

BLACK MESA COMPLEX

BLACK MESA AND KAYENTA MINES

Sedimentation Structures/Impoundments
"As-Built" Drawings
Impoundment Certification/Reclamation Status



BLACK MESA AND KAYENTA MINE "AS-BUILTS"
Impoundment Certification/Reclamation Status

The following Table 1 shows when a structure has been certified by a Registered Professional Engineer after the structure has been constructed, after remedial work has been performed, or when the structure has been reclaimed, based on the sediment and water control structures reference index in Chapter 6, Table 4. Although Volumes 7A to 7F are not part of the Kayenta or Black Mesa permits, the intention is to provide the mine personnel and inspecting regulatory authority a reference copy of the "as-built" certification drawing, or indicate when a structure is reclaimed. The as-built certification for roads is included on Drawing No. 85400. Table 1 will be updated periodically when changes occur to this Table.



TABLE 1

Black Mesa/Kayenta Mines
Impoundment Certification/Reclamation
Status Table

<u>OBS</u>	<u>Structure ID</u>	<u>Location Reference</u>	<u>Const. Cert.** Engineer</u>	<u>Date of** Const. Cert.</u>	<u>Reclamation Date*</u>
1	BM-A1	Vol. 2	LK	11/22/85	--
2	BM-B	Vol. 7A	RL	06/24/99	--
3	BM-FWP	Vol. 2	JS	04/23/98	--
4	BM-SS	Vol. 7A	RL	06/24/99	--
5	BM-T	Vol. 7A	RL	10/25/01	--
6	BM-TW	Vol. 2	JS	04/23/98	--
7	CW-A	Vol. 2	JS	04/23/98	1993
8	CW-B	Vol. 1	N/A	N/A	--
9	J1-A	Vol. 2	RL	05/13/04	--
10	J2-A-Dam	Vol. 7A, 22	JS	12/22/86	--
11	J3-A	Vol. 7A	JS	06/23/97	--
12	J3-B	Vol. 7A	JS	06/09/97	1993
13	J3-C	Vol. 1	N/A	N/A	--
14	J3-D	Vol. 7A	JS	10/29/96	--
15	J3-E	Vol. 7A	BW	03/05/91	--
16	J3-F	Vol. 7A	JS	09/14/87	--
17	J3-G	Vol. 7A	JS	09/07/89	--
18	J3-H	Vol. 2	RL	03/03/00	--
19	J3-SL	Vol. 2	RL	02/29/00	--
20	J7-A	Vol. 7A	RB	12/14/95	--
21	J7-B	Vol. 1	N/A	N/A	1996
22	J7-B1	Vol. 7A	RB	09/27/95	--
23	J7-CD	Vol. 7A	N/A	N/A	2011
24	J7-Dam	Vol. 22	JS	12/03/85	--
25	J7-E	Vol. 7A	JS	10/28/96	2011
26	J7-F	Vol. 7A	N/A	N/A	2011
27	J7-G	Vol. 7A	JS	06/01/99	--
28	J7-H	Vol. 7A	JS	06/01/99	--
29	J7-I	Vol. 7A	JS	10/01/97	--
30	J7-J	Vol. 7A	JS	06/01/99	--
31	J7-K	Vol. 7A	JS	06/01/99	--
32	J7-L	Vol. 7A	N/A	N/A	1998
33	J7-JR	Vol. 1	JS	10/31/01	--
34	J7-M	Vol. 7A	JS	03/30/98	--
35	J7-N	Vol. 1	N/A	N/A	1998
36	J7-O	Vol. 1	N/A	N/A	1998
37	J7-P	Vol. 1	N/A	N/A	1998
38	J7-Q	Vol. 1	N/A	N/A	1998
39	J7-Q1	Vol. 1	N/A	N/A	1998
40	J7-R	Vol. 7A	JS	07/29/98	--
41	J7-R1	Vol. 7A	JS	07/29/98	--

TABLE 1
(Continued)

<u>OBS</u>	<u>Structure ID</u>	<u>Location Reference</u>	<u>Const. Cert.** Engineer</u>	<u>Date of** Const. Cert.</u>	<u>Reclamation Date*</u>
42	J7-S	Vol. 7A	RL	11/05/99	--
43	J7-T	Vol. 7A	RL	10/29/99	--
44	J7-U	Vol. 7A	RL	10/29/99	--
45	J7-V	Vol. 7A	JS	06/22/98	--
46	J16-A	Vol. 22	JS	12/03/85 & 03/08/99	--
47	J16-B	Vol. 1	N/A	N/A	1992
48	J16-C	Vol. 1	N/A	N/A	1992
49	J16-D	Vol. 7A	BW	11/05/91	--
50	J16-E	Vol. 7A	BW	11/05/91	--
51	J16-F	Vol. 7A	RB	11/09/95	--
52	J16-G	Vol. 7A	RB	12/12/95	--
53	J16-H	Vol. 1	N/A	N/A	1992
54	J16-I	Vol. 1	N/A	N/A	2003
55	J16-J	Vol. 1	N/A	N/A	2003
56	J16-K	Vol. 1	N/A	N/A	2003
57	J16-L	Vol. 22	JS	12/03/85 & 06/04/97	--
58	J19-A	Vol. 7A	JS	02/11/05	--
59	J19-B	Vol. 7A	JS	06/25/04	--
60	J19-D	Vol. 7A	JS	08/02/04	--
61	J19-E	Vol. 7A	JS	06/25/04	--
62	J19-RA	Vol. 7A	JS	09/23/05	--
63	J19-RB	Vol. 7A	JS	05/06/06	--
64	J19 Haul Road	Vol. 7A	RL	04/18/94	--
65	J19 Deadhead Rd	Vol. 7A	RL	12/03/97	--
66	J21-A	Vol. 7A	JS	01/05/09	--
67	J21-A1	Vol. 7A	JS	03/15/90	--
68	J21-B	Vol. 1	N/A	N/A	2003
69	J21-C	Vol. 7B	JS	11/16/95	--
70	J21-C2	Vol. 7B	JS	07/09/91	--
71	J21-D	Vol. 7B	JS	12/09/98	2012
72	J21-E	Vol. 7B	JS	01/06/09	2012
73	J21-F	Vol. 7B	JS	03/26/99	--
74	J21-F1	Vol. 7B	JS	03/26/99	--
75	J21-G	Vol. 7B	JS	07/21/03	--
76	J21-G1	Vol. 7B	JS	10/15/04	--
77	J21-H	Vol. 7B	JS	06/30/09	--
78	J21-H1	Vol. 7B	JS	06/30/09	--
79	J21-J	Vol. 1	N/A	N/A	2002
80	J21-T1	Vol. 1	N/A	N/A	1989
81	J21-T2	Vol. 1	N/A	N/A	1989
82	J21-T3	Vol. 1	N/A	N/A	1989
83	J21-T4	Vol. 1	N/A	N/A	1989
84	J27-A	Vol. 7B	JS	06/13/90	--
85	J27-B	Vol. 1	N/A	N/A	1999

TABLE 1
(Continued)

<u>OBS</u>	<u>Structure ID</u>	<u>Location Reference</u>	<u>Const. Cert.** Engineer</u>	<u>Date of** Const. Cert.</u>	<u>Reclamation Date*</u>
86	J27-RA	Vol. 7B	JS	03/03/99	--
87	J27-RB	Vol. 7B	JS	03/03/99	--
88	J27-RC	Vol. 7B	JS	03/03/99	--
89	J28-A	Vol. 1	N/A	N/A	1992
90	J28-B	Vol. 7B	RB	11/28/95	--
91	J28-C	Vol. 7B	RB	05/02/95	--
92	J28-D	Vol. 7B	RB	08/10/95	--
93	J28-E	Vol. 1	N/A	N/A	1992
94	J28-F	Vol. 1	N/A	N/A	1992
95	J28-G	Vol. 7B	RB	08/03/95	--
96	J28-H	Vol. 1	N/A	N/A	1992
97	J28-I	Vol. 1	N/A	N/A	1992
98	J28-SL	Vol. 4	JS	03/07/00	--
99	KM-A	Vol. 1	N/A	N/A	1995
100	KM-A2	Vol. 1	N/A	N/A	2001
101	KM-A3	Vol. 7B	JS	05/09/02	--
102	KM-B	Vol. 7B	RB	03/29/85	--
103	KM-C	Vol. 7B	JS	06/20/89	--
104	KM-D	Vol. 7B	RB	04/20/95	--
105	KM-E	Vol. 7B	RB	04/20/95	--
106	KM-E1	Vol. 7B	RB	07/13/95	--
107	KM-FWP	Vol. 22	JS	12/03/85	--
108	KM-TPB	Vol. 7B	JS	10/14/88	--
109	KM-TPB1	Vol. 7B	JS	07/21/95	--
110	KP	Vol. 1	N/A	N/A	1993
111	LF-1	Vol. 1	N/A	N/A	1998
112	LF-2	Vol. 1	N/A	N/A	1998
113	LF-3	Vol. 1	N/A	N/A	1998
114	MW-A	Vol. 7C	RL	01/31/05	--
115	MW-B	Vol. 7C	RL	10/29/99	--
116	N1-AC	Vol. 7C	RB	05/10/95	--
117	N1-B	Vol. 1	N/A	N/A	1991 (prelaw)
118	N1-D	Vol. 1	N/A	N/A	Prelaw
119	N1-E	Vol. 1	N/A	N/A	Prelaw
120	N1-F	Vol. 7C	RB&JS	05/16/95 & 10/11/96	--
121	N1-G	Vol. 1	N/A	N/A	1991 (prelaw)
122	N1-H	Vol. 1	N/A	N/A	1991 (prelaw)
123	N1-I	Vol. 1	N/A	N/A	1991 (prelaw)
124	N1-J	Vol. 1	N/A	N/A	1991 (prelaw)
125	N1-K	Vol. 1	N/A	N/A	1991 (prelaw)
126	N1-L	Vol. 7C	RB	05/31/95	--
127	N1-M	Vol. 7C	RB	05/22/95	--
128	N1-N	Vol. 1	N/A	N/A	1992
129	N1-O	Vol. 7C	JS	06/20/89	--



TABLE 1
(Continued)

<u>OBS</u>	<u>Structure ID</u>	<u>Location Reference</u>	<u>Const. Cert.** Engineer</u>	<u>Date of** Const. Cert.</u>	<u>Reclamation Date*</u>
130	N2-D	Vol. 1	N/A	N/A	Prelaw
131	N2-E	Vol. 1	N/A	N/A	Prelaw
132	N2-G	Vol. 1	N/A	N/A	2000
133	N2-RA	Vol. 7C	RB	10/12/95	--
134	N2-RB	Vol. 7C	RB	09/20/95	Permanent
135	N2-RC	Vol. 7C	RB	11/01/95 & 06/21/96	Permanent
136	N5-A	Vol. 7C	JS	06/19/89	--
137	N5-A1	Vol. 1	N/A	N/A	1996
138	N5-D	Vol. 7C	RB	12/12/95	--
139	N5-E	Vol. 7C	RB	12/12/95	--
140	N5-F	Vol. 7C	BW	07/01/91	--
141	N5-G	Vol. 7D	JS	06/19/89	--
142	N6-B	Vol. 1	N/A	N/A	Prelaw
143	N6-C	Vol. 7D	JS	06/09/97	2012
144	N6-D	Vol. 7D	JS	06/09/97	2012
145	N6-D1	Vol. 7D	JS	06/23/97	--
146	N6-E	Vol. 7D	JS	09/26/96	--
147	N6-F	Vol. 7D	N/A	N/A	2009
148	N6-G	Vol. 7D	JS	06/19/89	--
149	N6-H	Vol. 7D	JS	06/19/89	--
150	N6-I	Vol. 7D	JS	06/20/90	--
151	N6-J	Vol. 7D	JS	06/20/90	--
152	N6-K	Vol. 7D	JS	07/18/97	--
153	N6-K1	Vol. 7D	N/A	N/A	2006
154	N6-L	Vol. 7D	JS	07/18/97	--
155	N6-M	Vol. 7D	JS	04/09/97	--
156	N6-T1	Vol. 1	N/A	N/A	1991
157	N6-T2	Vol. 1	N/A	N/A	1996
158	N7-A1	Vol. 1	N/A	N/A	2001
159	N7-B	Vol. 1	N/A	N/A	1992
160	N7-C	Vol. 1	N/A	N/A	1992
161	N7-D	Vol. 7D	JS	06/12/90	Permanent
162	N7-E	Vol. 7D	JS	02/16/90	Permanent
163	N7-E1	Vol. 1	N/A	N/A	2001
164	N8-A	Vol. 1	N/A	N/A	2001
165	N8-B	Vol. 1	N/A	N/A	2001
166	N8-B1	Vol. 1	N/A	N/A	2001
167	N8-RA	Vol. 6	JS	12/18/00	Permanent
168	N9-B	Vol. 7D	JS	11/03/06	--
169	N9-B1	Vol. 7D	JS	11/03/06	--
170	N9-B2	Vol. 7D	JS	06/01/07	--
171	N9-C	Vol. 7D	JS	11/03/06	--
172	N9-C1	Vol. 7D	JS	11/03/06	--
173	N9-D	Vol. 7D	JS	11/03/06	--

TABLE 1
(Continued)

