

## Memo

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<b>To:</b>	Mr. Timothy S. Ralston, CHMM, REM	<b>Date:</b>	March 28, 2016
<b>Company:</b>	Pinto Valley Mining Corp.	<b>From:</b>	Jasper Begay, PE
<b>Copy to:</b>	Chris Rife, WestLand Resources, Inc.	<b>Project #:</b>	219500.290 Task 700
<b>Subject:</b>	Mine Reservoir Reclamation Plan and Cost		

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### 1 Introduction

SRK Consulting, Inc. (SRK) has prepared a conceptual engineering design for the closure and reclamation of the Mine Reservoir. The Mine Reservoir is located on federal land administered by the Tonto National Forest (TNF) long Forest Service Road 287B (FR 287B) between the Pinto Valley Mine (PVM) and Freeport-McMoran Miami Mine at 33°24'18.20"N and 110°56'46.23"W (see Figure 1). The Mine Reservoir is part of the existing land use authorization for Rights-of-Way PHX-080933. A cost estimate for the closure and reclamation of the Mine Reservoir is presented in Table 1.

### 2 Closure and Reclamation of Mine Reservoir

The closure and reclamation of the Mine Reservoir will include the following activities after cessation of active mining operations at PVM. For the purpose of the conceptual closure design, SRK assumed that the reservoir will be dry and will not require any pumping. Reclamation of the reservoir will begin by ripping of the existing concrete material. The ripped concrete will be loaded onto dumpsters and hauled to the solid waste landfill located in Miami, Arizona.

The side walls of the reservoir will be regraded from a 0.5H:1V slope to a regrade slope of 2.5H:1V (see Figure 2). The reservoir bottom will be covered with surrounding native borrow materials and sloped at a 2 percent grade towards the southeast corner of the reservoir. A section of the FR 287B will be excavated for a culvert system that includes three 24-inch corrugated metal pipes (CMPs).

The set of CMPs have been sized to the 100-year, 24-hour storm event peak flows from the upper watershed basin (see Figure 3 and Attachment A). Installation of riprap apron at the outlet of the CMPs is required for erosion protection and energy dissipation. The backfill of the reservoir will be scarified and revegetated.

### 3 Post-reclamation Inspection and Maintenance Activities

The Mine Reservoir will be inspected periodically to monitor for erosion. In addition, the re-established drainages will be inspected after major rainfall events to make sure the culvert and riprap apron are working properly. The culvert will be maintained so that obstructions or debris will be removed annually, or as needed following a significant storm event.

### 4 Conclusions

The total closure and reclamation cost estimate is \$93,488 for the Mine Reservoir. The reclamation cost estimate includes only direct costs (i.e. labor, equipment, materials) for reclamation construction. No indirect costs have been included. The summary of costs is presented in Table 1.

