

# J. E. STOVER & ASSOCIATES, INC.

2352 NORTH 7<sup>TH</sup> STREET, UNIT B  
GRAND JUNCTION, COLORADO 81501  
PHONE: (970) 245-4101, FAX: (970) 242-7908

MINE ENGINEERING  
MINE RECLAMATION

CIVIL ENGINEERING  
CONST. MANAGEMENT

May 18, 2018

Janet Binns  
Division of Reclamation, Mining & Safety  
1313 Sherman St., Room 215  
Denver, CO 80203

Re: Bowie Resources, LLC, Bowie No. 1 Mine  
Technical Revision #115, revise underdrain location  
Adequacy Response #1

Dear Ms. Binns:

DRMS' letter dated April 18, 2018 transmitted its adequacy review for the referenced technical revision. On behalf of Bowie Resources LLC, following are its responses to the DRMS' comment and concerns.

1. **DRMS:** The extent of riprap for the East Diversion Ditch is somewhat inconsistent between the three submitted maps. On Map 21-3 the symbol for riprap extends well above the confluence with Ditch D-F1. On Map 15-3 and Map 20 the rip rap is shown ending at Ditch D-F1. Please revise maps as appropriate and re-submit them to the Division.

**BRL:** The riprap location has been revised on **Maps 15-3 and Map 20** to be consistent with Map 21-3. In addition, the viewports have been changed to show the full extents of the East Diversion Ditch.

2. **DRMS:** On the page for Manning's equation calculations, the portion for the 30" half culvert should possibly be removed since the "smart ditch" was the chosen alternative. Also, Volume IX, page App. B-102 already exists in the permit (approved with MR-195). Therefore, the pagination number TR-115 page App. B-102 will need to be revised. Calculations demonstrating Manning's Equation for Culvert T-F1 is has previously been approved with MR-191 as page "B-103". Please correct TR-115 Culvert T-F1 Manning's Equation calculation to page B-103.

**BRL:** In reference to the 30" smart ditch, the Operator would like to leave the half culvert design in the permit. In the event the smart ditch fails, a half culvert would be approved, on-site and ready to repair. Whereas there is no smart ditch currently on site, it would have to be ordered, which would delay the repair time.

Please remove page App. B-102 from consideration, and replace with the attached page **App. B-103** (Page App. B-102 was a typo). And, in order for the pagination to

make more sense, the revised Appendix B pages will now follow page App. B-103 (pages App. B-103i-1-3vi). A note has been added to App. B-103 to clarify the Smart Ditch has been installed and hydrology design follows.

Feel free to contact me if you have any questions.

Sincerely,



Tamme Bishop, P.E.  
Project Engineer

Cc: Bill Bear

**Culvert T-F1\***  
**Manning's Equation**  
**Flow In a 30" Half Culvert**

Flow Depth	D	0.80	Feet
Slope	S	0.33	Express as Decimal
Mannings "N"	N	0.015	Express as Decimal
AREA = Number Derived in AutoCad			1.35 FEET^2
WETTED PERIMETER= (2*Pi*r)/2			3.01 FEET
<i>Number derived in AutoCad</i>			
R=AREA/WETTED PERIMETER			0.45
V=(1.49/N)*(R^.667)*(S^.5)=			33.43 FT/SEC
Q = A X V =			45.14 CFS
Q REQUIRED - Peak Discharge *			7.12 CFS

*\*Flow from top of gob pile No.2, SedCad design follows*

**Culvert T-F1**  
**Manning's Equation**  
**Flow In a Trapezoidal "Smart Ditch" Channel**

Depth	D	0.4	Feet
Width	W	1.12	Feet
Slope	S	0.25	Express as Decimal
Mannings "N"	N	0.022	Express as Decimal
Side Slope	X	1.3	Slope = X:1
AREA=(W*D)+(X*D^2)=			0.66 FEET^2
WETTED PERIMETER=(W)+2*[((X*D)^2+D^2)^0.5]			2.43 FEET
R=AREA/WETTED PERIMETER			0.27
V=(1.49/N)*(R^.667)*(S^.5)=			14.14 FT/SEC
Q = A X V =			9.27 CFS
Q REQUIRED - Peak Discharge			7.12 CFS