<u>OBS</u>	<u>Structure ID</u>	<u>Location Reference</u>	<u>Const. Cert.** Engineer</u>	<u>Date of** Const. Cert.</u>	<u>Reclamation Date*</u>
174	N9-E	Vol. 7D	JS	11/03/06	--
175	N9-F	Vol. 7D	JS	12/29/05	--
176	N9-G	Vol. 7D	JS	11/03/06	--
177	N9-H	Vol. 7D	JS	11/03/06	--
178	N9-I	Vol. 7D	JS	11/03/06	--
179	N10-A	Vol. 7E	JS	10/14/88	--
180	N10-A1	Vol. 7E	NA&JS	09/26/95 & 11/12/96	--
181	N10-A2	Vol. 7E	NA	09/26/95	--
182	N10-B	Vol. 7E	RB	09/18/95	--
183	N10-B1	Vol. 7E	JS	03/05/98	--
184	N10-C	Vol. 7E	RB	07/13/95	--
185	N10-D	Vol. 7E	JS	05/22/98	--
186	N10-D1	Vol. 7E	NA	09/26/95	--
187	N10-E	Vol. 1	N/A	N/A	1994
188	N11-A	Vol. 7E	GA	06/27/08	--
189	N11-A1	Vol. 7E	GA	06/27/08	--
190	N11-A2	Vol. 7E	GA	06/27/08	--
191	N-11 Deadhead Rd	Vol. 7E	RL	12/07/95	--
192	N11-C	Vol. 7E	RL	03/07/95	--
193	N11-E	Vol. 7E	RL	03/07/95	--
194	N11-G	Vol. 7E	RL	05/08/95	--
195	N11-G1	Vol. 7E	RL	05/08/95	--
196	N11-G2	Vol. 7E	JS	06/25/04	--
197	N11-G3	Vol. 1	N/A	N/A	2003
198	N12-A	Vol. 1	N/A	N/A	1994
199	N12-C	Vol. 7E	RL	09/24/01	--
200	N12-C1	Vol. 7E	RL	07/12/94	--
201	N12-C2	Vol. 7E	RL	07/12/94	--
202	N12-F	Vol. 1	N/A	N/A	1994
203	N12-G	Vol. 1	N/A	N/A	1994
204	N12-H	Vol. 1	N/A	N/A	1994
205	N12-I	Vol. 1	N/A	N/A	1994
206	N12-J	Vol. 1	N/A	N/A	1994
207	N12-K	Vol. 1	N/A	N/A	1994
208	N12-L	Vol. 1	N/A	N/A	1994
209	N12-M	Vol. 7E	RL	09/23/94	--
210	N12-N	Vol. 7E	RB	11/20/95	--
211	N13-A	Vol. 1	N/A	N/A	1995
212	N13-B	Vol. 1	N/A	N/A	1995
213	N13-C	Vol. 1	N/A	N/A	1992
214	N13-D	Vol. 1	N/A	N/A	1992
215	N13-E	Vol. 1	N/A	N/A	1995



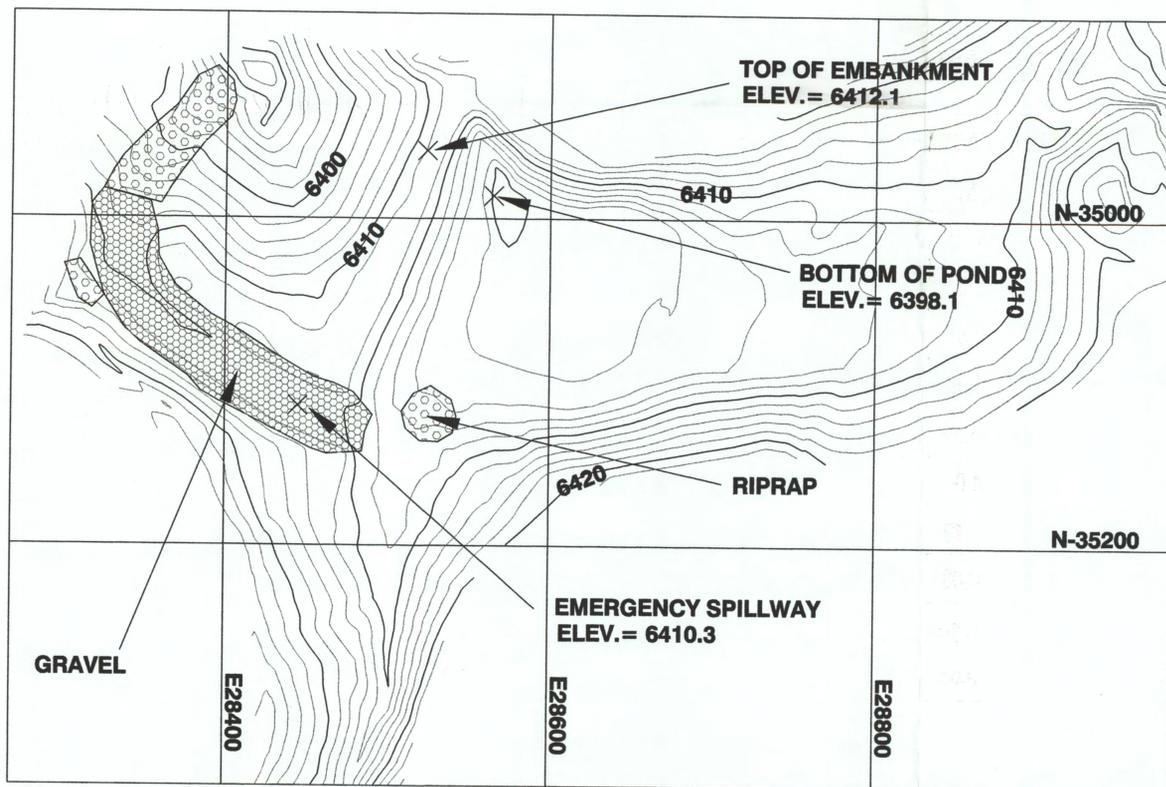
TABLE 1
(Continued)

<u>OBS</u>	<u>Structure ID</u>	<u>Location Reference</u>	<u>Const. Cert.** Engineer</u>	<u>Date of** Const. Cert.</u>	<u>Reclamation Date*</u>
216	N14-A	Vol. 1	N/A	N/A	1992
217	N14-B	Vol. 7F	RB&JS	05/11/95 & 11/14/96	--
218	N14-C	Vol. 7F	RB	11/20/95	--
219	N14-D	Vol. 22	JS	12/03/85	--
220	N14-E	Vol. 22	JS	12/03/85	--
221	N14-F	Vol. 22	JS	12/03/85	--
222	N14-G	Vol. 22	JS	12/03/85	--
223	N14-H	Vol. 22	JS	12/03/85	--
224	N14-L	Vol. 1	N/A	N/A	1991
225	N14-M	Vol. 1	N/A	N/A	2003
226	N14-N	Vol. 1	N/A	N/A	1992
227	N14-O	Vol. 1	N/A	N/A	1992
228	N14-P	Vol. 7F	RB	11/20/95	--
229	N14-Q	Vol. 7F	RB	04/13/95	--
230	N14-R	Vol. 1	N/A	N/A	1992
231	N14-S	Vol. 1	N/A	N/A	1992
232	N14-T	Vol. 7F	JS	02/14/97	--
233	TPC-A	Vol. 7F	JS	06/13/90	--
234	TPF-A	Vol. 7F	RB	12/18/95	--
235	TPF-B	Vol. 1	N/A	N/A	1992
236	TPF-C	Vol. 1	N/A	N/A	1992
237	TPF-D	Vol. 7F	RB	11/22/95	--
238	TPF-E	Vol. 7F	JS	10/09/97	--
239	TS-A	Vol. 7F	BW	12/13/91	--
240	TS-B	Vol. 7F	BW & RL	12/13/91 & 7/20/95	--
241	Transfer 23/24 HR	Vol. 7F	BW	10/29/91	--
242	WW-2	Vol. 7F	RL	10/29/99	--
243	WW-3	Vol. 7F	RL	06/24/99	--
244	WW-4	Vol. 7	JS	12/14/85	--
245	WW-5	Vol. 7F	RL	06/24/99	--
246	WW-6	Vol. 7F	RL	10/29/99	--
247	WW-9	Vol. 1	N/A	N/A	2000
248	WW-9A	Vol. 7F	RL	02/15/01	--
249	WW-9B	Vol. 7F	RL	02/15/01	--
250	WW-9C	Vol. 7F	RL	02/15/01	--
251	WW-9D	Vol. 1	N/A	N/A	2000

• Calendar year basis

** Not applicable






PLAN VIEW
 SCALE: 1" = 50'
 SURVEY DATE: 05-27-99

C.I. = 2'

I CERTIFY THAT THIS SILTATION STRUCTURE WAS CONSTRUCTED IN ACCORDANCE WITH THE APPROVED MINING PERMIT AND THAT THE INFORMATION CONTAINED HEREIN ACCURATELY DESCRIBES THE CONSTRUCTED STRUCTURE TO THE BEST OF MY KNOWLEDGE AND BELIEF.



RANDALL L. LEHN
 PEABODY WESTERN COAL COMPANY

ARIZONA P.E. 26858
 DATE: JUN 24 1999

BM-SS POND STAGE CAPACITY TABLE

ELEVATION (ft-msl)	STAGE (ft)	AREA (acres)	CAPACITY (ac-ft)	TOTAL CAPACITY (ac-ft)	DESCRIPTION
6398.1	0	0	0	0	BOTTOM OF POND
6400.0	1.9	0.02	0.02	0.02	
6402.0	3.9	0.27	0.29	0.31	
6404.0	5.9	0.51	0.78	1.09	
6406.0	7.9	0.74	1.25	2.34	
6408.0	9.9	1.00	1.74	4.08	
6410.0	11.9	1.34	2.34	6.42	
6410.3	12.2	1.38	0.41	6.83	EMERGENCY SPILLWAY
6412.0	13.9	1.63	2.56	9.39	
6412.1	14.0	1.64	0.16	9.55	TOP OF EMBANKMENT



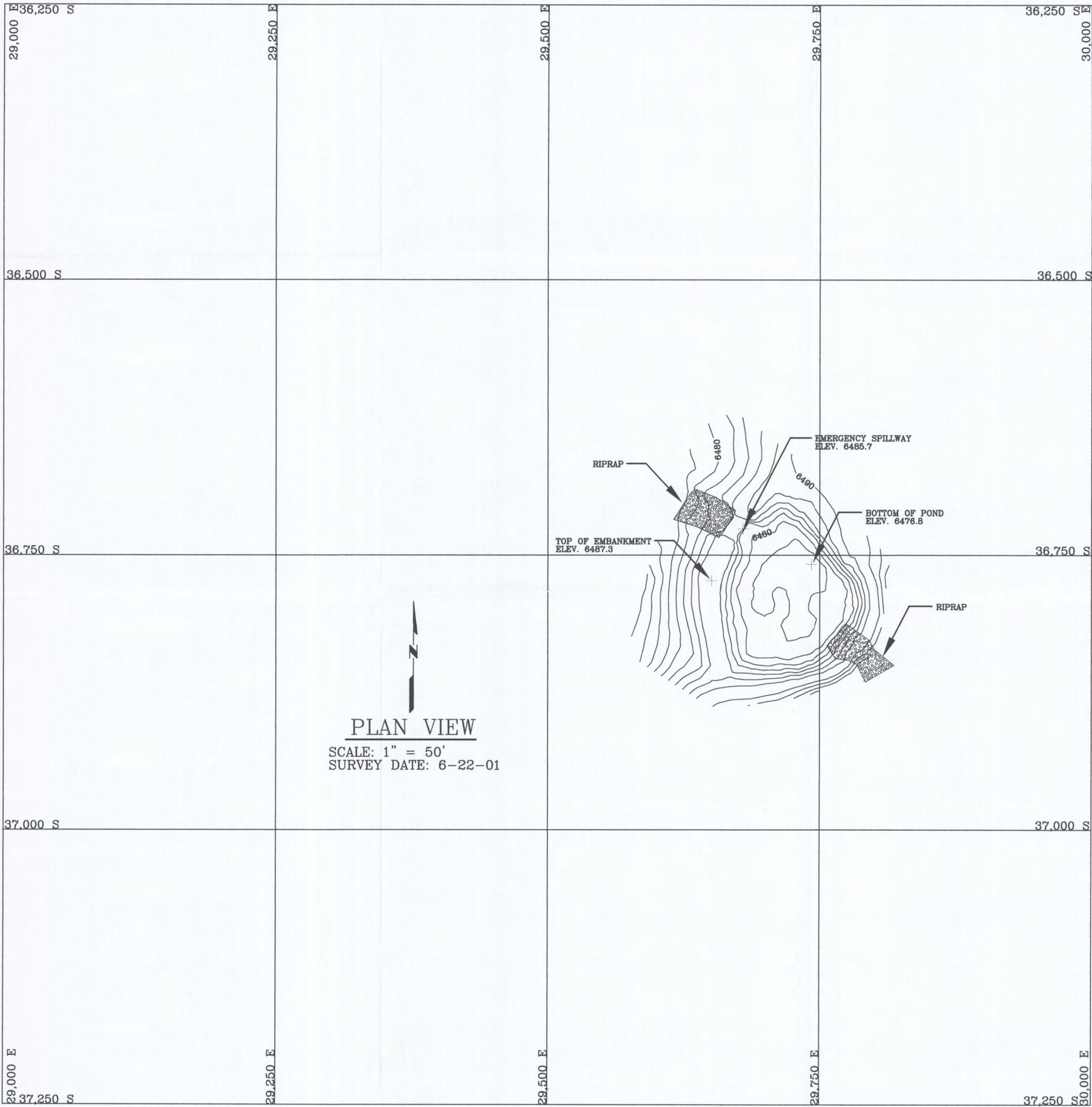
REVISIONS

DATE	CHK'D	DESCRIPTION

**BM-SS POND
AS-BUILT**

BLACK MESA MINE
 PEABODY WESTERN COAL COMPANY
 PO BOX 625 KAYENTA, ARIZONA 86033

DESIGNED BY: PWCC	SCALE: AS SHOWN
DRAWN BY: CI	DRAWING DATE: 06-02-99
CHECKED BY: RL	SURVEY DATE: 05-27-99
CONTOUR INT.: 2'	DWG FILE: BM-SS A..9.DWG



PLAN VIEW
 SCALE: 1" = 50'
 SURVEY DATE: 6-22-01

Elevation (ft-msl)	Stage (ft)	Area (Acres)	Capacity (ac-ft)	Total Capacity (ac-ft)	Description
6476.8	0.00	0.00	0.00	0.00	Bottom of Pond
6478.0	1.2	0.08	0.05	0.05	
6480.0	3.2	0.21	0.29	0.34	
6482.0	5.2	0.27	0.48	0.82	
6484.0	7.2	0.31	0.58	1.40	
6485.7	8.9	0.34	0.55	1.95	Emergency Spillway
6486.0	9.2	0.35	0.10	2.05	
6487.3	10.5	0.39	0.48	2.54	Top of Embankment



I certify these facilities were constructed as designed and approved in the mining permit and that the information contained herein is accurate to the best of my knowledge and belief.

