF THE DESIGNER AND THE DESIGNER'S LIABILITY SHALL BE THE SOLE RESPONSIBILITY FOR THE DESIGN AND CONSTRUCTION OF THE PROJECT. THE CLIENT AGREES THAT THE DESIGNER SHALL NOT BE USED FOR PURPOSES OTHER THAN THOSE INTENDED AND SHALL HOLD THE DESIGNER HARMLESS FROM ANY SUCH USES.

DATE: 12/05

SCALE: 1"=50' (FOR SCALE)

SCALE: 1"=100' (FOR SCALE)

DATE: 12/05

SCALE: 1"=50' (FOR SCALE)

SCALE: 1"=100' (FOR SCALE)

DATE: 12/05

SCALE: 1"=50' (FOR SCALE)

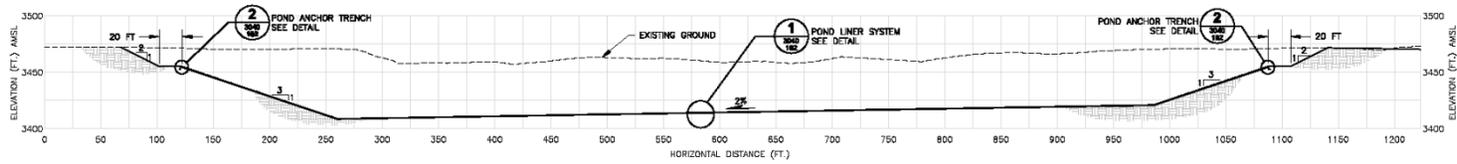
SCALE: 1"=100' (FOR SCALE)



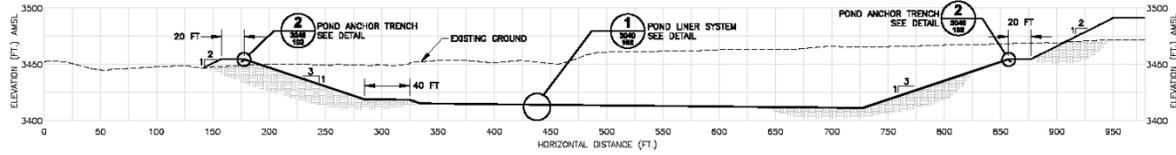


Non-Stormwater Impoundment Liner System

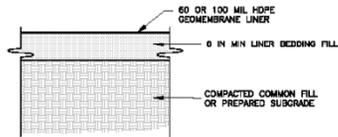
- Single Liner System
 - Prepared Subgrade
 - 6-inch Liner Bedding Fill (no permeability requirement)
 - 60 mil HDPE geomembrane liner (minimum)



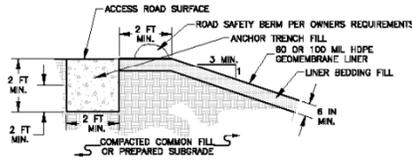
A STORMWATER IMPOUNDMENT SECTION A-A
 3040-102
 0 50 100 Feet
 1"=50'(B SCALE)
 1"=100'(B SCALE)



B STORMWATER IMPOUNDMENT SECTION B-B
 3040-102
 0 50 100 Feet
 1"=50'(B SCALE)
 1"=100'(B SCALE)



1 STORMWATER IMPOUNDMENT LINER DETAIL
 3040-102
 N.T.S.



2 STORMWATER IMPOUNDMENT LINER ANCHOR TRENCH DETAIL
 3040-102
 N.T.S.

LEGEND

- EXISTING GROUND SURFACE
- PROPOSED GROUND SURFACE
- LINER
- 3:1 3 HORIZONTAL TO 1 VERTICAL SLOPE
- 1:1 1 HORIZONTAL TO 1 VERTICAL SLOPE
- 1:1 1 HORIZONTAL TO 1 VERTICAL SLOPE
- 1:1 1 HORIZONTAL TO 1 VERTICAL SLOPE

REV.	DATE	REVISION DESCRIPTION	DESIGNER	APPROVED	REV.	DATE	REVISION DESCRIPTION	DESIGNER	APPROVED	DATE	REFERENCE CHANGES
1	08/08/06	ISSUED FOR CONSTRUCTION	MJC	MJC							
0	08/08/06	ISSUED FOR CONSTRUCTION	MJC	MJC							
0	08/08/06	PRELIMINARY DESIGN SUBMITTAL	MJC	MJC							
0	08/08/06	PRELIMINARY DESIGN REVIEW	MJC	MJC							
0	08/08/06	CONSTRUCTION DESIGN REVIEW	MJC	MJC							