*\* Smart ditch liner has been installed. For complete hydrology design, see following pages.*

## ***Temporary Culvert T-F1***



J.E. Stover & Associates, Inc.  
2352 N. 7th Street, Unit B  
Grand Junction, CO 81501

Phone: 970-245-4101  
Email: tamme.jestover@bresnan.net



## ***General Information***

### ***Storm Information:***

Storm Type:	NRCS Type II
Design Storm:	100 yr - 24 hr
Rainfall Depth:	2.600 inches

## ***Structure Detail:***

### ***Structure #1 (Nonerodible Channel)***

#### ***Temporary T-F1***

Temporary T-F1 Nonerodible Channel Inputs:

Material: Shales and hardpans

Nonerodible Channel Results:

	w/o Freeboard	w/ Freeboard
Design Discharge:	7.12 cfs	
Depth:	0.40 ft	1.40 ft
Top Width:	2.03 ft	2.99 ft
Velocity:	12.89 fps	
X-Section Area:	0.55 sq ft	
Hydraulic Radius:	0.248 ft	
Froude Number:	4.35	

## ***Structure Summary:***

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	4.400	4.400	7.12	0.59

### ***Subwatershed Hydrology Detail:***

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#1	1	4.400	0.084	0.000	0.000	90.000	TR55	7.12	0.593
	<b>Σ</b>	<b>4.400</b>						<b>7.12</b>	<b>0.593</b>

### ***Subwatershed Time of Concentration Details:***

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	4.62	30.00	650.01	2.140	0.084
<b>#1</b>	<b>1</b>	<b>Time of Concentration:</b>					<b>0.084</b>

## Ditch F8 - Temporary Rip Rap

Material: Riprap

*Triangular Channel*

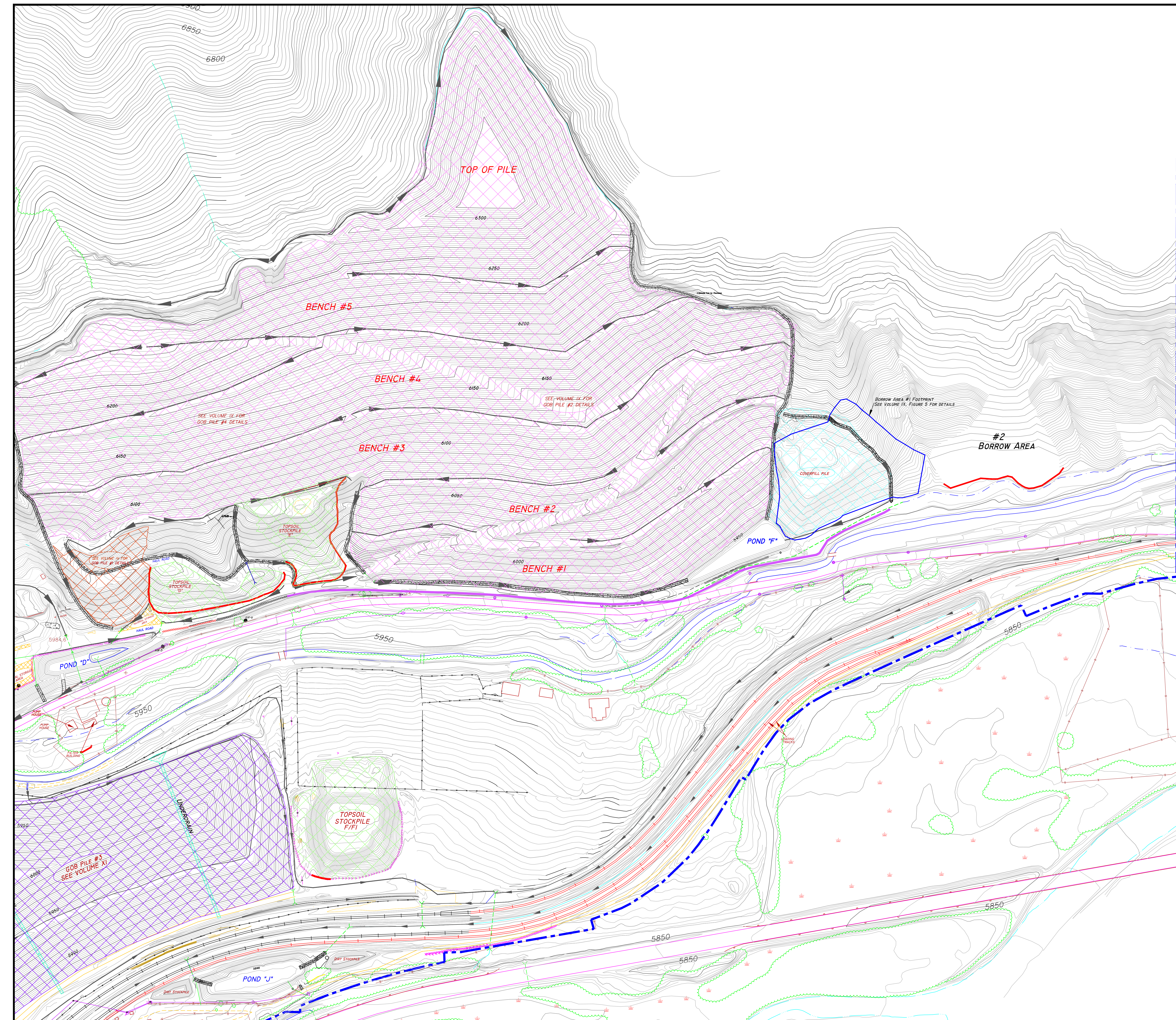
Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
3.0:1	15.0:1	4.6	1.00		

