FORM 28 Rev 6/99

State of Colorado
Oil and Gas Conservation Commission

1120 Lincoln Street, Suite 801, Denver, Colorado 80203 (303) 894-2100 Fax: (303) 894-2109

FOR OGCC USE ONLY

Surety ID: _____

CENTRALIZED E&P WASTE MANAGEMENT FACILITY PERMIT

Submit this Form and accompanying documents for each facility per Rule 908. Financial Assurance in the amount of $50,000 is required to operate each facility.

OGCC Operator Number: 16695
Name of Operator: Chevron Midcontinent, L.P.
Address: 332 Road 3100
City: Aztec State: NM Zip: 87410

Contact Name and Telephone:
Jeff Pickett
No: 505-326-2657
Fax: 505-334-7134

Surface Owner (if different than above): Rowean Crader
Address: 28481 Highway 160
City: Durango State: CO Zip: 81301 Phone: 970-259-6458

Facility Name: Crader Pond Water Treatment Facility
Address: N/A
City: Durango State: CO Zip: 81301
Phone: 505-326-2657 Fax: 505-334-7134

Location (QtrQtr, Sec, Twp, Rng, Mer): SW/NW, 2, 34N,9W, N.M.P.M.
Latitude: 37.23900°
Longitude: 107.83065°

Complete the Attachment Checklist

	Oper	OGCC
Site description (topo, geol, hydro)	✓	
Adjacent land use description	✓	
Topographic map	✓	
Site drainage map with structures	✓	
Scaled drawing and survey map	✓	
Facility design & engineering	✓	
Operating plan	✓	
Water analysis report	✓	
Financial assurance	✓	
Closure plan	✓	
Local gov't zoning compliance	✓	
Local gov't permits and notice	✓	

1. Is the site in a sensitive area? ☐ Y ☑ N

2. What are the average annual precipitation and evaporation rates for the site? Precipitation: 20 inches/year Evaporation: 50 inches/year

3. Has a description of the site's general topography, geology and hydrology been attached? ☑ Y ☐ N

4. Has a description of the adjacent land use been attached? ☑ Y ☐ N

5. Has a 1:24,000 topographic map showing the site location been attached? ☑ Y ☐ N

6. Has a site plan showing drainage patterns, diversion or containment structures, roads, fencing, tanks, pits, buildings and any other pertinent construction details been attached? ☑ Y ☐ N

7. If site is not owned by the operator, is written authorization of the surface owner attached? ☑ Y ☐ N

8. Has a scaled drawing and survey showing the entire section(s) containing the proposed facility been attached? ☑ Y ☐ N

9. What measures have been implemented to limit access to the facilty by wildlife, domestic animals or by members of the public? Briefly explain.

10. Is there a planned firelane of at least 10 feet in width around the active treatment areas and within the perimeter fence? ☑ Y ☐ N

11. Is there an additional buffer zone of at least 10 feet within the perimeter firelane? ☑ Y ☐ N

12. Have surface water diversion structures been constructed to accommodate a 100-year, 24-hour event? ☑ Y ☐ N

13. Has a waste profile been calculated according to Rule 908.b.6? ☑ Y ☐ N

14. Has facility design and engineering been provided as required by Rule 908.b.7? ☑ Y ☐ N

15. Has an operating plan been completed as required by Rule 908.b.8? ☑ Y ☐ N

16. Has ground water monitoring for the site been provided? ☐ Y ☑ N ***Attach Water Analysis Report, Form 25, for each monitoring well installed.***

17. Has financial assurance been provided as required by Rule 704? ☑ Y ☐ N

18. Has a closure plan been provided? ☑ Y ☐ N

19. Have local government requirements for zoning and construction been complied with? ☑ Y ☐ N

20. Have permits and notifications required by local governments and other agencies been provided? ☑ Y ☐ N

Print Name: Teresa Jackson

Signed: Teresa Jackson Title: Regulatory Specialist Date: 5/17/07

OGCC Approved: _____ Title: _____ Date: _____

CONDITIONS OF APPROVAL, IF ANY:

Facility Number:

LIST OF ATTACHMENTS

CRADER POND WATER TREATMENT FACILITY

A	SITE DESCRIPTION
B	DESCRIPTION OF ADJACENT LAND USES
C	TOPOGRAPHIC MAP, SURVEY & FIELD MEASUREMENTS
D	FACILITY DIAGRAM
E	FACILITY DESIGN & ENGINEERING
F	OPERATING PLAN
G	STORED MATERIAL PROFILE
H	FINANCIAL ASSURANCE
I	CLOSURE PLAN
J	LOCAL GOVERNMENT ZONING COMPLIANCE, PERMITS & NOTICE
K	SURFACE OWNER AUTHORIZATION

ATTACHMENT A

SITE DESCRIPTION

CRADER POND WATER TREATMENT FACILITY

The site is located approximately 1.5 miles to the southeast of Durango in La Plata County. The facility was constructed in 1990 as a storage/treatment facility for produced water. The site of Crader Pond contains a sparse cover of vegetation. The site is relatively flat and slopes to the south at an inclination of approximately 10 to 1, horizontal to vertical. The NRCS soil survey states soils present on the site are Arboles clay and Zyme clay loam. Arboles clay is described as a well drained, medium runoff, slow to very slow permeability, soils formed in fine textured slope alluvium derived from shale. Zyme clay loam is described as a well drained, high to very high runoff, slow permeable soil derived from residuum derived from shale. There is also presence of gravel and cobble from Zyme-Rock outcrop underlying the site.