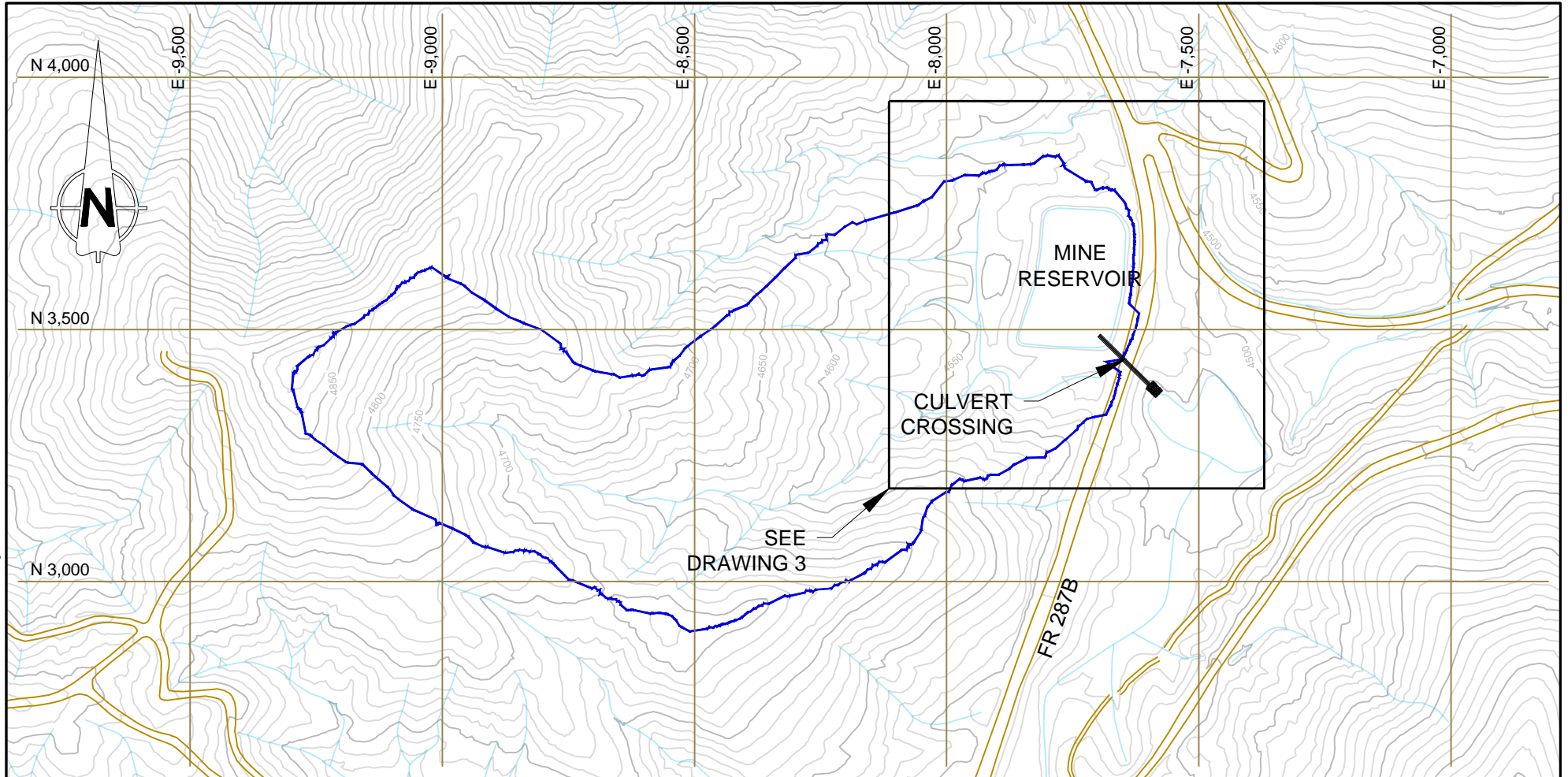
**Table 1: Summary Cost**

Item	Description	Qty	Unit	Unit Cost	Subtotal	Total
<b>900</b>	<b>Mine Reservoir</b>					
901	Demolition of Mine Reservoir Pond	52052	S.F.	\$0.18	\$9,549	\$9,549
902	Removal of Concrete and Disposal at Off-site Solid Waste Landfill	964	C.Y.	\$2.57	\$2,482	\$41,581
903	Backfilling and Regrading Mine Reservoir Pond	6160	C.Y.	\$0.64	\$3,936	\$3,936
904	Installation of Culvert System				\$36,450	\$36,450
904.01	Excavating Embankment	2500	C.Y.	\$2.94	\$7,350	
904.02	24" Corrugated Metal Pipes	400	L.F.	\$39.07	\$15,628	
904.03	Filling Embankment (20% swell)	2940	C.Y.	\$0.78	\$2,293	
904.04	Compacting Embankment	2450	C.Y.	\$3.18	\$7,791	
904.05	Riprap Installation with Geotextile	35	C.Y.	\$96.78	\$3,387	
905	Scarifying Mine Reservoir Pond	2.36	AC.	\$186.44	\$440	\$440
906	Revegetating Mine Reservoir Pond	2.36	AC.	\$649.15	\$1,532	\$1,532
<b>Grand Total:</b>						<b>\$93,488</b>








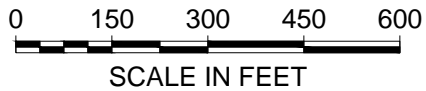
**Figure 1: Location of Mine Reservoir**





**EXPLANATION**

-  EXISTING GROUND CONTOURS (MAJOR/MINOR) 10 FEET INTERVAL
-  REGRADE GROUND CONTOURS (MAJOR/MINOR) 5 FEET INTERVAL
-  WATERSHED BASIN BOUNDARY
-  UNPAVED ROADS
-  DRAINAGES



**GENERAL NOTES**

1. THE MAP PROJECTION IS IN PINTO VALLEY MINE SITE (INSPIRATION) COORDINATES (FT).

**REFERENCES**

1. 2011 TOPOGRAPHY PROVIDED BY BHP (2011).