### PADER Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	17.12 cfs	
Depth:	0.65 ft	1.65 ft
Top Width:	11.65 ft	29.65 ft
Velocity:	4.54 fps	
X-Section Area:	3.77 sq ft	
Hydraulic Radius:	0.321 ft	
Froude Number:	1.41	
Manning's n:	0.0330	
Dmin:	2.00 in	
D50:	3.00 in	
Dmax:	4.50 in	







**LEGEND:**

- PERMIT BOUNDARY
- BERM OR GUARDRAIL
- POWERLINE/TELEPHONE DITCH
- UNDESIGNED CULVERT
- LIGHT USE ROAD
- HAUL ROAD
- TOPSOIL STOCKPILE AREAS
- MATERIAL STORAGE AREAS
- GOB PILE AREA (Vol. IX)
- GOB PILE AREA (Vol. IX)
- GOB PILE AREA (Vol. IX)
- COVERFILL STOCKPILE AREA
- RIP RAP

**NOTES:**

- SEE MAP NO. 15-2 FOR UPPER PORTION OF FACILITIES
- SEE MAP NO. 15-3 FOR EASTERN PORTION OF FACILITIES
- SEE MAP NO. 15-4 FOR WESTERN PORTION OF FACILITIES

**ENGINEER'S CERTIFICATION**

I hereby certify that this drawing was done by me or under my supervision and that all of the information presented on this drawing is true and correct to the best of my knowledge and belief.