Data reviewed from historical site specific borehole drilling on the site concluded that the subsurface consisted of silty clays with varying amounts of gravel and cobble. The nearest water well is approximately 830 feet to the west of Crader pond. The water table at the site is unknown. Using the water wells in the area as an indication of the water table it is estimated to be between 40-60 feet.

The Crader pond evaporation facility is designed to protect groundwater resources. The pond bottom is lined with 2 feet of reconditioned on site clay soil mixed and compacted to 90% (A.S.T.M. D-698).

ATTACHMENT B

DESCRIPTION OF ADJACENT LAND USES

CRADER POND WATER TREATMENT FACILITY

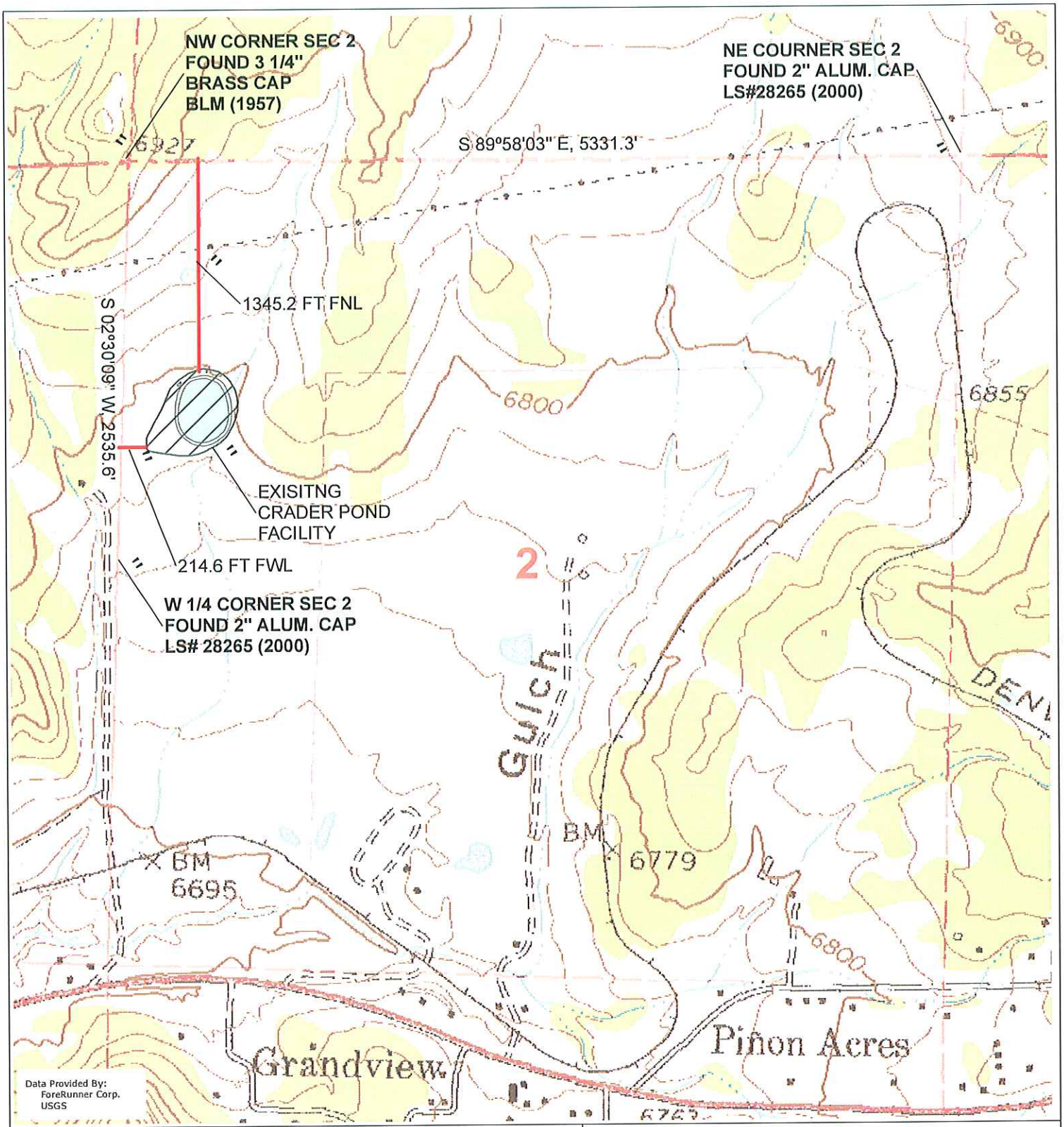
Adjacent land uses include residential, agricultural, industrial, mining and natural gas production. Water evaporation ponds present relatively benign effects in terms of noise, odor, dust and visual impact, therefore it is anticipated that surrounding properties will not experience impacts from this facility. However, mitigation measures will be put into place if any adverse impacts arise.