DESIGN: JB  
DRAWN: JB  
REVIEWED: CKH/RP  
APPROVED: CKH

PREPARED BY:



PROJECT:

**PINTO VALLEY MINE  
PLAN OF OPERATIONS SUPPORT**

DRAWING TITLE:

**MINE RESERVOIR LOCATION  
& WATERSHED BASINS**

DATE:

MAR. 2016

REVISION:

0

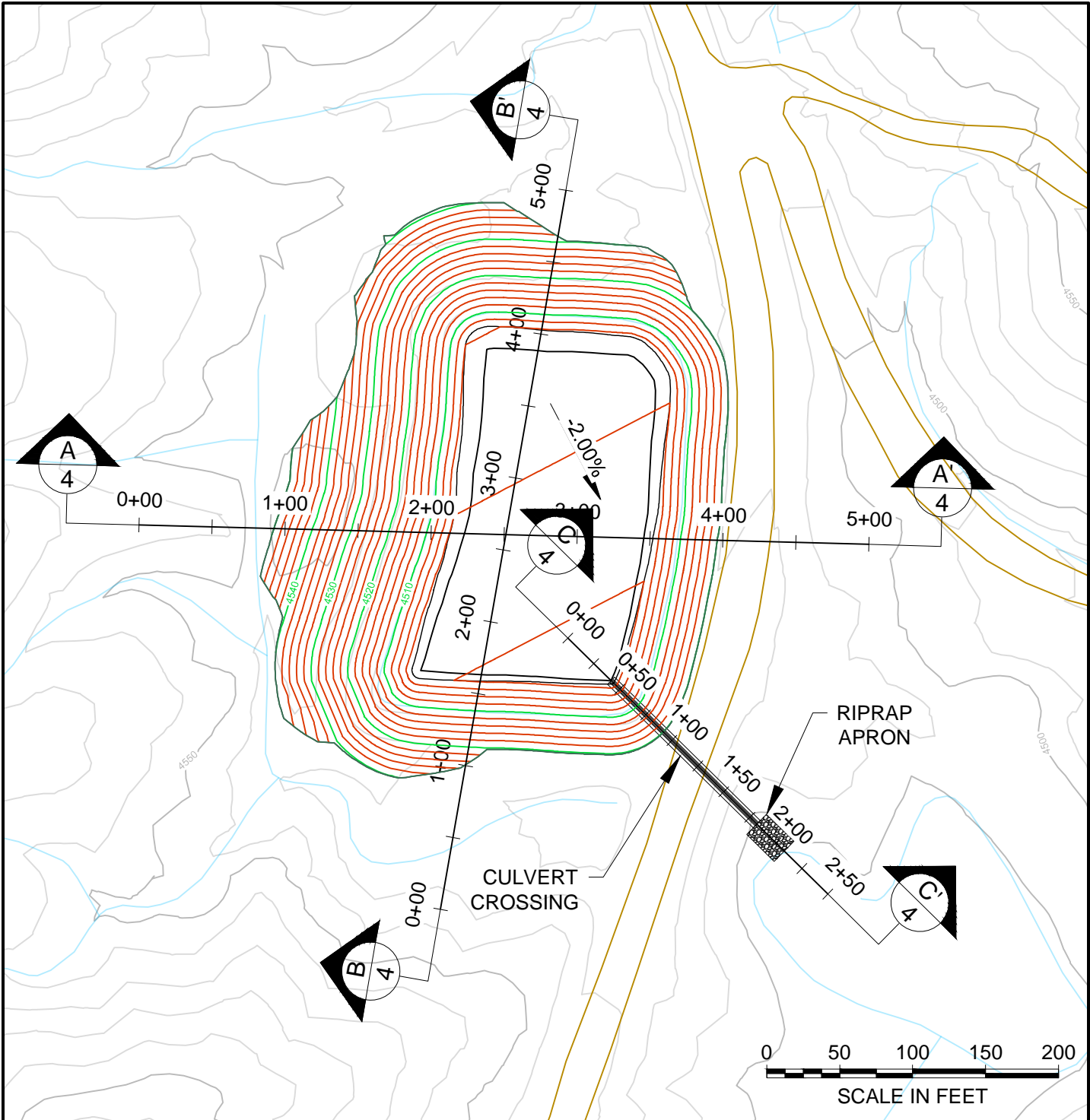
DRAWING NO.:

SRK PROJECT NO.:

29500.290

**2**

IF THE ABOVE BAR  
DOES NOT MEASURE 1 INCH,  
THE DRAWING SCALE IS ALTERED



**EXPLANATION**

- 5280 EXISTING GROUND CONTOURS (MAJOR/MINOR) 10 FEET INTERVAL
- 5280 REGRADE GROUND CONTOURS (MAJOR/MINOR) 5 FEET INTERVAL
- WATERSHED BASIN BOUNDARY
- UNPAVED ROADS
- DRAINAGES

**GENERAL NOTES**

1. THE MAP PROJECTION IS IN PINTO VALLEY MINE SITE (INSPIRATION) COORDINATES (FT).
2. CROSS-SECTION LABELS INDICATE LETTERS AS IDENTIFIERS & NUMBERS AS DRAWING NOS. LOCATION.