**PREPARED FOR:**

**BRL**  
BOWIE RESOURCES, LLC

**BOWIE NO. 2 MINE**  
P.O. BOX 4833  
PAGUA, COLORADO 81428

**DESIGNED BY:** J. E. STOVER & ASSOCIATES  
2030 N. 7th Street, Unit B  
Grand Junction, CO 81505

**DATE:** 05/10/98

**SCALE:** 1" = 100'

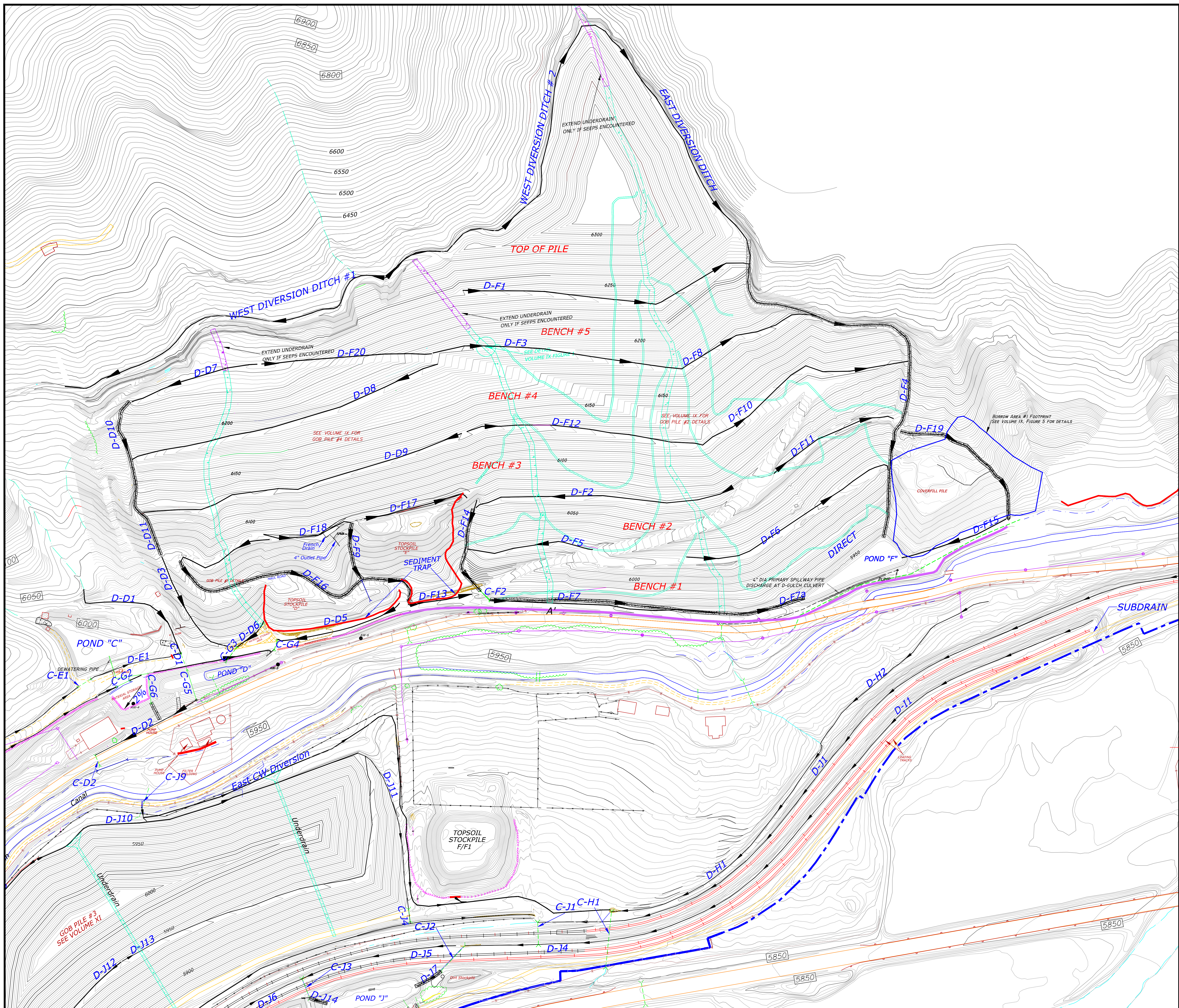
**PROJECT:** BOWIE NO. 2 MINE

**TITLE:** MINE FACILITIES

**SHEET 3 OF 3**

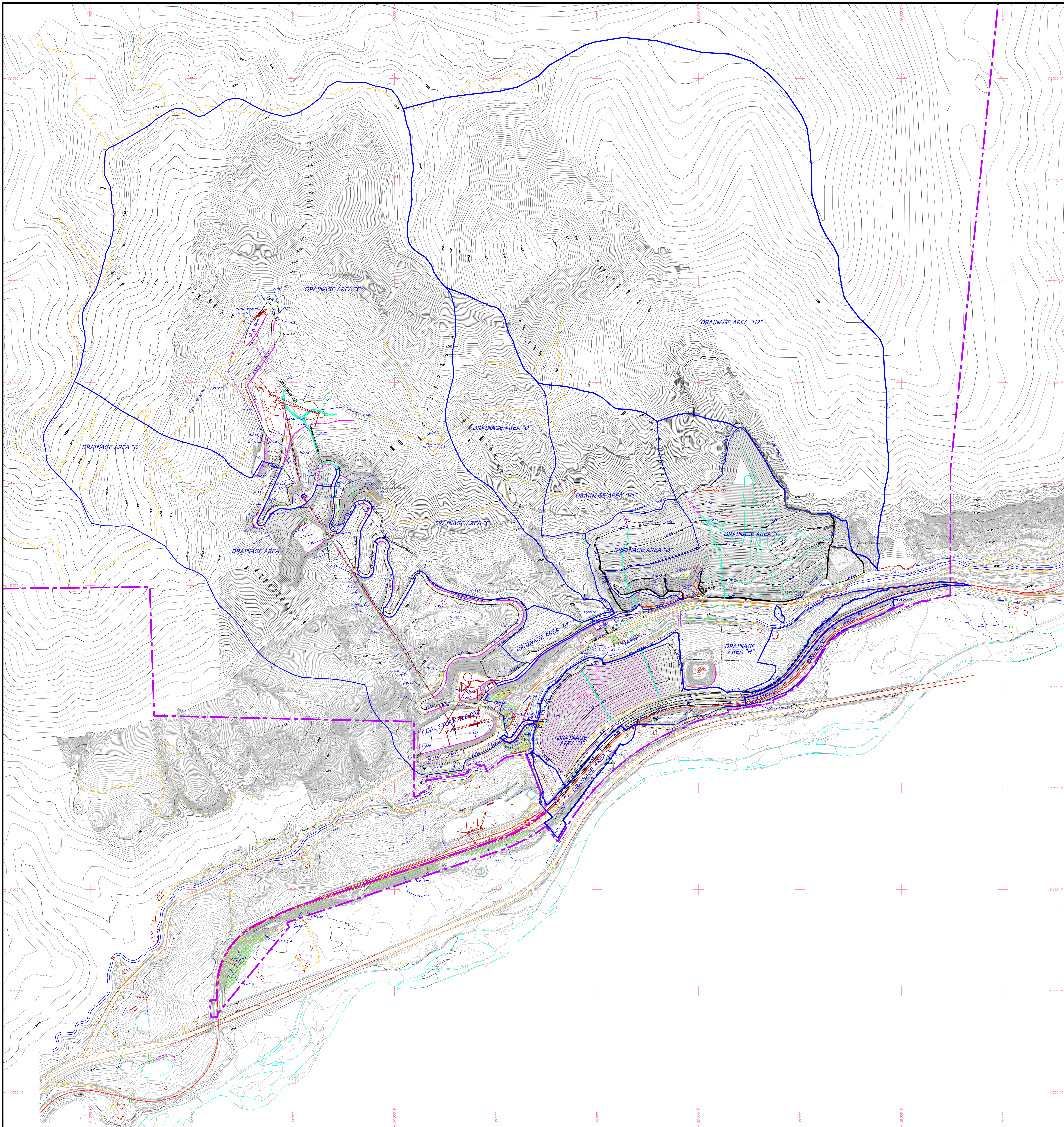
**MAP NO. 15-**





26 TR-115 Install rip rap in segment of E. Diversion Ditch T.K.B. 03/28/18 25 TR-113 Revise Drainage on top of Pile #4 T.K.B. 06/21/17 24 TR-109 Expand Pond J to the West T.K.B. 09/09/16 23 MR-186 Add to map Light Use Road near Pond J T.K.B. 05/02/16 22 TR-105 Gob Pile #3 east expansion T.K.B. 09/17/15 21 TR-98, Adequacy response #1 T.K.B. 04/22/15		LEGEND: — PERMIT BOUNDARY — BERM OR GUARDRAIL — FENCE — POWERLINE/TELEPHONE — DESIGNED DITCH — UNDESIGNED CULVERT — CULVERT — LIGHT USE ROAD — HAUL ROAD — SEDIMENT FENCE/TRAP D=DITCH C=CULVERT D-B15 DRAINAGE AREA Sed. Control (supplemental) RIP-RAP CHANNEL		NOTE: SEE MAP NO. 15-1 FOR LOWER PORTION OF FACILITIES SEE MAP NO. 15-3 FOR UPPER PORTION OF FACILITIES SEE MAP NO. 15-4 FOR WESTERN PORTION OF FACILITIES ORIGINAL