DESIGNED BY	JFL	CHECKED BY	JWR
DRAWN BY	MJC	DATE PLOTTED	12/05
DATE PLOTTED	12/05	PROJECT NUMBER	053-2538
DATE PLOTTED	12/08/06	DRAWING NUMBER	DD 3040-102
DATE PLOTTED		SCALE	AS SHOWN

NOTICE: THIS DRAWING HAS BEEN PREPARED BY GOLDR ASSOCIATES INC. AS AN INSTRUMENT OF SERVICE. THE OWNER IS THE RESPONSIBLE PARTY FOR THE DESIGN AND CONSTRUCTION OF THE PROJECT. THE CLIENT AGREES THAT THE DRAWING SHALL NOT BE USED FOR PURPOSES OTHER THAN THOSE INTENDED, AND SHALL HOLD THE DRAWING PROVIDER HARMLESS FROM ANY OTHER SUCH USE.

UNLESS OTHERWISE SPECIFIED: YES NO DATE FILE UPDATED: YES NO MODEL UPDATED: YES NO

DD 3040-21-102
 PHELPS DODGE SAFFORD INC.
 SAFFORD LEACH PROJECT DETAILED DESIGN
 STORMWATER IMPOUNDMENT SECTIONS AND DETAILS
 100% HEAP LEACH DESIGN
 CADD FILE No. 3040-102





Operational Requirements (Safford)

- Quarterly monitoring of monitoring wells
- Quarterly monitoring of condition of controls around perimeter of leach pad
- Monitoring of LCRS in Process Pond
- Monitoring of solution volumes in Stormwater Impoundment



Existing Leach Facilities

- Most existing leach stockpiles were unlined or only partially lined with clay, and relied primarily on natural features (e.g., bedrock) to contain leach solutions
- Solution containment from existing leach stockpiles has improved over time due to installation of new headwalls and lined PLS ponds and conveyances
- Future ground water protection from existing leach facilities has focused on closure
- Closure measures for existing leach stockpiles are designed to minimize long-term discharge of leachate while continuing to collect solution draindown and leachate for copper recovery and/or treatment



In-Pit Leach Stockpiles

- Both Tyrone and Chino have obtained variances for construction of future leach facilities inside open pits
- In-pit leach stockpiles have been approved for construction without liners
- Liner construction is not feasible inside open pits
- Even without liners, placement of leach facilities inside open pits is favored due to hydrologic control provided by the pits and placing new stockpiles inside the existing disturbed footprint
- The Tyrone settlement contemplates variances for construction of future facilities or facility expansions in areas where groundwater already is impacted



Closure of Leach Facilities

- Stabilize leached ore
 - Regrading
 - Covers
 - Revegetation
- Collection and Treatment of Impacted Water
- Process Water Impoundments
- Pipelines

- Leachate escaping from stockpiles/heaps following cessation of leaching



Closure of Leach Facilities

- DP 1341 Settlement addresses closure requirements of existing unlined leach facilities inside and outside Open Pit Surface Drainage Areas
- Freeport understands that the Copper Rules will be developed consistent with these closure requirements
- For new unlined leach facilities inside the Open Pit Surface Drainage Areas, Freeport expects that the same closure requirements would apply
- For new lined leach facilities outside the Open Pit Surface Drainage, Freeport expects that because the liner, collection and monitor systems are protective of protect groundwater, the key objectives of surface reclamation would focus on other regulatory program objectives such as
 - achieving a Self-Sustaining Eco-system (SSE)
 - protection of surface water



Closure Objectives for Lined Leach Facilities

- Continued Collection and Treatment of Impacted Water
- Limit erosion and discharge clean runoff water
- Revegetate to approved post-mining land use SSE standards



Methods to Achieve Closure Objectives

- Maintain water/collection and solution drain down
- Cover surface with acceptable cover material so surface runoff is dischargeable
 - Cover implies regrading to a 2.5:1 slope or flatter
- Maintain perimeter storm water controls to reduce run-on to the facility



Methods to Achieve Closeout Objectives

- Cover material is of acceptable material to limit erosion
- Cover implies regrading to a 2.5:1 slope or flatter
- To achieve vegetation standards in our region – minimum cover thickness is 18 inches thick.