Randolph S. Lehn
 Arizona Professional Engineer No. 26858

OCT 25 2001
 Date

BM-T POND
 AS-BUILT

BLACK MESA
 PEABODY WESTERN COAL CO.

DESIGNED BY: PWCC SCALE: 1" = 50'
 DRAWN BY: D.B. DRAWING DATE: 10-22-01
 CHECKED BY: R.L. SURVEY DATE: 06-22-01
 CONTOUR INTERVAL: 2'

AS-BUILT REPORT

Permanent Impoundment

J1-RB

Black Mesa Mine

Navajo County, Arizona

PEABODY WESTERN COAL COMPANY



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Exhibit 1 - J1-RB Permanent Impoundment As-Built	

Introduction

Pond J1-RB is an existing incised internal impoundment structure constructed by Peabody Western Coal Company in the J-1/N-6 reclamation area and is proposed as a permanent impoundment structure. Peabody Western Coal Company plans to utilize structure J1-RB as one of the original AZ-0001-E Permit impoundments to mitigate post-mining livestock and wildlife watering sources, see Chapter 6, Permanent Impoundment section and Chapter 14, Postmining Water Sources section. The location of Structure J1-RB and its watershed boundary is shown on Drawing No. 85400 (Sheet L-8) and Drawing No. 85405. The site-specific general construction plans are shown on Exhibit 1. This as-built report contains information specific to Structure J1-RB. In addition, the spillway design for J1-RB was evaluated using the 25-year, 6-hour storm.

Mine-wide design, construction, and reclamation information is presented in the "General Report, Kayenta and Black Mesa Mines, Navajo County, Arizona for Peabody Coal Company", December, 1985 (PAP), Chapter 6, Attachment D, Volume 2, along with the methods and results of analyses used for slope stability, hydrology, and hydraulics, and in Chapter 6, Pages 11 to 42, "Sediment and Water Control Facility Plan".

Inspection

The site of the existing structure J1-RB was inspected in June 2014 by a Registered Professional Engineer from Peabody Western Coal Company, to assure that the site is suitable and no adverse conditions exist to prevent the successful operation of this structure. A detailed geotechnical investigation was not performed since the impoundment is incised, with no embankments and emergency spillway required. Information in Chapter 6, Attachment D was utilized to confirm the stability of the re-graded slopes.

Site Description

Land Use

J1-RB structure has a 23.9-acre combined drainage area and is located on a tributary to Moenkopi Wash at the Black Mesa Mine. The watershed is classified as 100 percent reclaimed.

Design Analyses

General

Structure J1-RB as-built report was prepared by a Registered Professional Engineer from Peabody Western Coal Company. The as-built report was performed in accordance with applicable 30 CFR 780 and 816 regulations of the United States Department of the Interior, Office of Surface Mining Reclamation and Enforcement (OSMRE) and included a review of available project files. The most current information contained in the Peabody Western Coal Company files includes topographic maps developed from aerial photography flown in 2010 and was used in the analyses of the structure.

Stability

Structure J1-RB is completely incised and does not incorporate an embankment. All re-graded (incised) slopes are equal to or flatter than 4.0:1 (horizontal to vertical). Given that the graded side slopes are equal to or flatter than the recommended final reclamation slopes, the slopes will be stable.

WATER PERSISTENCE

The Water Persistence information is included in the J1/J3/J7/N6 Termination of Jurisdiction (TOJ) application for Pond J1-RB submitted on July 1, 2013 to OSMRE.

WATER QUALITY

The Water Quality information is included in the J1/J3/J7/N6 TOJ application for Pond J1-RB.

DIMINUTION OF ADJACENT WATER QUANTITY AND QUALITY

The Diminution of Adjacent Water Quantity and Quality information is included in the J1/J3/J7/N6 TOJ application for Pond J1-RB.

Hydrology

The hydrologic analysis was completed using the computer program SEDCAD+ (see Appendices A, B, and C). Structure J1-RB is classified as a low hazard structure (see Drawing No. 85408). In addition, the Black Mesa Mine area is sparsely populated with no people living in the downstream flood plain. The structure has a capacity of 31.56 acre-feet; therefore, the spillway was analyzed using the 25-year, 6-hour storm for a temporary

impoundment. Structure J1-RB was conservatively assumed to be full to the emergency spillway at the time of the 10-year storm. The storage capacity of the Structure J1-RB was analyzed using the 10-year, 24-hour storm. The pond was conservatively assumed to completely contain the 10-year, 24-hour storm without discharge downstream to Moenkopi Wash; plus, provide adequate sediment storage volume.

The following parameters were used in the hydrologic analysis:

	10-Year <u>24-Hr Storm</u>	25-Year <u>6-Hr. Storm</u>
1. Water Course Length, L	0.290 mi	0.290 mi
2. Elevation Difference, H	55 ft	55 ft
3. Time of Concentration, Tc	0.074 hr	0.074 hr
4. SCS Curve Number	81	81
5. Rainfall Depth	2.1 in	1.9 in
6. Drainage Area	23.9 ac	23.9 ac

Hydraulics

The SEDCAD 4 computer program was used to evaluate inflow to the sedimentation structure, outflow from the structure, and the resulting water surface elevations. The 10-year storm was routed through Structure J1-RB as will be the worst case scenario during mining and reclamation. The initial conditions and results of the analysis are summarized in the following J1-RB hydraulics table:

J1-RB HYDRAULICS TABLE

		10-Yr, 24-Hr	25-Yr, 6-Hr
	Units	Storm	Storm
Initial Reservoir Volume Condition		Empty	Full to emergency Spillway elevation
Inflow			
Peak Flow	cfs	18.15	22.96
Volume	ac-ft	1.33	1.07
Storage			
Peak Stage	msl	6657.2	6657.2
Emerg. Spillway Elev.	msl	6657.1	6657.1
Peak Storage	ac-ft	32.21	32.2
Storage Capacity	ac-ft	31.56	31.56
Outflow			
Peak Flow	cfs	N/A	28.0
Spillway Elevation	msl	6657.1	6657.1
Embankment Crest Elev.	msl	6660.0	6660.0
Peak Stage	msl	---	6657.2
Freeboard	ft	---	2.8
Emergency Spillway Channel			
Flow Depth	ft	---	0.2
Critical Velocity	fps	---	1.03
Mannings "n"	---	---	0.030
Width	ft	---	30
Outflow Channel			
Slope	%	---	0.7
Normal Velocity	fps	---	1.14
Normal Depth	ft	---	0.2
Mannings "n"	---	---	0.030

Emergency Spillway and Outlet Channel

The emergency spillway and outlet channel for J1-RB will be a trapezoidal channel. The alignment and dimensions are shown on Exhibit 1 and includes the following dimensions:

Minimum Channel Depth (Spillway)	. . . . .	1.2 ft.
(Outflow)	. . . . .	1.2 ft.
Channel Width	. . . . .	30 ft.
Channel Length (Spillway)	. . . . .	60 ft.
(Outflow)	. . . . .	160 ft.
Side Slopes (Horizontal to Vertical)	. . . . .	3:1 or flatter
Average Slope (Spillway)	. . . . .	0 %
Maximum Slope (Outflow)	. . . . .	0.7 %
Spillway Elevation	. . . . .	6657.1

Storage Capacity

The impoundment stage-capacity table (see Exhibit 1) is based on the 2010 aerial topographic mapping conducted for Peabody Western Coal Company. The total storage capacity of Structure J1-RB is designed to contain approximately 31.56 acre-feet.

The calculations for the sediment load entering Structure J1-RB were made utilizing the Revised Universal Soil Loss Equation with the following parameters:

1. Rainfall Factor, R 40
2. Soil Erodibility Factor, K 0.38
3. Slope Factor, LS 4.02
4. Cover Factor, C 0.15
5. Erosion Control Factor, P 0.40

The hydrologic analysis gives the storage volume required to treat the 10-year, 24-hour storm, and the remaining storage volume available for storing sediment. Structure J1-RB has sufficient storage by itself. Therefore, the sediment storage capacity was determined for the structure. The results of the analysis are presented in the following table.

Storage for Structure J1-RB

	J1-RB
Total Storage Capacity	31.56 ac-ft
10-Year, 24-Hour Storm Inflow	1.33 ac-ft
Available Sediment	
Storage Capacity	30.23 ac-ft
Sediment Inflow Rate	0.04 ac-ft/yr
Sediment Storage Life	755.8 yrs

The following appendices and drawing are attached and complete this as-built report.

Appendix A - Hydrology, Hydraulic, and Sedimentation Calculations for J1-RB

Appendix B - SEDCAD 4 (Input and Output) 10-Year, 24-Hour Storm Event for J1-RB

Appendix C - SEDCAD 4 (Input and Output) 25-Year, 6-Hour Storm Event for Outflow Spillway
Channel

Exhibit 1 - J1-RB Permanent Impoundment As-Built

APPENDIX A

HYDROLOGY, HYDRAULIC, AND SEDIMENTATION CALCULATIONS

J1-RB

Project: J1-RB Pond

Time of Concentration:

Elevation Difference = 6712 - 6657 = 208 ft.

Watercourse Length = 1,532 ft. = 0.290 mi.

Tc = 0.074 hr.

SCS Curve Number:

Cover Type	Soil Group	CN	Area (Acres)	CN*Area
Reclaimed	D	81	<u>23.9</u>	<u>1935.9</u>
			23.9	1935.9

Weighted CN = $1935.9/23.9 = 81 = \underline{\text{Use 81}}$

Drainage Basin Area:

23.9 acres

0.04 sq. miles

SEDCAD Utility-Routing Parameters:

K = 0.0 hr

X = 0.0 hr

Project: J1-RB Pond

Revised USLE Calculations:

Soil Erodibility Factor:

Soil Type	Soil Group	K	Area (Acres)	K * Area
Reclaimed	D	0.38	<u>23.9</u>	<u>9.08</u>
			23.9	9.08

Weighted k = $9.08/23.9 = 0.38$ Use 0.38

Soil Erodibility Factor: k = 0.38 (Reclaimed)

Slope Factor:

Length (ft)	Elev. Diff (ft)	Slope (%)	M	Theta (Degrees)	LS $(L/72.6)^M [17.2 \sin(\text{Theta}) - 0.55]$
362	40	11.05	0.6	6.33	3.53
467	55	11.78	0.6	6.75	4.50

Avg. LS = 4.02

Cover Factor: C = 0.15 (Reclaimed)

Practice Factor: P = 0.40 (Reclaimed)

Rainfall Factor: R = 40

Revised USLE Calculations:

A = $R * K * LS * C * P = \underline{3.67}$ Ton/acre

Sediment Inflow Rate:

DA = 23.9 ac.

SDR = 0.95

SI = $(A * DA * SDR * 94) / 192,400 = \underline{0.04}$ ac-ft/yr

APPENDIX B

SEDCAD 4 (INPUT AND OUTPUT)
10-YEAR, 24-HOUR STORM EVENT

J1-RB

J1-RB Pond Design (10yr-24hr)

Gary Altsisi, P.E.