ATTACHMENT C

TOPOGRAPHIC MAP, SURVEY & FIELD MEASURMENTS

CRADER POND WATER TREATMENT FACILITY

The survey topographic map and the raw field measurements are provided on the following pages.



LEGEND

Existing Pond Facility

This survey was performed in accordance with COGCC standards for permitting and construction. This data is provided without warranty either expressed or implied as to suitability for any purpose other than its original intent.

CRADER POND

SOUTHEAST DURANGO
T34N, R9W, SEC. 2, N.M.P.M.
LA PLATA COUNTY, COLORADO

FORERUNNER CORPORATION
211 ROCKPOINT DRIVE, SUITE 101
DURANGO, CO 81301
970-375-7707

3

TOPOGRAPHIC MAP

State Plane: NAD83 Colorado South

1:10,000

0 0.09 0.18 Miles

LAT: 37.23900° N LONG: 107.83065° W

PROJ. NO.	MAP FILE	
12142-A	CRADER_POND_AS-BUILT	
DRAWN BY	DATE	CLIENT
CS	03/06/07	KH

Chevron

CRADER_POND

This survey was performed in accordance with COGCC standards
for permitting and construction.
This data is provided without warranty either
expressed or implied as to suitability for any
purpose other than its original intent.

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CRADER_POND

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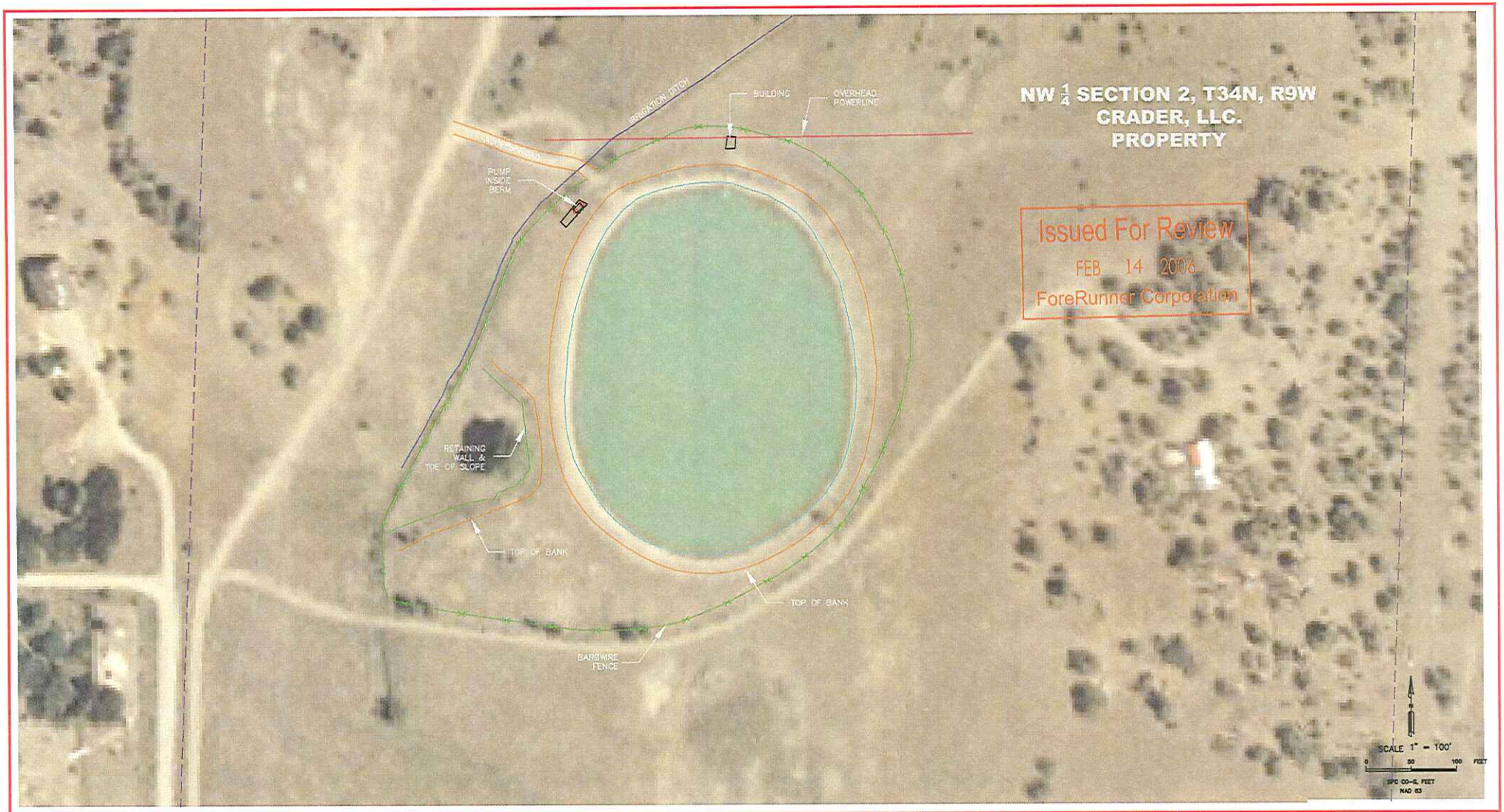
ATTACHMENT D

FACILITY DIAGRAM

CRADER POND WATER TREATMENT FACILITY



LEGEND:

PARCELS		ACCESS ROAD	
EXISTING PIPELINES		EXISTING WELLHEAD	
HYDRO		PIPELINE R.O.W.	

FORERUNNER CORPORATION
211 Rockpoint Drive, #101
Durango, Colorado 81301
(970) 375-1267

REV	BY	DATE	REVISION	CONTR. CHKD	CONTR. APPRD	DATE	CLIENT CHKD	CLIENT APPRD	DATE
LET	BY	DATE	DESCRIPTION	CHKD	APP	DATE			

Chevron

CRADER POND AS-BUILT SITE PLAN

LA PLATA COUNTY, NM

DRAWN/DATE	SCALE	PROJ. NO.	DWG. NO.	REV.
2/14/07	AS NOTED	12088-A	CRADER_POND-SITE	A

DESIGN BY: CS | CHECKED: ENGINEER | FILE: CRADERPOND.CSV | CDW NO.:

ATTACHMENT E

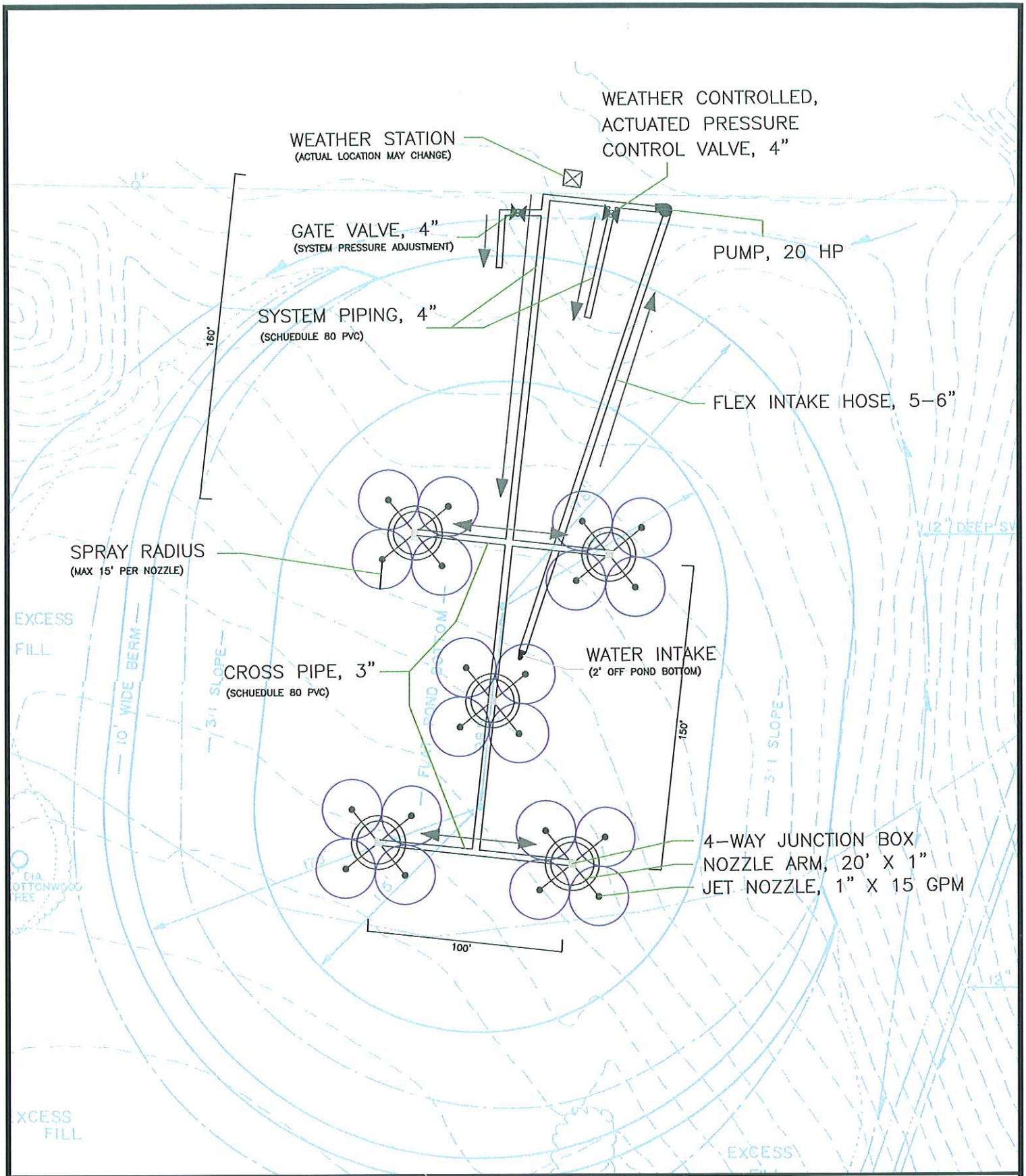
FACILITY DESIGN & ENGINEERING

CRADER POND WATER TREATMENT FACILITY

The current Crader Pond facility was permitted in 1990. The pond was constructed to act as a storage and evaporation pit for produced water from natural gas operations (see Construction Plans and the Geotechnical Engineering Study for the existing site in this attachment). Chevron is proposing to add 20-1 inch spray nozzles over the current facility to enhance the evaporation process (see engineering specifications for nozzles in this attachment).

The upgraded facility will recycle stored water through the nozzle scheme at a rate of 300 gallons per minute. Each nozzle will produce a spray pattern equal to, or less than, 30 feet in diameter and 7 feet in height. The estimated pressure at each nozzle during peak operation is estimated at 7 pounds per square inch. The nozzles will be arranged in 5 clusters, of 4 nozzles each, on floating pontoons (see the Site Design Map in this attachment).