**REFERENCES**

1. 2011 TOPOGRAPHY PROVIDED BY BHP (2011).

DESIGN: JB  
 DRAWN: JB  
 REVIEWED: CKH/RP  
 APPROVED: CKH

PREPARED BY:

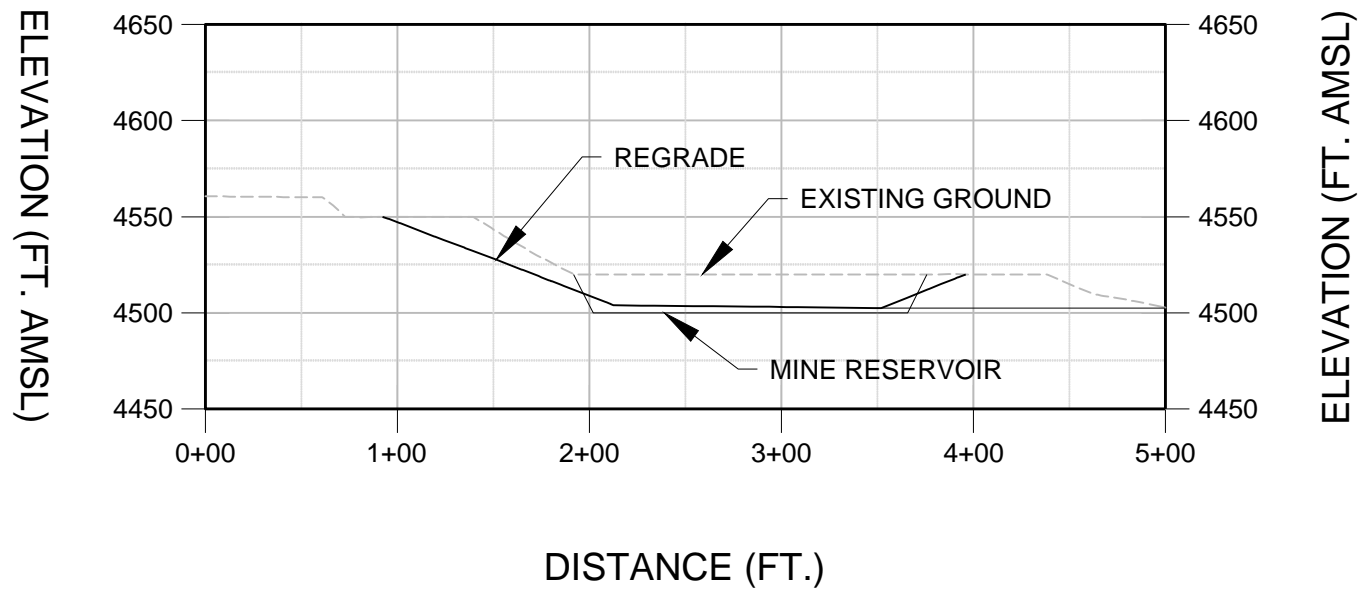
PROJECT:

DRAWING TITLE:  
 RECLAMATION OF MINE RESERVOIR  
 CROSS-SECTION LOCATIONS

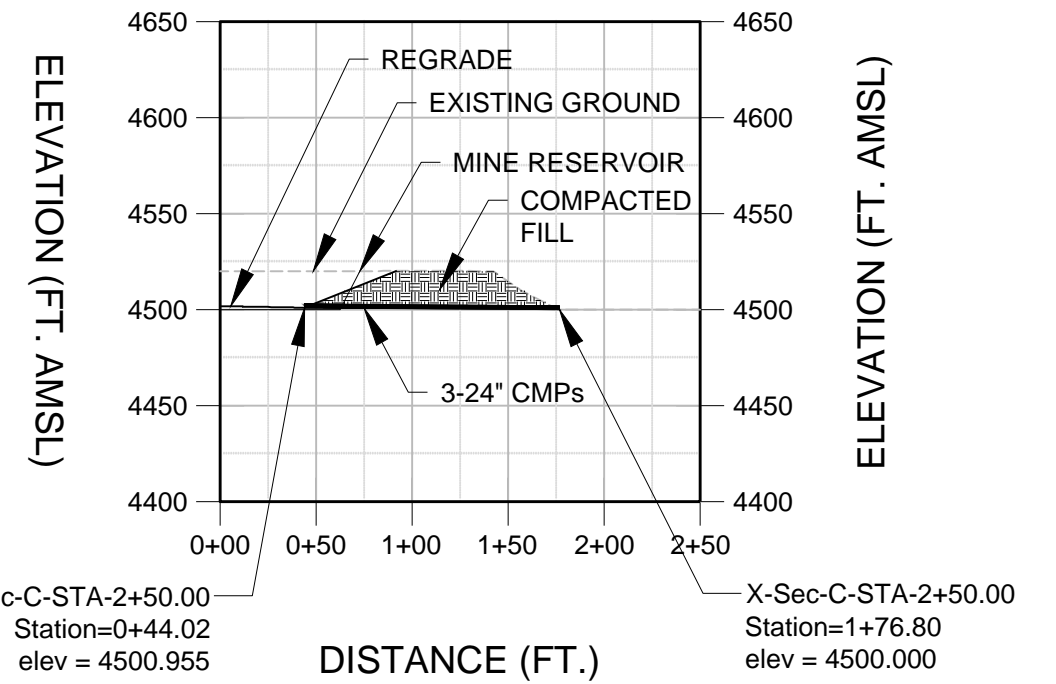
IF THE ABOVE BAR  
 DOES NOT MEASURE 1 INCH,  
 THE DRAWING SCALE IS ALTERED

**PINTO VALLEY MINE  
 PLAN OF OPERATIONS SUPPORT**

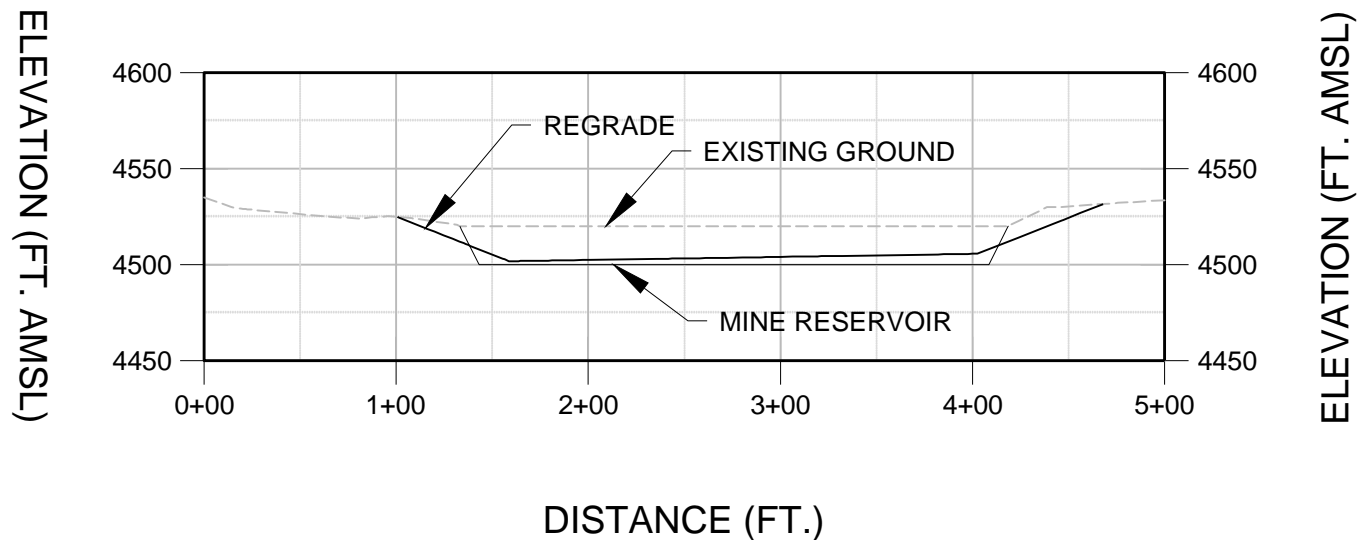
DATE: MAR. 2016	REVISION: 0	DRAWING NO.:
SRK PROJECT NO.:		<b>3</b>
219500.290		



**A** CROSS SECTION A (E-W)



**C** CROSS SECTION C (CULVERT)



**B** CROSS SECTION B (S-N)

**DETAIL / CROSS SECTION ID**

**GENERAL NOTES**

1. THE MAP PROJECTION IS IN PINTO VALLEY MINE SITE (INSPIRATION) COORDINATES (FT).

**REFERENCES**

1. 2011 TOPOGRAPHY PROVIDED BY BHP (2011).