Peabody Western Coal Co.
P.O. Box 650
Kayenta, AZ 86033

General Information

Storm Information:

Storm Type:	NRCS Type II
Design Storm:	10 yr - 24 hr
Rainfall Depth:	2.100 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Pond	#1	==>	End	0.000	0.000	J1-RB POND

#1
Pond

Structure Summary:

		Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	In			18.15	1.33
	Out	23.900	23.900	5.18	1.33

Structure Detail:

Structure #1 (Pond)

J1-RB POND

Pond Inputs:

Initial Pool Elev:	6,657.10 ft
Initial Pool:	31.79 ac-ft

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
6,657.10	60.00	3.00:1	3.00:1	30.00

Pond Results:

Peak Elevation:	6,657.20 ft
Dewater Time:	0.68 days

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
6,641.60	0.000	0.000	0.000	
6,642.10	0.027	0.005	0.000	
6,642.60	0.106	0.036	0.000	
6,643.10	0.236	0.119	0.000	
6,643.60	0.421	0.281	0.000	
6,644.10	0.657	0.549	0.000	
6,644.60	0.945	0.947	0.000	
6,645.00	1.213	1.377	0.000	
6,645.10	1.221	1.499	0.000	
6,645.60	1.264	2.120	0.000	
6,646.10	1.307	2.763	0.000	
6,646.60	1.350	3.427	0.000	
6,647.10	1.395	4.113	0.000	
6,647.60	1.440	4.822	0.000	
6,648.10	1.486	5.554	0.000	
6,648.60	1.533	6.308	0.000	
6,649.10	1.580	7.086	0.000	

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
6,649.60	1.628	7.888	0.000	
6,650.00	1.667	8.547	0.000	
6,650.10	1.708	8.716	0.000	
6,650.60	1.915	9.621	0.000	
6,651.10	2.135	10.633	0.000	
6,651.60	2.366	11.758	0.000	
6,652.10	2.609	13.001	0.000	
6,652.60	2.865	14.369	0.000	
6,653.10	3.132	15.868	0.000	
6,653.60	3.411	17.503	0.000	
6,654.10	3.702	19.281	0.000	
6,654.60	4.005	21.207	0.000	
6,655.00	4.255	22.858	0.000	
6,655.10	4.255	23.284	0.000	
6,655.60	4.255	25.411	0.000	
6,656.10	4.256	27.539	0.000	
6,656.60	4.256	29.667	0.000	
6,657.10	4.256	31.795	0.000	Spillway #1
6,657.20	4.424	32.214	5.179	16.20 Peak Stage
6,657.60	4.539	33.993	27.166	
6,658.10	4.831	36.335	54.333	
6,658.60	5.132	38.826	131.672	
6,659.10	5.442	41.469	213.075	
6,659.60	5.761	44.269	318.515	
6,660.00	6.023	46.626	416.643	

Detailed Discharge Table

Elevation (ft)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
6,641.60	0.000	0.000
6,642.10	0.000	0.000
6,642.60	0.000	0.000
6,643.10	0.000	0.000
6,643.60	0.000	0.000
6,644.10	0.000	0.000
6,644.60	0.000	0.000
6,645.00	0.000	0.000
6,645.10	0.000	0.000

Elevation (ft)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
6,645.60	0.000	0.000
6,646.10	0.000	0.000
6,646.60	0.000	0.000
6,647.10	0.000	0.000
6,647.60	0.000	0.000
6,648.10	0.000	0.000
6,648.60	0.000	0.000
6,649.10	0.000	0.000
6,649.60	0.000	0.000
6,650.00	0.000	0.000
6,650.10	0.000	0.000
6,650.60	0.000	0.000
6,651.10	0.000	0.000
6,651.60	0.000	0.000
6,652.10	0.000	0.000
6,652.60	0.000	0.000
6,653.10	0.000	0.000
6,653.60	0.000	0.000
6,654.10	0.000	0.000
6,654.60	0.000	0.000
6,655.00	0.000	0.000
6,655.10	0.000	0.000
6,655.60	0.000	0.000
6,656.10	0.000	0.000
6,656.60	0.000	0.000
6,657.10	0.000	0.000
6,657.60	27.166	27.166
6,658.10	54.333	54.333
6,658.60	131.672	131.672
6,659.10	213.075	213.075
6,659.60	318.515	318.515
6,660.00	416.643	416.643

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	23.900	0.074	0.000	0.000	81.000	M	18.15	1.330
	Σ	23.900						18.15	1.330

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	8. Large gullies, diversions, and low flowing streams	3.59	55.00	1,532.03	5.680	0.074
#1	1	Time of Concentration:					0.074

APPENDIX C

SEDCAD 4 (INPUT AND OUTPUT)

25-YEAR, 6-HOUR STORM EVENT

OUTFLOW SPILLWAY CHANNEL

J1-RB

J1-RB Pond Design (25yr-6hr)

Gary Altsisi, P.E.

Peabody Western Coal Co.
P.O. Box 650
Kayenta, AZ 86033

General Information

Storm Information:

Storm Type:	NRCS Type II
Design Storm:	25 yr - 6 hr
Rainfall Depth:	1.900 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Pond	#1	==>	End	0.000	0.000	J1-RB POND

#1
Pond

Structure Summary:

		Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	In	23.900	23.900	22.96	1.07
	Out			5.39	1.08

Structure Detail:

Structure #1 (Pond)

J1-RB POND

Pond Inputs:

Initial Pool Elev:	6,657.10 ft
Initial Pool:	31.79 ac-ft

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
6,657.10	60.00	3.00:1	3.00:1	30.00

Pond Results:

Peak Elevation:	6,657.20 ft
Dewater Time:	0.36 days

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
6,641.60	0.000	0.000	0.000	
6,642.10	0.027	0.005	0.000	
6,642.60	0.106	0.036	0.000	
6,643.10	0.236	0.119	0.000	
6,643.60	0.421	0.281	0.000	
6,644.10	0.657	0.549	0.000	
6,644.60	0.945	0.947	0.000	
6,645.00	1.213	1.377	0.000	
6,645.10	1.221	1.499	0.000	
6,645.60	1.264	2.120	0.000	
6,646.10	1.307	2.763	0.000	
6,646.60	1.350	3.427	0.000	
6,647.10	1.395	4.113	0.000	
6,647.60	1.440	4.822	0.000	
6,648.10	1.486	5.554	0.000	
6,648.60	1.533	6.308	0.000	
6,649.10	1.580	7.086	0.000	

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
6,649.60	1.628	7.888	0.000	
6,650.00	1.667	8.547	0.000	
6,650.10	1.708	8.716	0.000	
6,650.60	1.915	9.621	0.000	
6,651.10	2.135	10.633	0.000	
6,651.60	2.366	11.758	0.000	
6,652.10	2.609	13.001	0.000	
6,652.60	2.865	14.369	0.000	
6,653.10	3.132	15.868	0.000	
6,653.60	3.411	17.503	0.000	
6,654.10	3.702	19.281	0.000	
6,654.60	4.005	21.207	0.000	
6,655.00	4.255	22.858	0.000	
6,655.10	4.255	23.284	0.000	
6,655.60	4.255	25.411	0.000	
6,656.10	4.256	27.539	0.000	
6,656.60	4.256	29.667	0.000	
6,657.10	4.256	31.795	0.000	Spillway #1
6,657.20	4.425	32.231	5.389	8.65 Peak Stage
6,657.60	4.539	33.993	27.166	
6,658.10	4.831	36.335	54.333	
6,658.60	5.132	38.826	131.672	
6,659.10	5.442	41.469	213.075	
6,659.60	5.761	44.269	318.515	
6,660.00	6.023	46.625	416.643	

Detailed Discharge Table

Elevation (ft)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
6,641.60	0.000	0.000
6,642.10	0.000	0.000
6,642.60	0.000	0.000
6,643.10	0.000	0.000
6,643.60	0.000	0.000
6,644.10	0.000	0.000
6,644.60	0.000	0.000
6,645.00	0.000	0.000
6,645.10	0.000	0.000

Elevation (ft)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
6,645.60	0.000	0.000
6,646.10	0.000	0.000
6,646.60	0.000	0.000
6,647.10	0.000	0.000
6,647.60	0.000	0.000
6,648.10	0.000	0.000
6,648.60	0.000	0.000
6,649.10	0.000	0.000
6,649.60	0.000	0.000
6,650.00	0.000	0.000
6,650.10	0.000	0.000
6,650.60	0.000	0.000
6,651.10	0.000	0.000
6,651.60	0.000	0.000
6,652.10	0.000	0.000
6,652.60	0.000	0.000
6,653.10	0.000	0.000
6,653.60	0.000	0.000
6,654.10	0.000	0.000
6,654.60	0.000	0.000
6,655.00	0.000	0.000
6,655.10	0.000	0.000
6,655.60	0.000	0.000
6,656.10	0.000	0.000
6,656.60	0.000	0.000
6,657.10	0.000	0.000
6,657.60	27.166	27.166
6,658.10	54.333	54.333
6,658.60	131.672	131.672
6,659.10	213.075	213.075
6,659.60	318.515	318.515
6,660.00	416.643	416.643

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	23.900	0.074	0.000	0.000	81.000	M	22.96	1.074
	Σ	23.900						22.96	1.074

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	8. Large gullies, diversions, and low flowing streams	3.59	55.00	1,532.03	5.680	0.074
#1	1	Time of Concentration:					0.074

J1-RB POND SPILLWAY CHANNEL

Material: Graded Spoil

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Manning's n	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
30.00	8.0:1	10.0:1	0.5	0.0300	1.00			5.0

	w/o Freeboard	w/ Freeboard
Design Discharge:	5.39 cfs	
Depth:	0.17 ft	1.17 ft
Top Width:	32.99 ft	50.99 ft
Velocity:	1.03 fps	
X-Section Area:	5.24 sq ft	
Hydraulic Radius:	0.159 ft	
Froude Number:	0.46	

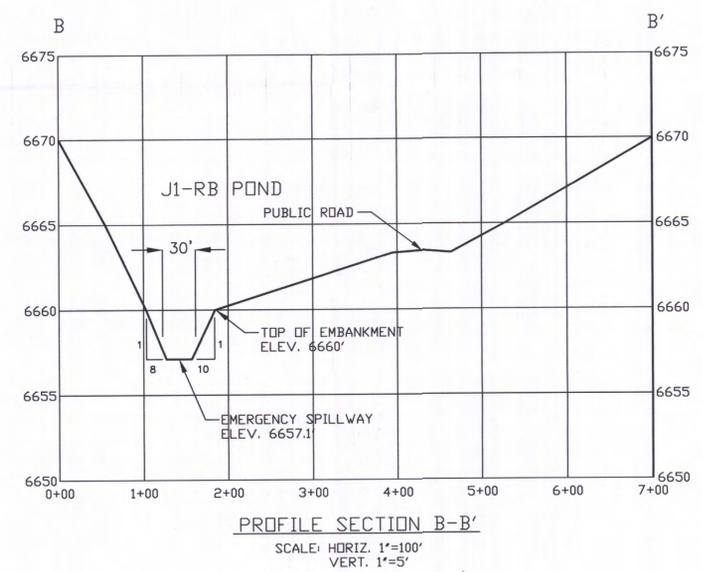
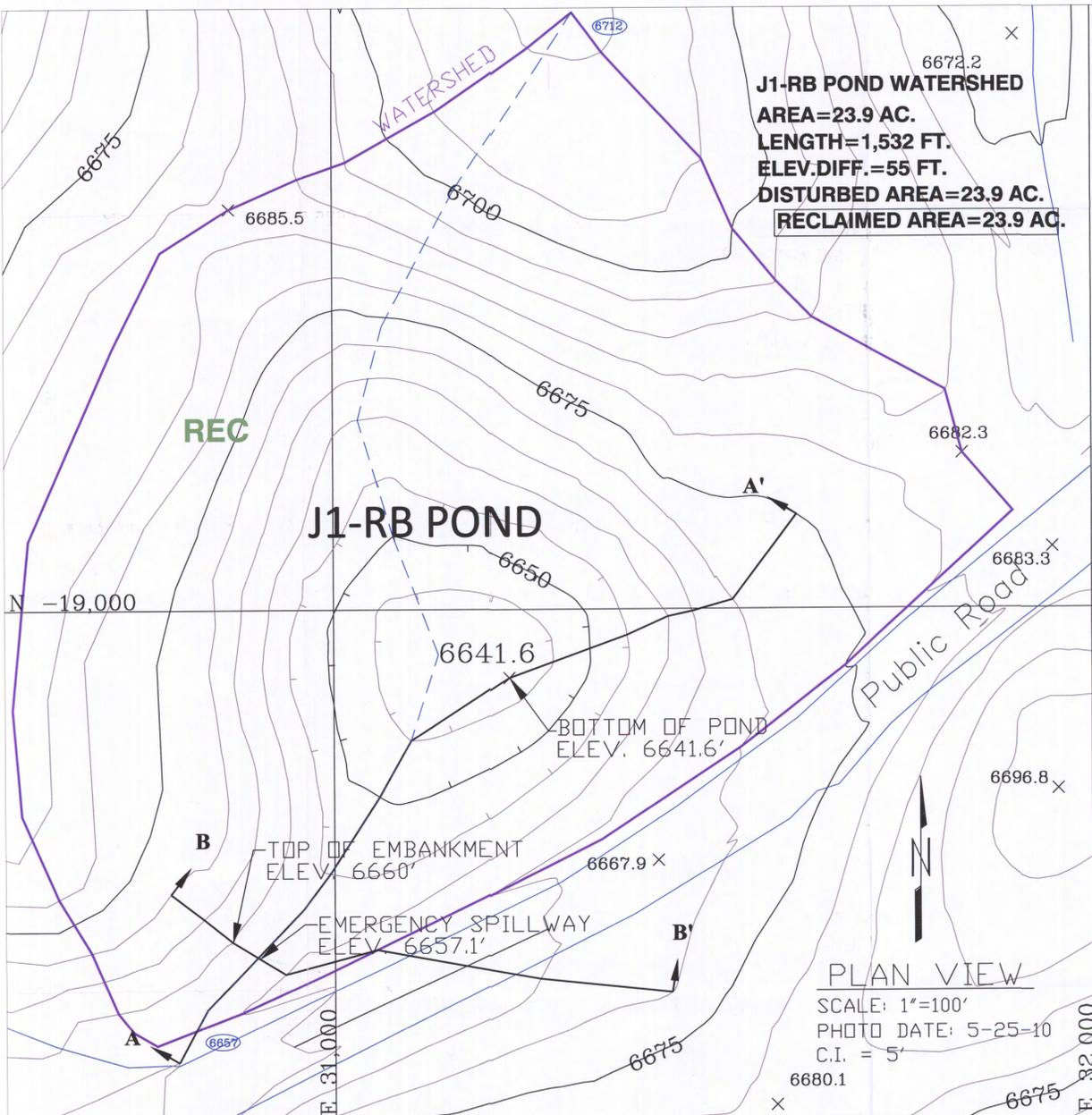
J1-RB POND SPILLWAY OUTFLOW CHANNEL