The system will be driven by a 20 horsepower electric pump. A wind-actuated control valve will be installed to decrease pressure to the nozzles to minimize wind drift. An automatic high level shut off valve will be installed to insure that a minimum of two feet of freeboard will be maintained at all times. The facility will be electrified to power all proposed equipment.



LEGEND

- NOZZLE LOCATION AND SPRAY AREA (MAX RADIUS=15')
- WATER FLOW DIRECTION
- FLOATING SUPPORT STRUCTURE
- ORIGINAL CONSTRUCTION PLAN LINES

SITE LEGAL LOCATION:
SW NW SECTION 2
TOWNSHIP 34N, RANGE 9W NMPM

N

FIGURE 1
SITE DESIGN MAP
CRADER EVAPORATION POND
CHEVRON
LA PLATA COUNTY, COLORADO

REVISION DATE:	08/15/06
REVISION NUMBER:	002
DRAWN BY:	KLK
APPROVED BY:	STN
PROJECT #	E06265
SCALE:	1"=60'

CORDILLERAN

WhirlJet® Spray Nozzles • Standard Spray

Medium Capacity

C | CX | CRC

One-piece cast-type
3/4" NPT or BSPT (F)

One-piece cast-type/
slope-bottom design
1"-2-1/2" NPT or BSPT (F)

Two-piece cast-type
1-1/4"-3" NPT or BSPT (F)

DESIGN FEATURES

Standard one-piece cast-type WhirlJet spray nozzles feature a hollow cone spray pattern with a ring-shaped impact area and spray angles of 59° to 84°.

They produce a uniform distribution of medium- to large-sized drops over a wide range of pressures and flow rates.

These WhirlJet nozzles produce finer atomization than other types of nozzles operating at the same flow rate and pressure, making them effective for quick heat transfer or effective airborne droplet impingement.

- **Model CX** slope-bottom WhirlJet nozzles feature the same uniform spray performance as the C Series, plus the added advantage of the patented, longer-life slope-bottom design to reduce the "drilling effect" of the liquid vortex in the whirlchamber.
- **Model CRC** two-piece WhirlJet spray nozzles feature a hollow cone spray pattern with a ring-shaped impact area. They are available in two spray angle series: narrow angle 45° to 52°, and standard angle 60° to 86°.

ACCESSORIES

- Adjustable Ball Fittings
- Split-eyelet Connector with Pressure Gauge
- Junction Box

See Section L for more info.

COMMON APPLICATIONS

- Evaporative cooling in spray ponds and cooling towers
- Aerating
- Wetting
- Evaporative concentration of wastewater
- Chemical processes

MATERIALS

Material	Material Code	Nozzle Type		
		C	CX	CRC
Cast				
Brass	(none)	•	•	•
316 Stainless Steel	SS	•	•	•
Cast Iron	I	•	•	•

Other materials available upon request.

WhirlJet® Spray Nozzles • Standard Spray
Medium Capacity

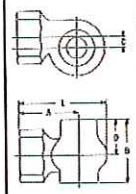
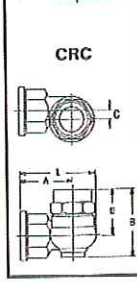
PERFORMANCE DATA