P:\Capstone\_Mining\219500.290\_POO\_Support\04C\_AutoCAD\MineReservoir\Drawings\02-04\_P\VM\_MineReservoir\219500.290\_20160328\FNL\_JB.dwg

DESIGN: JB	PREPARED BY:	DRAWING TITLE:	
DRAWN: JB		RECLAMATION OF MINE RESERVOIR CROSS-SECTIONS	
REVIEWED: CKH/RP		DATE:	REVISION:
APPROVED: CKH	PROJECT:	MAR. 2016	0
<p>IF THE ABOVE BAR DOES NOT MEASURE 1 INCH, THE DRAWING SCALE IS ALTERED</p>	<p><b>PINTO VALLEY MINE</b> <b>PLAN OF OPERATIONS SUPPORT</b></p>	DRAWING NO.:	
		219500.290	

## **Attachment A: Hydrology**

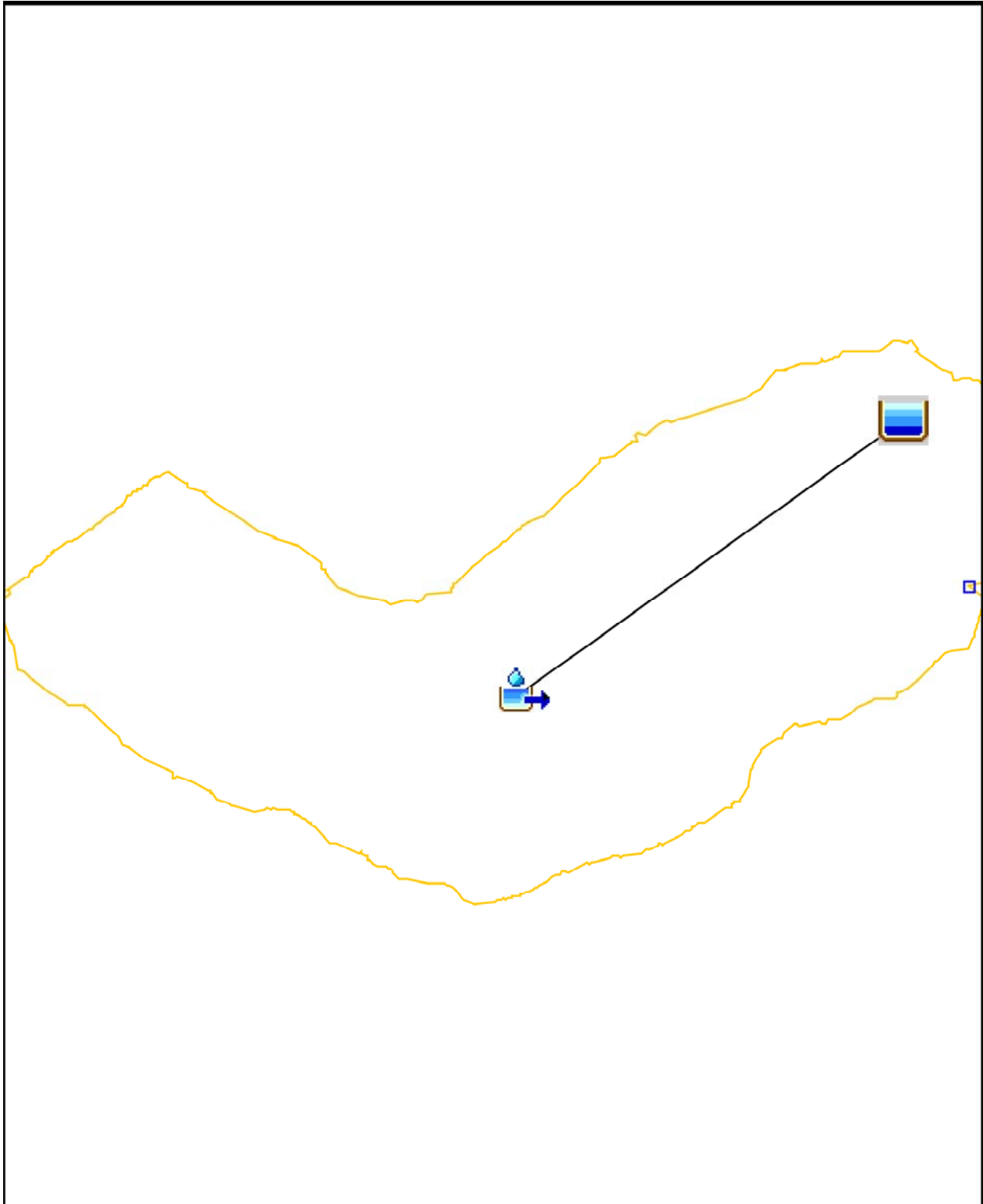


HEC-HMS

# Project : 219500.290\_PVM\_MR

Basin Model : Mine\_Reservoir

Mar 25 17:59:32 MST 2016





Project: 219500.290\_PVM\_MR Simulation Run: 100yr\_24hr

Start of Run: 21Mar2016, 12:00 Basin Model: Mine\_Reservoir  
End of Run: 22Mar2016, 12:02 Meteorologic Model: 100yr  
Compute Time: 21Mar2016, 12:21:19 Control Specifications: 24hr

Hydrologic Element	Drainage Area (MI <sup>2</sup> )	Peak Discharge (CFS)	Time of Peak	Volume (IN)
SB-01	0.0306	109.36	21Mar2016, 23:56	3.42
Mine_Reservoir	0.0306	109.36	21Mar2016, 23:56	3.42

**Sub-basin Notes**

- 1) Transform Method: Kinematic Wave
- 2) CN = 85 Desert Shrub (Poor, C); CN = 79 Desert Shrub (Good, C)
- 3) Sheet flow  $n = 0.12$

Subbasin	Actual Area [sf]	Length [ft]	Slope [ft/ft]	Area [mi <sup>2</sup> ]	Percent Area	100-yr/24-hr Rainfall Depth (inches)	CN	Channel Length	Channel Slope	Channel Width	Channel Side Slope [XH:1V]	Channel n
SB-01	852,896	270	0.47	0.0306	100	5.40	79	1,440	0.13	3.000	2.5	0.04
SB-01	852,896	404	0.40	0.0306	100	5.40	85	1,440	0.13	3.000	2.5	0.04

**Channel Notes**

- 1) Routing Method: Kinematic Wave
- 2) Trapezoidal Channels