Material: Graded Spoil

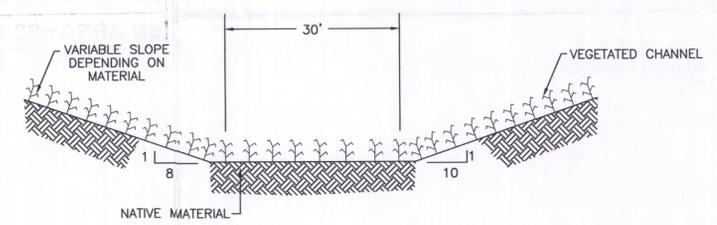
Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Manning's n	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
30.00	8.0:1	10.0:1	0.7	0.0300	1.00			5.0

	w/o Freeboard	w/ Freeboard
Design Discharge:	5.39 cfs	
Depth:	0.15 ft	1.15 ft
Top Width:	32.71 ft	50.71 ft
Velocity:	1.14 fps	
X-Section Area:	4.72 sq ft	
Hydraulic Radius:	0.144 ft	
Froude Number:	0.53	



J1-RB POND STAGE CAPACITY					
ELEV. (FT.-MSL)	STAGE (FT.)	AREA (ACRES)	CAPACITY (AC.-FT.)	TOTAL CAPACITY (AC.-FT.)	DESCRIPTION
6641.6	0.0	0.00	0.00	0.00	BOTTOM OF POND
6645.0	3.4	0.81	1.38	1.38	
6650.0	8.4	2.06	7.18	8.55	
6655.0	13.4	3.68	14.35	22.90	
6657.1	15.5	4.57	8.66	31.56	EMERGENCY SPILLWAY
6660.0	18.4	5.81	15.05	46.62	TOP OF EMBANKMENT



SECTION OF EMERGENCY SPILLWAY
 NOT TO SCALE
 J1-RB POND

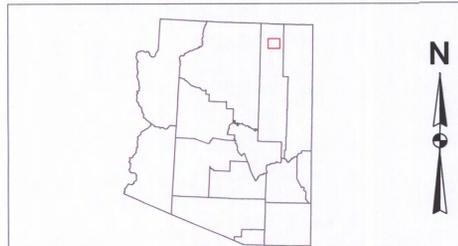
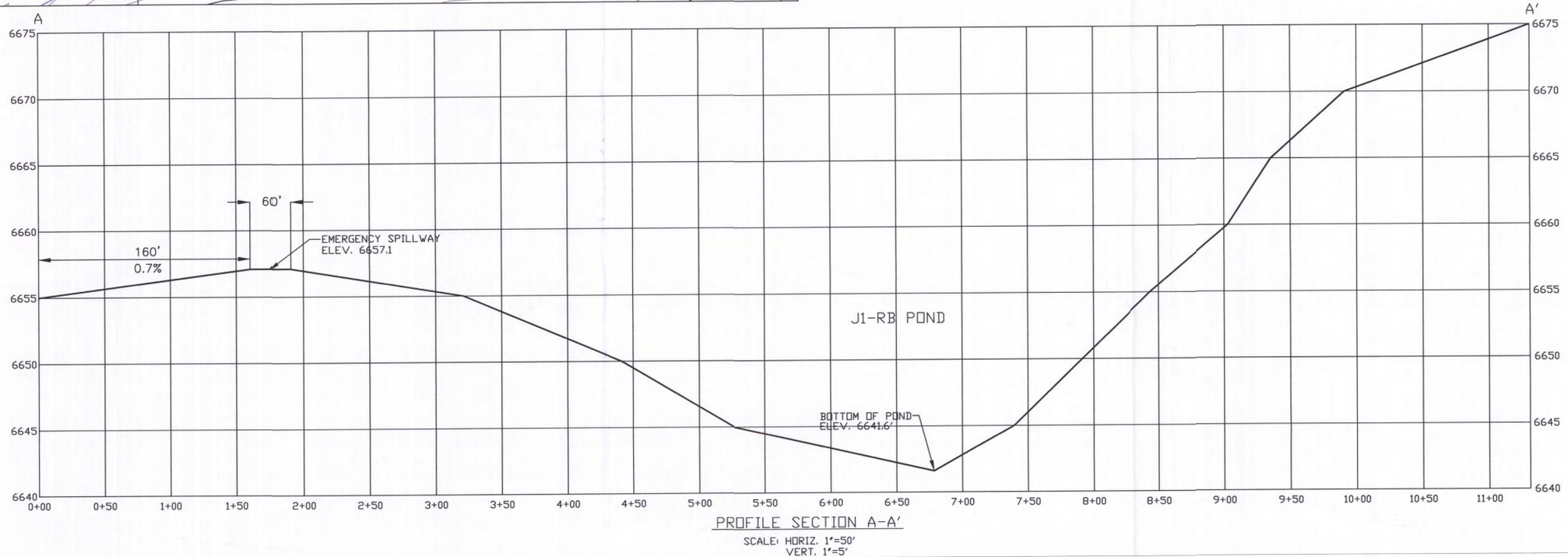
ENGINEER'S CERTIFICATION

I certify that this Siltation Structure was constructed in accordance with the approved mining permit and that the information contained herein accurately describes the constructed structure to the best of my knowledge and belief.



EXPIRES: 09/30/2014

Gary Altsisi
 ARIZONA P.E. 37842
 Reclamation Supervisor
 Peabody Western Coal Company



REVISION	REV'D BY	DATE

BLACK MESA MINE
 P.O. BOX 650
 KAYENTA, ARIZONA 86033

EXHIBIT 1
J1-RB PERMANENT IMPOUNDMENT (AS-BUILT)

LEGEND

- WATERSHED BOUNDARY
- DRAINAGE
- RECLAIMED
- TE-CHANNEL ELEV

DESIGNED BY: G.A.
 DRAWN BY: G.A.
 APPROVED BY: G.A.

COUNTRY: USA
 STATE/PROVINCE: ARIZONA
 GCS: DATUM/Projection
 PHOTO DATE: 5-25-2010

DATE: 06-24-2014
 SCALE: 1"=100'

DRAWING/SHEET: 1 of 1
 C.I.: 5'

0 100 200 300 FEET

\\VACAD.DWG\POND\UOMNE\AS-BUILT\J1-RB_POND_AS-BUILT_061914.dwg

APPENDIX A

HYDROLOGY, HYDRAULIC, AND SEDIMENTATION CALCULATIONS

J1-RA

Project: J1-RA Pond

Revised USLE Calculations:

Soil Erodibility Factor:

Soil Type	Soil Group	K	Area (Acres)	K * Area
16	B	0.05	16.7	0.84
Reclaimed	D	0.38	<u>245.3</u>	<u>93.21</u>
			262.0	94.05

Weighted k = $94.05/262.0 = 0.359$ Use 0.36

Soil Erodibility Factor: k = 0.36 (Reclaimed)

Slope Factor:

Length (ft)	Elev. Diff (ft)	Slope (%)	M	Theta (Degrees)	LS $(L/72.6)^M * [17.2 \sin(\text{Theta}) - 0.55]$
445	55	12.36	0.6	7.08	4.66
381	60	15.75	0.6	9.02	5.80
545	90	16.51	0.6	9.46	7.63

Avg. LS = 6.03

Cover Factor: C = 0.15 (Reclaimed)

Practice Factor: P = 0.40 (Reclaimed)

Rainfall Factor: R = 40

Revised USLE Calculations:

A = $R * K * LS * C * P = 5.21$ Ton/acre

Sediment Inflow Rate:

DA = 262.0 ac.

SDR = 0.90

SI = $(A * DA * SDR * 94) / 192,400 = 0.60$ ac-ft/yr

Project: J1-RA Pond

Time of Concentration:

Elevation Difference = 6905 - 6697 = 208 ft.

Watercourse Length = 6,713 ft. = 1.271 mi.

Tc = 0.353 hr.

SCS Curve Number:

Cover Type	Soil Group	CN	Area (Acres)	CN*Area
Reclaimed	D	81	16.7	1085.5
Pinyon/Juniper	B	65	<u>245.3</u>	<u>19869.3</u>
			262.0	20954.8

Weighted CN = $20954.8/262.0 = 79.98 = \underline{\text{Use } 80}$

Drainage Basin Area:

262.0 acres

0.41 sq. miles

SEDCAD Utility-Routing Parameters:

K = 0.0 hr

X = 0.0 hr

impoundment. Structure J1-RA was conservatively assumed to be full to the emergency spillway at the time of the 10-year storm. The storage capacity of the Structure J1-RA was analyzed using the 10-year, 24-hour storm. The pond was conservatively assumed to completely contain the 10-year, 24-hour storm without discharge downstream to Moenkopi Wash; plus, provide adequate sediment storage volume.

The following parameters were used in the hydrologic analysis:

	10-Year <u>24-Hr Storm</u>	25-Year <u>6-Hr. Storm</u>
1. Water Course Length, L	1.271 mi	1.271 mi
2. Elevation Difference, H	208 ft	208 ft
3. Time of Concentration, Tc	0.353 hr	0.353 hr
4. SCS Curve Number	80	80
5. Rainfall Depth	2.1 in	1.9 in
6. Drainage Area	262.0 ac	262.0 ac

Hydraulics

The SEDCAD 4 computer program was used to evaluate inflow to the sedimentation structure, outflow from the structure, and the resulting water surface elevations. The 10-year storm was routed through Structure J1-RA as will be the worst case scenario during mining and reclamation. The initial conditions and results of the analysis are summarized in the following J1-RA hydraulics table:

J1-RA HYDRAULICS TABLE

	Units	10-Yr, 24-Hr Storm	25-Yr, 6-Hr Storm
Initial Reservoir Volume Condition		Empty	Full to emergency Spillway elevation
Inflow			
Peak Flow	cfs	90.15	102.0
Volume	ac-ft	10.9	8.8
Storage			
Peak Stage	msl	6697.5	6697.5
Emerg. Spillway Elev.	msl	6697.1	6697.1
Peak Storage	ac-ft	29.6	29.9
Storage Capacity	ac-ft	26.07	26.07
Outflow			
Peak Flow	cfs	N/A	28.0
Spillway Elevation	msl	6697.1	6697.1
Embankment Crest Elev.	msl	6700.0	6700.0
Peak Stage	msl	---	6697.5
Freeboard	ft	---	2.5
Emergency Spillway Channel			
Flow Depth	ft	---	0.4
Critical Velocity	fps	---	1.64
Mannings "n"	---	---	0.030
Width	ft	---	42
Outflow Channel			
Slope	%	---	12.5
Normal Velocity	fps	---	4.56
Normal Depth	ft	---	0.2
Mannings "n"	---	---	0.030

Emergency Spillway and Outlet Channel

The emergency spillway and outlet channel for J1-RA will be a trapezoidal channel. The alignment and dimensions are shown on Exhibit 1 and includes the following dimensions:

Minimum Channel Depth (Spillway)	. . . . .	1.4 ft.
(Outflow)	. . . . .	1.2 ft.
Channel Width	. . . . .	42 ft.
Channel Length (Spillway)	. . . . .	100 ft.
(Outflow)	. . . . .	200 ft.
Side Slopes (Horizontal to Vertical)	. .	3:1 or flatter
Average Slope (Spillway)	. . . . .	0 %
Maximum Slope (Outflow)	. . . . .	12.5 %
Spillway Elevation	. . . . .	6697.1

Storage Capacity

The impoundment stage-capacity table (see Exhibit 1) is based on the 2010 aerial topographic mapping conducted for Peabody Western Coal Company. The total storage capacity of Structure J1-RA is designed to contain approximately 26.07 acre-feet.

The calculations for the sediment load entering Structure J1-RA were made utilizing the Revised Universal Soil Loss Equation with the following parameters:

1. Rainfall Factor, R 40
2. Soil Erodibility Factor, K 0.36
3. Slope Factor, LS 6.03
4. Cover Factor, C 0.15
5. Erosion Control Factor, P 0.40

The hydrologic analysis gives the storage volume required to treat the 10-year, 24-hour storm, and the remaining storage volume available for storing sediment. Structure J1-RA has sufficient storage by itself. Therefore, the sediment storage capacity was determined for the structure. The results of the analysis are presented in the following table.

Storage for Structure J1-RA

	J1-RA
Total Storage Capacity	26.07 ac-ft
10-Year, 24-Hour Storm Inflow	10.91 ac-ft
Available Sediment	
Storage Capacity	15.16 ac-ft
Sediment Inflow Rate	0.60 ac-ft/yr
Sediment Storage Life	25.3 yrs

The following appendices and drawing are attached and complete this as-built report.

Appendix A - Hydrology, Hydraulic, and Sedimentation Calculations for J1-RA

Appendix B - SEDCAD 4 (Input and Output) 10-Year, 24-Hour Storm Event for J1-RA

Appendix C - SEDCAD 4 (Input and Output) 25-Year, 6-Hour Storm Event for Outflow Spillway
Channel

Exhibit 1 - J1-RA Permanent Impoundment As-Built

APPENDIX B

**SEDCAD 4 (INPUT AND OUTPUT)
10-YEAR, 24-HOUR STORM EVENT**

J1-RA

J1-RA Pond Design (10yr-24hr)

Gary Altsisi, P.E.