TOPOGRAPHY BY KUH - 6/11/95 UPDATED TOPOGRAPHY BY DATA MAPPING - 8/8/97 UPDATED TOPOGRAPHY BY DATA MAPPING - 9/16/02		ENGINEER'S CERTIFICATION I hereby certify that this drawing was done by me or under my direct supervision and that all of the information presented on this drawing is true and correct to the best of my knowledge and belief. Tammerlin K Stover-Bishop Date Colorado P.E. 43402		PREPARED FOR: BOWTIE RESOURCES, LTD. BOWTIE NO. 2 MINE P.O. BOX 483 PAONIA, COLORADO 81428 PREPARED BY: STOVER & ASSOCIATES, Inc. 2800 N. 7th Street, Suite B Grand Junction, CO 81501		PROJECT: BOWTIE NO. 2 MINE TITLE: DRAINAGE PLANS SHEET 3 OF 4 DRMS I.D. No. C - 1996 - 083 SCALE: 1" = 100'		DESIGNED BY: L.K.J. 11/23/96 CHECKED BY:		MAP NO. 21-3	
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49 TR-115 ADD #1	T.K.B. 05/17/06
48 TR-115 Rip rap into portion of E. Diversion ditch	T.K.B. 03/23/16
47 TR-113 Revise top of #4 drainage	T.K.B. 06/20/17
46 TR-109 Expand Pond J to the West	T.K.B. 09/09/16
45 WP-186 Add to map L.L. Use road near Pond J	T.K.B. 05/02/16
44 TR-105 Gab. Pile #3 East Expansion	T.K.B. 09/23/16
No. DESCRIPTION:	BY DATE
REFERENCES	

<b>LEGEND:</b>	
PERMIT BOUNDARY	DRAINAGE AREA BOUNDARY