- 3)  $n = 0.04$  for natural streambed/riprap
- 4) Bottom Width = 1 ft (Average)
- 5) Side Slope = 2.5H:1V

# HY-8 Culvert Analysis Report

## Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 11 cfs

Design Flow: 110 cfs

Maximum Flow: 121 cfs

**Table 1 - Summary of Culvert Flows at Crossing: Mine-Reservoir**

Headwater Elevation (ft)	Total Discharge (cfs)	3-24in-CMP Discharge (cfs)	Roadway Discharge (cfs)	Iterations
4502.09	11.00	11.00	0.00	1
4502.61	22.00	22.00	0.00	1
4503.11	33.00	33.00	0.00	1
4504.16	44.00	44.00	0.00	1
4505.69	55.00	55.00	0.00	1
4507.50	66.00	66.00	0.00	1
4509.61	77.00	77.00	0.00	1
4512.00	88.00	88.00	0.00	1
4514.70	99.00	99.00	0.00	1
4517.70	110.00	110.00	0.00	1
4520.14	121.00	118.19	2.77	12
4520.00	117.72	117.72	0.00	Overtopping



**Table 2 - Culvert Summary Table: 3-24in-CMP**

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
11.00	11.00	4502.09	0.994	1.088	2-M2c	0.804	0.665	0.665	0.518	4.011	1.565
22.00	22.00	4502.61	1.489	1.612	2-M2c	1.215	0.962	0.962	0.774	4.905	1.984
33.00	33.00	4503.11	1.955	2.111	7-M2c	1.709	1.186	1.186	0.975	5.670	2.266
44.00	44.00	4504.16	2.475	3.155	7-M2c	2.000	1.376	1.376	1.147	6.363	2.484
55.00	55.00	4505.69	3.108	4.691	7-M2c	2.000	1.540	1.540	1.299	7.063	2.664
66.00	66.00	4507.50	3.894	6.502	7-M2c	2.000	1.674	1.674	1.436	7.834	2.818
77.00	77.00	4509.61	4.857	8.610	7-M2c	2.000	1.778	1.778	1.563	8.697	2.953
88.00	88.00	4512.00	6.008	11.002	7-M2c	2.000	1.851	1.851	1.680	9.664	3.073
99.00	99.00	4514.70	7.338	13.695	7-M2c	2.000	1.897	1.897	1.791	10.715	3.183
110.00	110.00	4517.70	8.824	16.701	7-M2t	2.000	1.728	1.895	1.895	11.912	3.283
121.00	118.19	4520.14	10.033	19.142	6-FFc	2.000	2.000	2.000	1.994	12.540	3.376