Peabody Western Coal Co.
P.O. Box 650
Kayenta, AZ 86033

General Information

Storm Information:

Storm Type:	NRCS Type II
Design Storm:	10 yr - 24 hr
Rainfall Depth:	2.100 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Pond	#1	==>	End	0.000	0.000	J1-RA POND

#1
Pond

Structure Summary:

		Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	In			90.15	10.90
	Out	262.000	262.000	25.73	10.91

Structure Detail:

Structure #1 (Pond)

J1-RA POND

Pond Inputs:

Initial Pool Elev:	6,697.10 ft
Initial Pool:	26.08 ac-ft

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
6,697.10	100.00	15.00:1	16.00:1	42.00

Pond Results:

Peak Elevation:	6,697.51 ft
Dewater Time:	0.92 days

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
6,689.00	0.000	0.000	0.000	
6,689.50	0.011	0.002	0.000	
6,690.00	0.044	0.015	0.000	
6,690.50	0.197	0.071	0.000	
6,691.00	0.448	0.228	0.000	
6,691.50	0.804	0.537	0.000	
6,692.00	1.266	1.050	0.000	
6,692.50	1.825	1.818	0.000	
6,693.00	2.498	2.894	0.000	
6,693.50	3.268	4.332	0.000	
6,694.00	4.144	6.180	0.000	
6,694.50	5.126	8.494	0.000	
6,695.00	6.205	11.322	0.000	
6,695.50	6.587	14.520	0.000	
6,696.00	6.980	17.911	0.000	
6,696.50	7.384	21.502	0.000	
6,697.00	7.800	25.297	0.000	

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
6,697.10	7.885	26.082	0.000	Spillway #1
6,697.50	9.146	29.485	25.198	21.80
6,697.51	9.231	29.569	25.730	0.30 Peak Stage
6,698.00	10.852	34.478	56.704	
6,698.50	12.707	40.361	152.781	
6,699.00	14.706	47.208	295.506	
6,699.50	16.849	55.091	486.736	
6,700.00	19.137	64.081	728.105	

Detailed Discharge Table

Elevation (ft)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
6,689.00	0.000	0.000
6,689.50	0.000	0.000
6,690.00	0.000	0.000
6,690.50	0.000	0.000
6,691.00	0.000	0.000
6,691.50	0.000	0.000
6,692.00	0.000	0.000
6,692.50	0.000	0.000
6,693.00	0.000	0.000
6,693.50	0.000	0.000
6,694.00	0.000	0.000
6,694.50	0.000	0.000
6,695.00	0.000	0.000
6,695.50	0.000	0.000
6,696.00	0.000	0.000
6,696.50	0.000	0.000
6,697.00	0.000	0.000
6,697.10	0.000	0.000
6,697.50	25.198	25.198
6,698.00	56.704	56.704
6,698.50	152.781	152.781
6,699.00	295.506	295.506
6,699.50	486.736	486.736
6,700.00	728.105	728.105

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	262.000	0.353	0.000	0.000	80.000	M	90.15	10.905
	Σ	262.000						90.15	10.905

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	8. Large gullies, diversions, and low flowing streams	3.10	208.00	6,713.14	5.280	0.353
#1	1	Time of Concentration:					0.353

APPENDIX C

SEDCAD 4 (INPUT AND OUTPUT)

25-YEAR, 6-HOUR STORM EVENT

OUTFLOW SPILLWAY CHANNEL

J1-RA

J1-RA Pond Design (25yr-6hr)

Gary Altsisi, P.E.

Peabody Western Coal Co.
P.O. Box 650
Kayenta, AZ 86033

General Information

Storm Information:

Storm Type:	NRCS Type II
Design Storm:	25 yr - 6 hr
Rainfall Depth:	1.900 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Pond	#1	==>	End	0.000	0.000	J1-RA POND

#1
Pond

Structure Summary:

		Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	In	262.000	262.000	101.98	8.78
	Out			27.98	8.78

Structure Detail:

Structure #1 (Pond)

J1-RA POND

Pond Inputs:

Initial Pool Elev:	6,697.10 ft
Initial Pool:	26.08 ac-ft

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
6,697.10	100.00	15.00:1	16.00:1	42.00

Pond Results:

Peak Elevation:	6,697.54 ft
Dewater Time:	0.65 days

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
6,689.00	0.000	0.000	0.000	
6,689.50	0.011	0.002	0.000	
6,690.00	0.044	0.015	0.000	
6,690.50	0.197	0.071	0.000	
6,691.00	0.448	0.228	0.000	
6,691.50	0.804	0.537	0.000	
6,692.00	1.266	1.050	0.000	
6,692.50	1.825	1.818	0.000	
6,693.00	2.498	2.894	0.000	
6,693.50	3.268	4.332	0.000	
6,694.00	4.144	6.180	0.000	
6,694.50	5.126	8.494	0.000	
6,695.00	6.205	11.322	0.000	
6,695.50	6.587	14.520	0.000	
6,696.00	6.980	17.911	0.000	
6,696.50	7.384	21.502	0.000	
6,697.00	7.800	25.297	0.000	

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
6,697.10	7.885	26.082	0.000	Spillway #1
6,697.50	9.146	29.485	25.198	14.80
6,697.54	9.349	29.926	27.981	0.75 Peak Stage
6,698.00	10.852	34.478	56.704	
6,698.50	12.707	40.361	152.781	
6,699.00	14.706	47.208	295.506	
6,699.50	16.849	55.091	486.736	
6,700.00	19.137	64.081	728.105	

Detailed Discharge Table

Elevation (ft)	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
6,689.00	0.000	0.000
6,689.50	0.000	0.000
6,690.00	0.000	0.000
6,690.50	0.000	0.000
6,691.00	0.000	0.000
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6,692.00	0.000	0.000
6,692.50	0.000	0.000
6,693.00	0.000	0.000
6,693.50	0.000	0.000
6,694.00	0.000	0.000
6,694.50	0.000	0.000
6,695.00	0.000	0.000
6,695.50	0.000	0.000
6,696.00	0.000	0.000
6,696.50	0.000	0.000
6,697.00	0.000	0.000
6,697.10	0.000	0.000
6,697.50	25.198	25.198
6,698.00	56.704	56.704
6,698.50	152.781	152.781
6,699.00	295.506	295.506
6,699.50	486.736	486.736
6,700.00	728.105	728.105

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	262.000	0.353	0.000	0.000	80.000	M	101.98	8.777
	Σ	262.000						101.98	8.777

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	8. Large gullies, diversions, and low flowing streams	3.10	208.00	6,713.14	5.280	0.353
#1	1	Time of Concentration:					0.353

J1-RA POND SPILLWAY OUTFLOW CHANNEL

Material: Graded Spoil

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Manning's n	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
42.00	15.0:1	16.0:1	12.5	0.0300	1.00			5.0

	w/o Freeboard	w/ Freeboard
Design Discharge:	27.98 cfs	
Depth:	0.14 ft	1.14 ft
Top Width:	46.31 ft	77.31 ft
Velocity:	4.56 fps	
X-Section Area:	6.13 sq ft	
Hydraulic Radius:	0.132 ft	
Froude Number:	2.21	

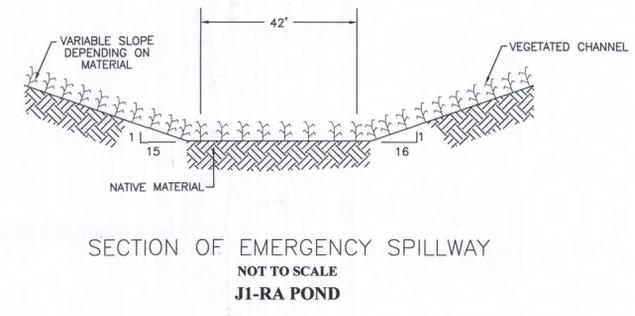
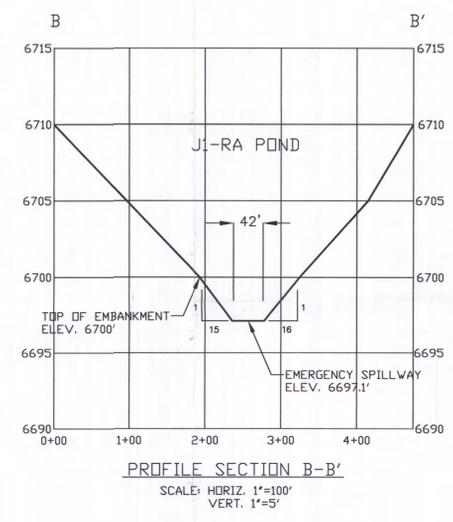
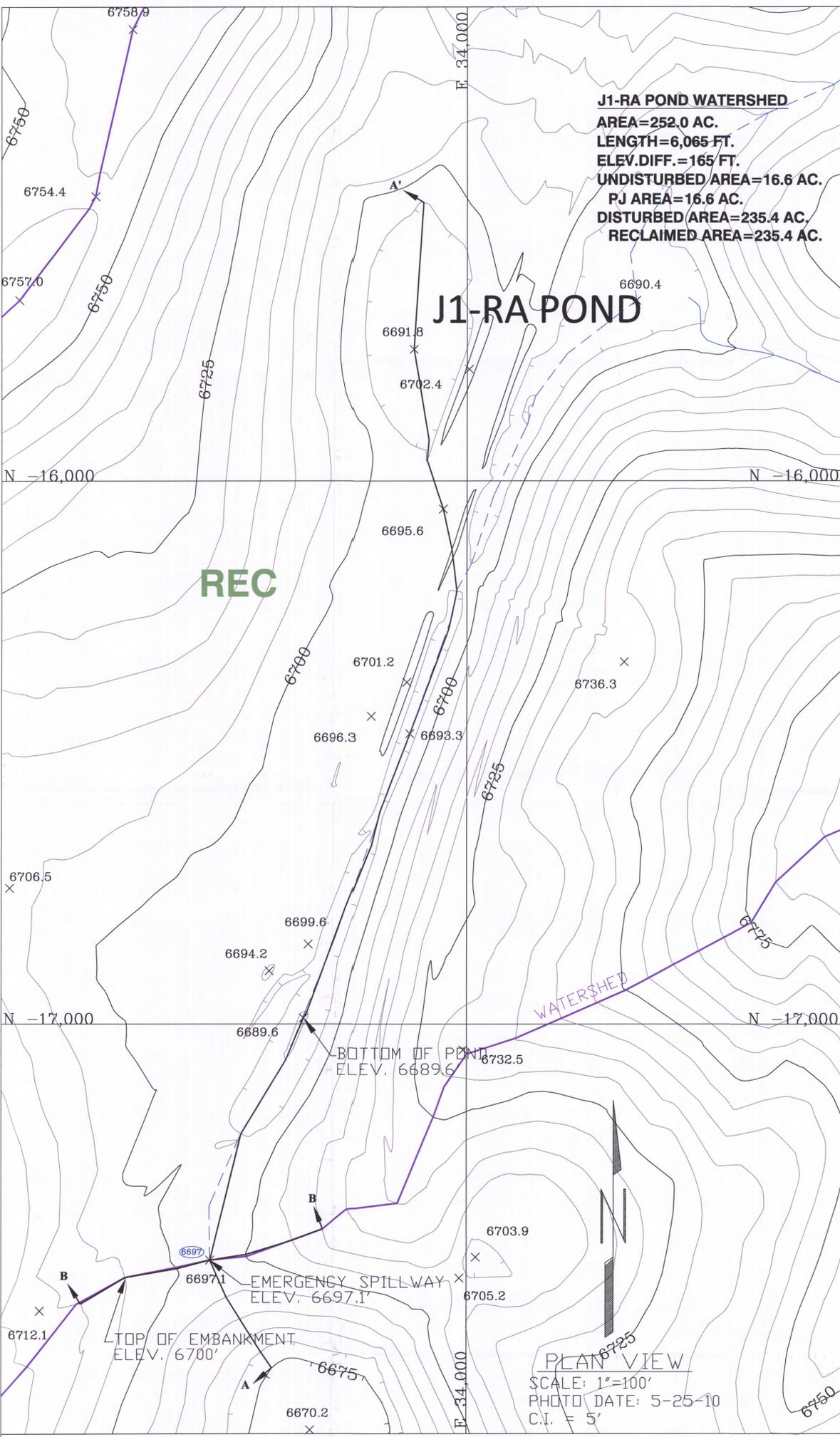
J1-RB POND SPILLWAY CHANNEL

Material: Graded Spoil

Trapezoidal Channel

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Manning's n	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
30.00	8.0:1	10.0:1	0.5	0.0300	1.00			5.0

	w/o Freeboard	w/ Freeboard
Design Discharge:	5.39 cfs	
Depth:	0.17 ft	1.17 ft
Top Width:	32.99 ft	50.99 ft
Velocity:	1.03 fps	
X-Section Area:	5.24 sq ft	
Hydraulic Radius:	0.159 ft	
Froude Number:	0.46	



J1-RA POND STAGE CAPACITY					
ELEV. (FT.-MSL)	STAGE (FT.)	AREA (ACRES)	CAPACITY (AC.-FT.)	TOTAL CAPACITY (AC.-FT.)	DESCRIPTION
6689.6	0.0	0.00	0.00	0.00	BOTTOM OF POND
6690.0	0.4	0.04	0.01	0.01	
6695.0	5.4	4.48	11.30	11.31	
6697.1	7.5	9.58	14.76	26.07	EMERGENCY SPILLWAY
6700.0	10.4	16.62	37.99	64.06	TOP OF EMBANKMENT

ENGINEER'S CERTIFICATION

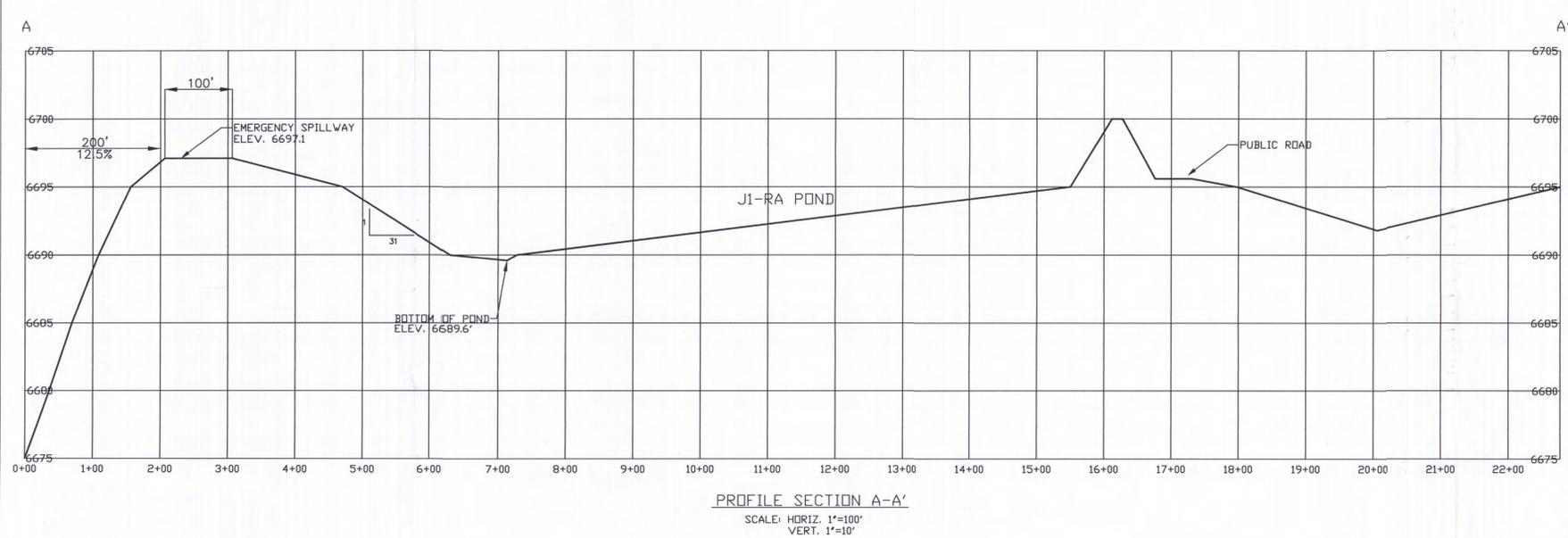
I certify that this Siltation Structure was constructed in accordance with the approved mining permit and that the information contained herein accurately describes the constructed structure to the best of my knowledge and belief.