DESIGNED DITCH	SEDIMENT FENCE/TRAP
BERM OR GUARDRAIL	Sed. Control (supplemental)
LIGHT USE ROAD	UNDESIGNED CULVERT
HAUL ROAD	
S.A.E.	
RIP-RAP CHANNEL	
CULVERT	
ROCK UNDERDRAIN	

D = DITCH  
C = CULVERT

STRUCTURE #

C-B8

DRAINAGE AREA

**NOTE:**  
SEE MAPS 21-1, 21-2, 21-3 AND 21-4 FOR DETAILED DRAINAGE PLANS.  
CONTOUR INTERVAL = 2' WHERE AVAILABLE, 10' ELSEWHERE  
ORIGINAL TOPOGRAPHY BY KLH - 6/11/95  
UPDATED TOPOGRAPHY BY DATA MAPPING - 8/8/97  
UPDATED TOPOGRAPHY BY DATA MAPPING - 9/16/02

**ENGINEER'S CERTIFICATION**  
I hereby certify that this drawing was done by me or under my direct supervision and that all of the information presented on this drawing is true and correct to the best of my knowledge and belief.

Tamerrin K Stover-Bishop  
Colorado P.E. 43402

Date

PREPARED FOR:

**BRL** BOWIE RESOURCES, LLC  
BOWIE NO. 2 MINE  
P.O. BOX 4455  
PADRIA, COLORADO 81428

PREPARED BY:

**J. R. STOVER & ASSOCIATES, INC.**  
1000 N. 7th Street, Suite 100  
Grand Jct., CO 81501

DESIGNED BY: L.K.J.

DRAWN BY: L.K.J.

CHECKED BY:

ONE INCH

SCALE: 1" = 300'

PROJECT: BOWIE NO. 2 MINE

TITLE: SEDIMENTATION CONTROL PLAN

DRWS I.D. No. C - 1996 - 083

SCALE: 1" = 300'

DRG. NAME: MAP NO. 20