\*\*\*\*\*  
Straight Culvert  
Inlet Elevation (invert): 4501.00 ft, Outlet Elevation (invert): 4500.00 ft  
Culvert Length: 131.37 ft, Culvert Slope: 0.0076  
\*\*\*\*\*

**Site Data - 3-24in-CMP**

Site Data Option: Culvert Invert Data  
Inlet Station: 44.29 ft  
Inlet Elevation: 4501.00 ft  
Outlet Station: 175.66 ft  
Outlet Elevation: 4500.00 ft  
Number of Barrels: 3

**Culvert Data Summary - 3-24in-CMP**

Barrel Shape: Circular  
Barrel Diameter: 2.00 ft  
Barrel Material: Corrugated Steel  
Embedment: 0.00 in  
Barrel Manning's n: 0.0240  
Culvert Type: Straight  
Inlet Configuration: Thin Edge Projecting  
Inlet Depression: NONE

**Table 3 - Downstream Channel Rating Curve (Crossing: Mine-Reservoir)**

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
11.00	4500.52	0.52	1.57	0.16	0.40
22.00	4500.77	0.77	1.98	0.24	0.43
33.00	4500.98	0.98	2.27	0.30	0.44
44.00	4501.15	1.15	2.48	0.36	0.45
55.00	4501.30	1.30	2.66	0.41	0.46
66.00	4501.44	1.44	2.82	0.45	0.47
77.00	4501.56	1.56	2.95	0.49	0.47
88.00	4501.68	1.68	3.07	0.52	0.48
99.00	4501.79	1.79	3.18	0.56	0.48
110.00	4501.89	1.89	3.28	0.59	0.48
121.00	4501.99	1.99	3.38	0.62	0.49

### **Tailwater Channel Data - Mine-Reservoir**

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 12.00 ft

Side Slope (H:V): 3.00 (1:1)

Channel Slope: 0.0050

Channel Manning's n: 0.0400

Channel Invert Elevation: 4500.00 ft

### **Roadway Data for Crossing: Mine-Reservoir**

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 20.00 ft

Crest Elevation: 4520.00 ft

Roadway Surface: Gravel

Roadway Top Width: 50.00 ft



# HY-8 Energy Dissipation Report

## External Energy Dissipator

Parameter	Value	Units
Select Culvert and Flow		
Crossing	Mine-Reservoir	
Culvert	3-24in-CMP	
Flow	110.00	cfs
Culvert Data		
Culvert Width (including multiple barrels)	6.0	ft
Culvert Height	2.0	ft
Outlet Depth	1.89	ft
Outlet Velocity	11.91	ft/s
Froude Number	1.53	
Tailwater Depth	1.89	ft
Tailwater Velocity	3.28	ft/s
Tailwater Slope (SO)	0.0076	
External Dissipator Data		
External Dissipator Category	Streambed Level Structures	
External Dissipator Type	Riprap Basin	
Restrictions		
Froude Number	<3	
Input Data		
Condition to be used to Compute Basin Outlet Velocity	Envelope Curve	
D50 of the Riprap Mixture		
Note:	Minimum HS/D50 = 2 is Obtained if D50 = 0.599 ft	
D50 of the Riprap Mixture	0.500	ft
DMax of the Riprap Mixture	1.000	ft
Results		
Brink Depth	1.895	ft
Brink Velocity	11.912	ft/s
Depth (YE)	2.149	ft
Riprap Thickness	1.500	ft
Riprap Foreslope	2.0000	ft
Check HS/D50		
Note:	OK if HS/D50 > 2.0	
HS/D50	3.520	
HS/D50 Check	HS/D50 is OK	
Check HS/D50		
Note:	OK if $0.1 < D50/YE < 0.7$	
Check D50/YE	0.233	
D50/YE Check	D50/YE is OK	
Basin Length (LB)	26.400	ft
Basin Width	19.600	ft
Apron Length	8.800	ft
Pool Length	17.600	ft
Pool Depth (HS)	1.760	ft
TW/YE	0.882	
Tailwater Depth (TW)	1.895	ft
Average Velocity with TW	2.482	ft/s

Critical Depth (Yc)	0.960	ft
Average Velocity with Yc	5.325	ft/s
Downstream Riprap for High TW		
Distance: 1 LB		
Velocity	8.732	ft/s
Size	0.497	ft
Distance: 2 LB		
Velocity	4.688	ft/s
Size	0.143	ft
Distance: 3 LB		
Velocity	3.116	ft/s
Size	0.063	ft
Distance: 4 LB		
Velocity	2.332	ft/s
Size	0.035	ft