Gary Altissi
 ARIZONA P.E. 37842
 Reclamation Supervisor
 Peabody Western Coal Company

LEGEND

- WATERSHED BOUNDARY
- DRAINAGE
- REC RECLAIMED
- 6697 Tc-CHANNEL ELEV



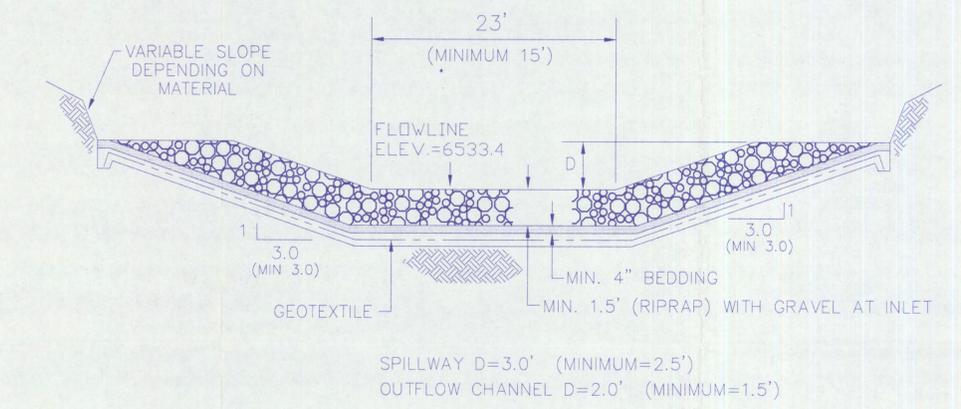
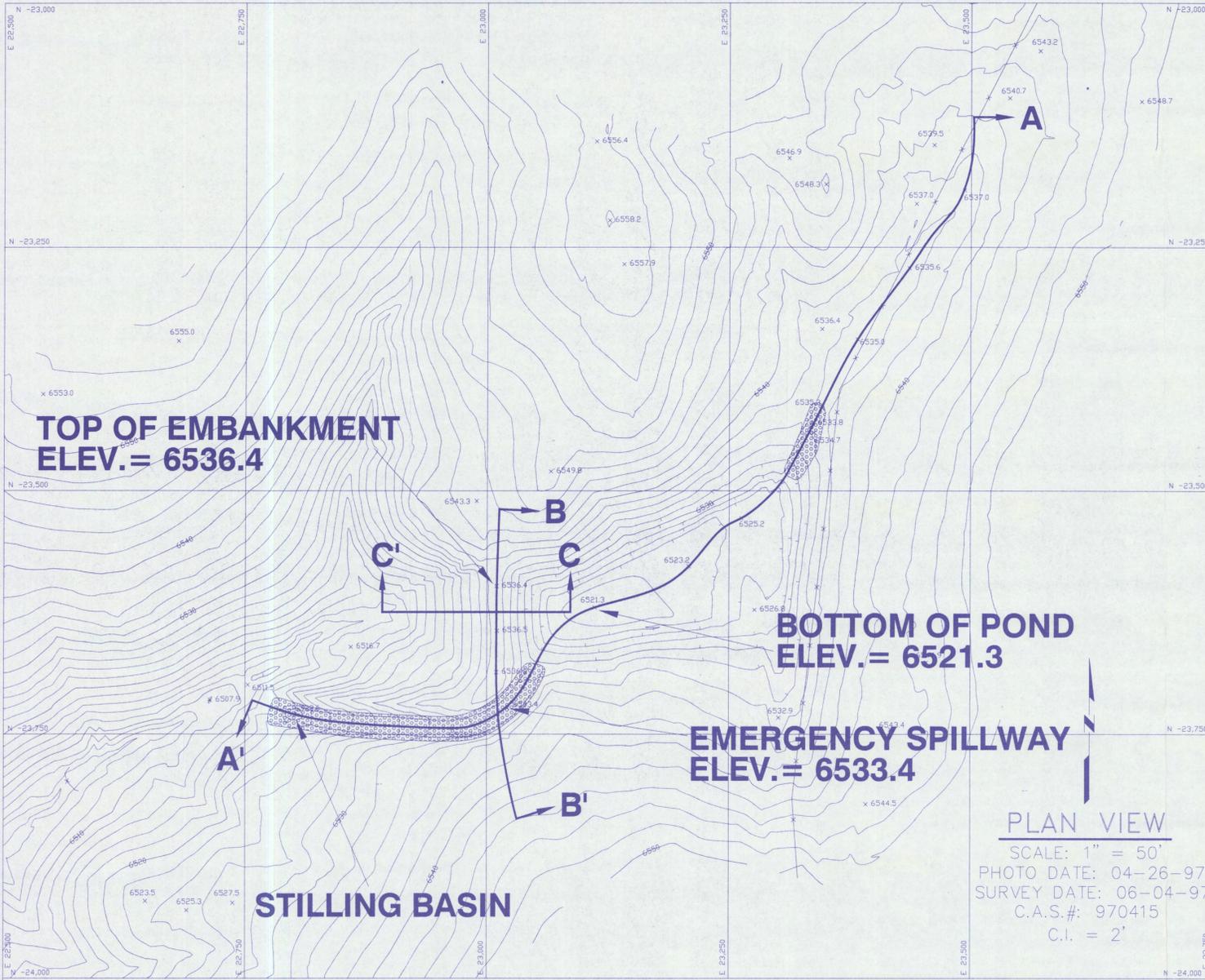
BLACK MESA MINE
Peabody ENERGY
 P.O. BOX 650
 KAYENTA, ARIZONA 86033

EXHIBIT 1
J1-RA PERMANENT IMPOUNDMENT (AS-BUILT)

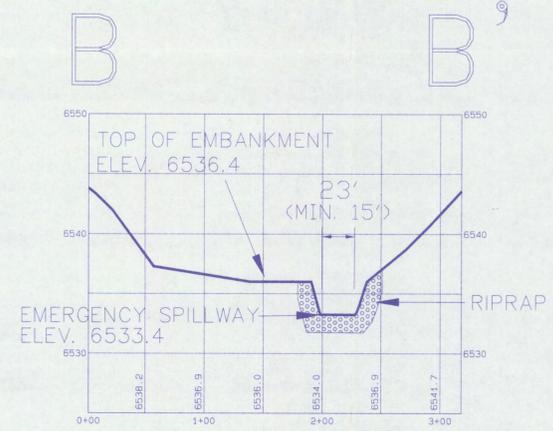
REVISION	REV'D BY	DATE

DESIGNED BY: G.A.	COUNTRY: USA
DRAWN BY: G.A.	STATE/PROVINCE: ARIZONA
APPROVED BY: G.A.	GCS: DATUM/Projection
DATE: 06-24-2014	PHOTO DATE: 5-25-2010
SCALE: 1" = 100'	DRAWING/SHEET: 1 of 1
	C.I.: 5'

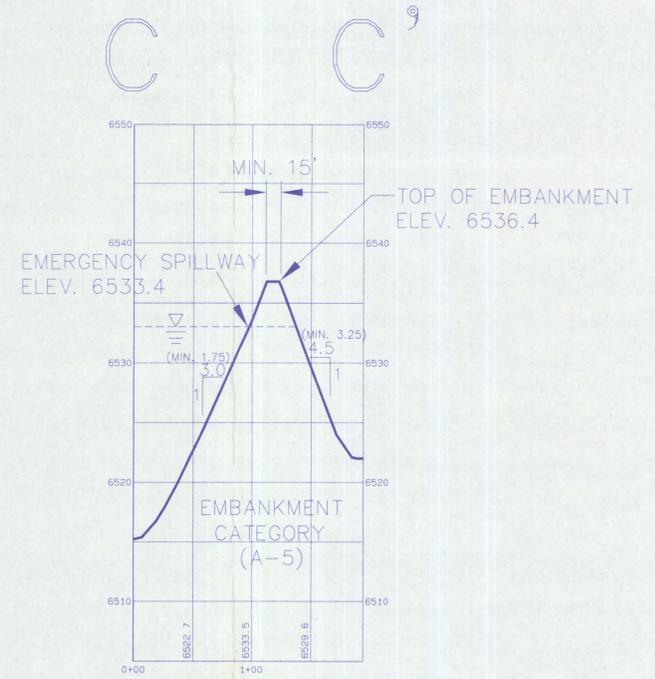
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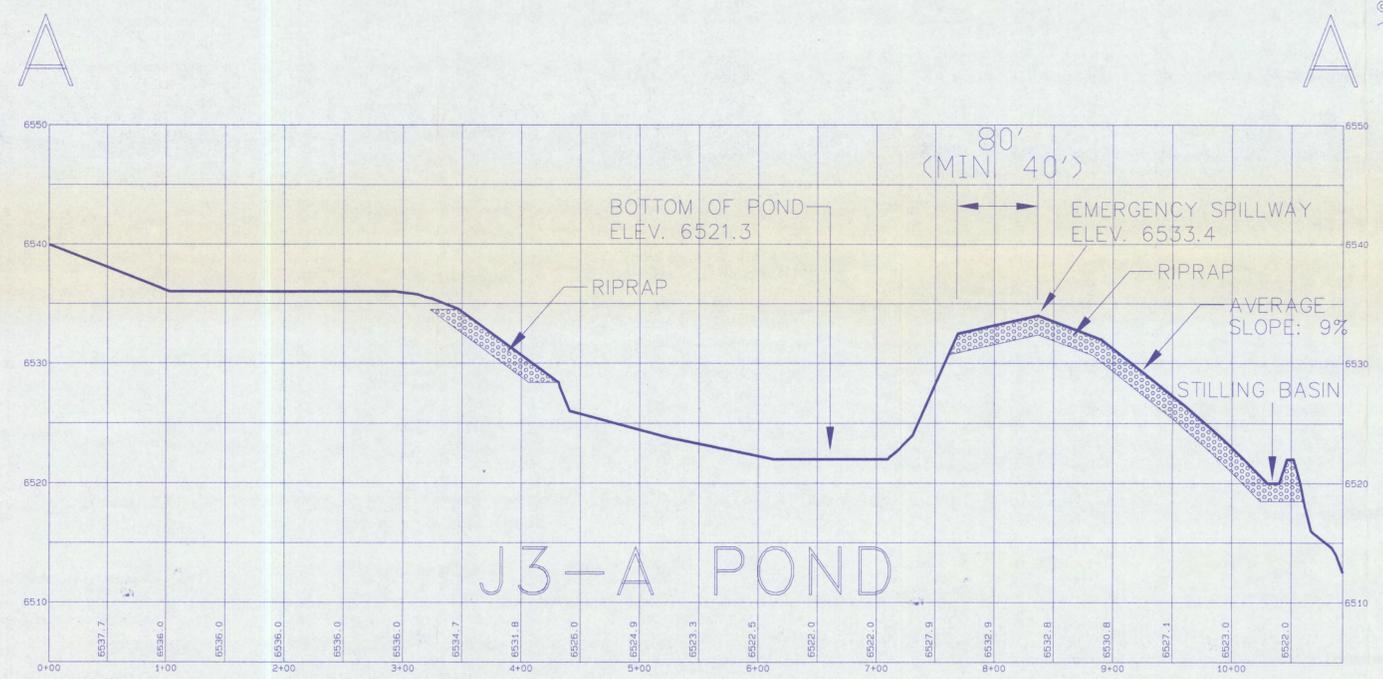
**J3-A POND
TYPICAL CROSS-SECTION OF EMERGENCY SPILLWAY
NOT TO SCALE**



SECTION B - B'
VERTICAL SCALE: 1" = 5'
HORIZONTAL SCALE: 1" = 50'



SECTION C - C'
VERTICAL SCALE: 1" = 5'
HORIZONTAL SCALE: 1" = 50'



SECTION A - A'
VERTICAL SCALE: 1" = 5'
HORIZONTAL SCALE: 1" = 50'

J3-A POND STAGE-CAPACITY TABLE

Elevation (ft-msl)	Stage (ft)	Area (Acres)	Capacity (ac-ft)	Total Capacity (ac-ft)	Description
6521.3	0.0	0.00	0.00	0.00	BOTTOM OF POND
6522.0	0.7	0.09	0.03	0.03	
6524.0	2.7	0.29	0.38	0.41	
6526.0	4.7	0.52	0.81	1.22	
6528.0	6.7	0.69	1.21	2.43	
6530.0	8.7	0.85	1.54	3.97	
6532.0	10.7	1.07	1.92	5.89	
6533.4	12.1	1.27	1.64	7.53	EMERGENCY SPILLWAY
6534.0	12.7	1.35	0.79	8.32	
6536.0	14.7	1.85	3.20	11.52	
6536.4	15.1	1.97	0.76	12.28	TOP OF EMBANKMENT

I CERTIFY THAT THIS SILTATION STRUCTURE WAS CONSTRUCTED IN ACCORDANCE WITH THE APPROVED MINING PERMIT AND THAT THE INFORMATION CONTAINED HEREIN ACCURATELY DESCRIBES THE CONSTRUCTED STRUCTURE TO THE BEST OF MY KNOWLEDGE AND BELIEF

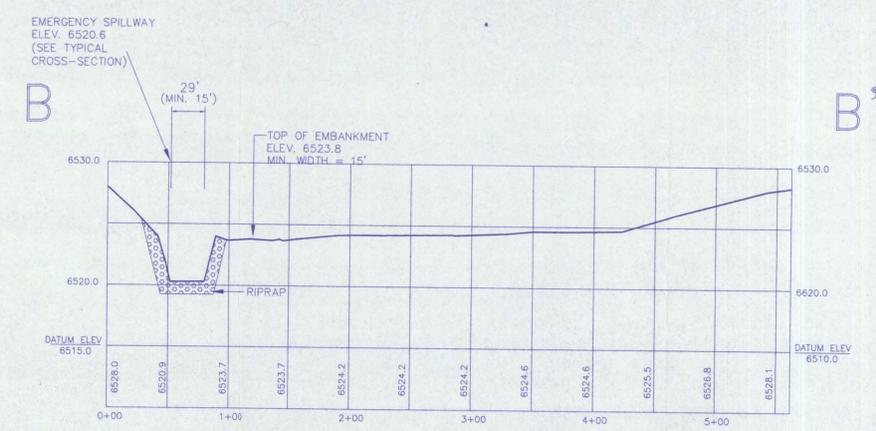
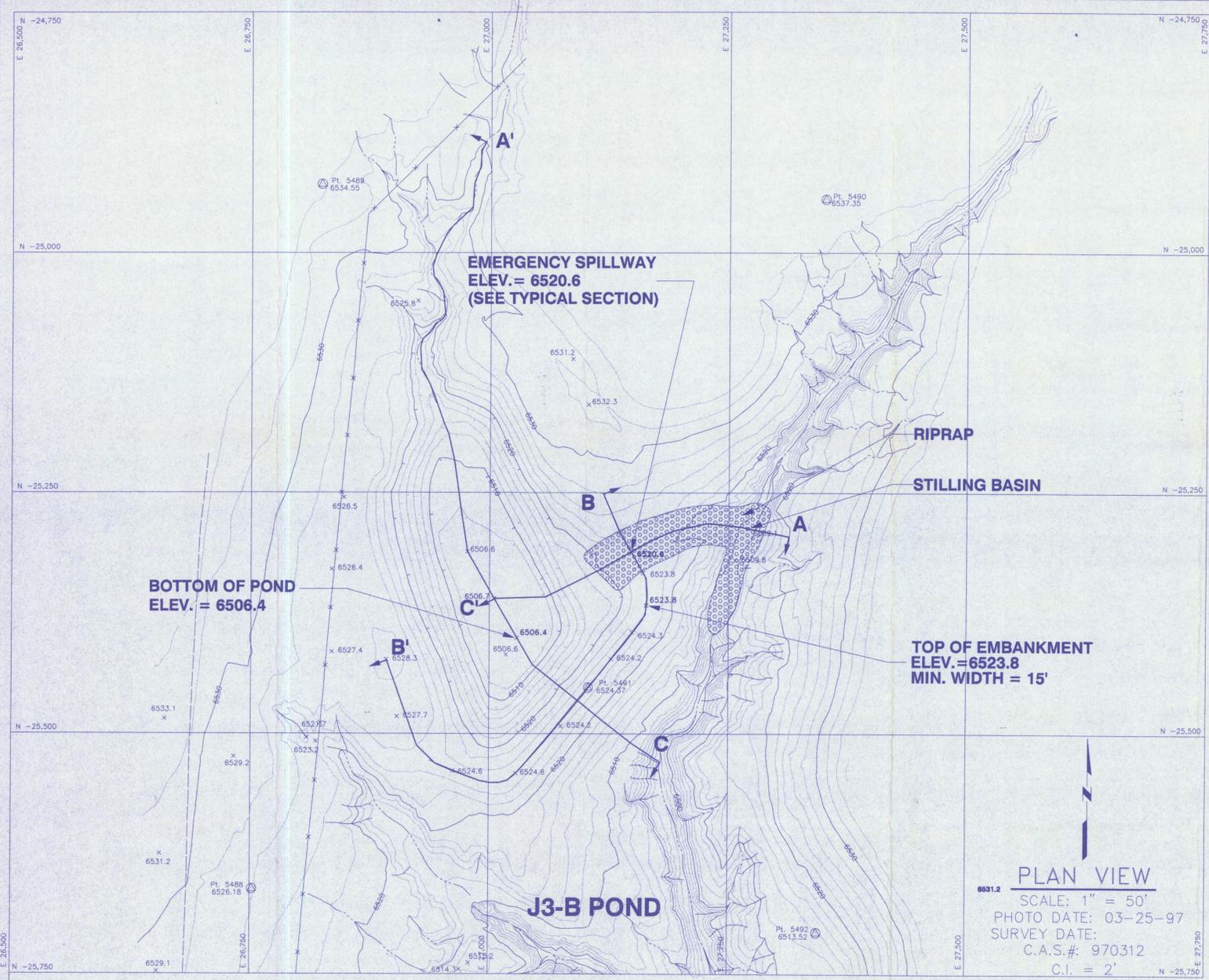


REVISIONS			J3-A POND AS-BUILT	
DATE	CHK'D	DESCRIPTION		

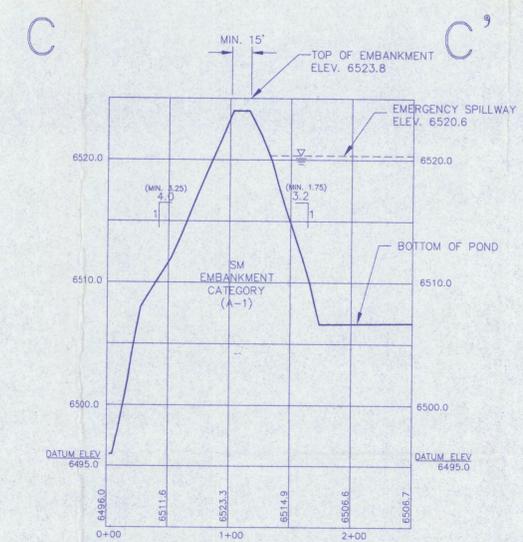
BLACK MESA MINE
PEARBODY WESTERN COAL COMPANY
1300 SOUTH YALE ST. FLAGSTAFF, ARIZONA 86001

DESIGNED BY: PWCC
DRAWN BY: SMM
CHECKED BY: JCS
CONTOUR INT.: 2'

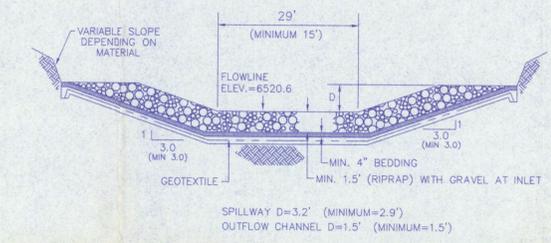
SCALE: AS SHOWN
DRAWING DATE: 06-24-97
PHOTO DATE: 04-26-97
DWG FILE: J3-AAS-1.DWG



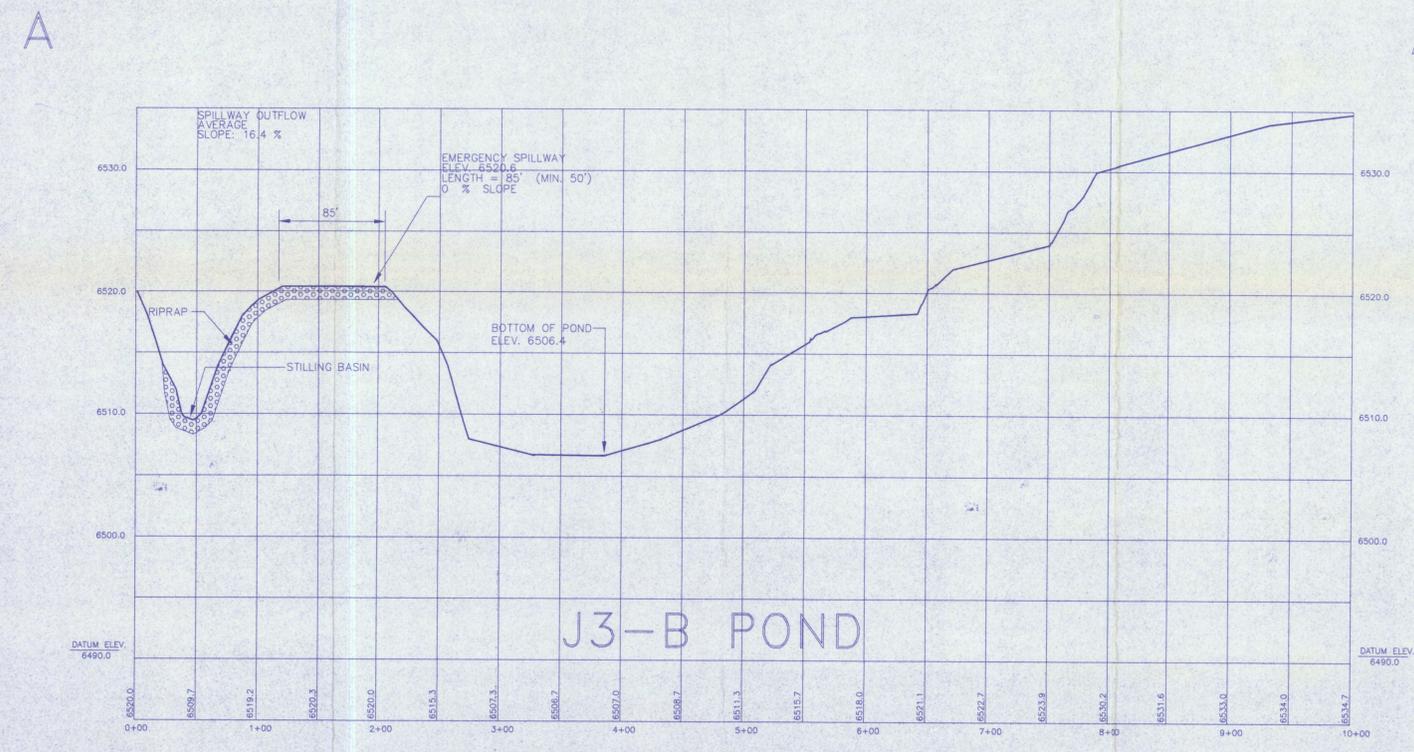
SECTION B - B'
VERTICAL SCALE: 1" = 5'
HORIZONTAL SCALE: 1" = 50'



SECTION C - C'
VERTICAL SCALE: 1" = 5'
HORIZONTAL SCALE: 1" = 50'



J3-B POND
TYPICAL CROSS-SECTION OF EMERGENCY SPILLWAY
NOT TO SCALE



SECTION A - A'
VERTICAL SCALE: 1" = 5'
HORIZONTAL SCALE: 1" = 50'

J3-B POND STAGE-CAPACITY TABLE					
Elevation (ft-msl)	Stage (ft)	Area (Acres)	Capacity (ac-ft)	Total Capacity (ac-ft)	Description
6506.4	0.0	0.00	0.00	0.00	BOTTOM OF POND
6508.0	1.6	0.29	0.23	0.23	
6510.0	3.6	0.43	0.72	0.95	
6512.0	5.6	0.59	1.02	1.97	
6514.0	7.6	0.71	1.30	3.27	
6516.0	9.6	0.84	1.55	4.82	
6518.0	11.6	1.03	1.87	6.69	
6520.0	13.6	1.22	2.25	8.94	
6520.6	14.2	1.29	0.75	9.70	EMERGENCY SPILLWAY
6522.0	15.6	1.43	1.90	11.60	
6523.8	17.4	1.60	2.73	14.33	TOP OF EMBANKMENT

I CERTIFY THAT THIS SILTATION STRUCTURE WAS CONSTRUCTED IN ACCORDANCE WITH THE APPROVED MINING PERMIT AND THAT THE INFORMATION CONTAINED HEREIN ACCURATELY DESCRIBES THE CONSTRUCTED STRUCTURE TO THE BEST OF MY KNOWLEDGE AND BELIEF.



ARIZONA P.E. 18782-1
DATE: JUN 08 1997

REVISIONS			J3-B POND AS-BUILT	
DATE	CHK'D	DESCRIPTION		

BLACK MESA MINE
PEABODY WESTERN COAL COMPANY
1300 SOUTH YALE ST. FLAGSTAFF, ARIZONA 86001

DESIGNED BY: PWCC SCALE: AS SHOWN
DRAWN BY: A.B. DRAWING DATE: 06-9-97
CHECKED BY: JGS PHOTO DATE: 3-26-95
CONTOUR INT.: 2' DWG FILE: J3-BAS-1.DWG