C, CX

Nozzle Inlet Conn. NPT or BSPT	Nozzle Type Conn. F C	Nozzle Type Conn. F CX	Capacity Size	Inlet Dia. Nom.	Orifice Dia. Nom.	Capacity (gallons per minute) 3 psi	4 psi	5 psi	7 psi	10 psi	15 psi	20 psi	30 psi	40 psi	60 psi	80 psi	100 psi	Spray Angle 7 psi	20 psi	60 psi
3/4	●		5	.594"	.391"	3.3	3.8	4.2	5.0	6.0	7.3	8.4	10.4	11.9	14.6	16.9	18.9	59°	61°	63°
	●		6	.594"	.453"	3.9	4.5	5.1	6.0	7.2	8.8	10.2	12.4	14.3	17.5	20	23	62°	64°	66°
	●		7	.594"	.500"	4.6	5.3	5.9	7.0	8.4	10.3	11.9	14.5	16.7	21	24	26	70°	71°	72°
	●		10	.594"	.656"	6.5	7.6	8.4	10.0	11.9	14.6	16.9	21	24	29	34	38	73°	75°	77°
1		●	7	.688"	.453"	4.6	5.3	5.9	7.0	8.4	10.3	11.9	14.5	16.7	21	24	26	64°	65°	66°
		●	8	.688"	.500"	5.2	6.0	6.8	8.0	9.6	11.7	13.5	16.5	19.1	23	27	30	65°	66°	67°
		●	9	.688"	.563"	5.9	6.8	7.6	9.0	10.8	13.2	15.2	18.6	22	26	30	34	66°	67°	69°
		●	10	.688"	.609"	6.5	7.6	8.4	10.0	11.9	14.6	16.9	21	24	29	34	38	67°	69°	71°
		●	12	.688"	.672"	7.8	9.1	10.2	12.0	14.3	17.5	20	25	29	35	41	45	70°	73°	75°
		●	15	.688"	.813"	9.8	11.3	12.7	15.0	17.9	22	25	31	36	44	51	57	76°	79°	81°
1-1/4		●	10	.844"	.563"	6.5	7.6	8.4	10.0	11.9	14.6	16.9	21	24	29	34	38	65°	67°	67°
		●	12	.844"	.641"	7.8	9.1	10.2	12.0	14.3	17.5	20	25	29	35	41	45	68°	70°	71°
		●	14	.844"	.719"	9.2	10.6	11.8	14.0	16.7	21	24	29	34	41	47	53	71°	73°	75°
		●	16	.844"	.797"	10.5	12.1	13.5	16.0	19.1	23	27	33	38	47	54	60	74°	75°	77°
		●	20	.844"	.953"	13.1	15.1	16.9	20	24	29	34	41	48	59	68	76	76°	77°	79°
1-1/2		●	16	1.094"	.688"	10.5	12.1	13.5	16.0	19.1	23	27	33	38	47	54	60	64°	67°	69°
		●	20	1.094"	.859"	13.1	15.1	16.9	20	24	29	34	41	48	59	68	76	69°	72°	74°
		●	25	1.094"	1.016"	16.4	18.9	21	25	30	37	42	52	60	73	85	95	72°	74°	76°
		●	30	1.094"	1.125"	20	23	25	30	36	44	51	62	72	88	101	113	74°	76°	78°
2		●	30	1.438"	.938"	20	23	25	30	36	44	51	62	72	88	101	113	66°	67°	70°
		●	35	1.438"	1.063"	23	26	30	35	42	51	59	72	84	103	118	132	68°	70°	73°
		●	40	1.438"	1.188"	26	30	34	40	48	59	68	83	96	117	135	151	70°	72°	75°
		●	45	1.438"	1.297"	29	34	38	45	54	66	76	93	108	132	152	170	72°	74°	78°
		●	50	1.438"	1.422"	33	38	42	50	60	73	84	104	119	146	169	189	74°	77°	82°
		●	60	1.438"	1.563"	39	45	51	60	72	88	102	124	143	175	203	227	77°	79°	84°
2-1/2		●	60	1.875"	1.422"	39	45	51	60	72	88	102	124	143	175	203	227	67°	68°	71°
		●	70	1.875"	1.594"	46	53	59	70	84	103	119	145	167	205	237	264	69°	71°	74°
		●	80	1.875"	1.734"	52	60	68	80	96	117	135	165	191	234	270	302	71°	73°	77°
		●	90	1.875"	1.875"	59	68	76	90	108	132	152	186	215	264	304	340	73°	75°	80°
		●	100	1.875"	2.000"	65	76	84	100	120	146	169	207	239	293	338	378	77°	79°	83°

WhirlJet® Spray Nozzles • Standard Spray
Medium Capacity

DIMENSIONS & WEIGHTS

C, CX / CRC	Nozzle Type (Conn.)	Nozzle Inlet Conn. NPT or BSPT	A	B	C	D	L	Net Weight
	C (F)	3/4	1-1/2"	1-21/32"	19/64"	29/32"	2-9/32"	7 oz.
	CX (F)	1	1-3/4"	1-27/32"	11/32"	1-1/32"	2-5/8"	11 oz.
		1-1/4	2-1/16"	2-3/16"	7/16"	1-1/4"	3-1/16"	1.25 lbs.
		1-1/2	2-7/16"	2-7/8"	9/16"	1-21/32"	3-11/16"	1.75 lbs.
		2	2-15/16"	3-11/16"	23/32"	2-3/32"	4-17/32"	3 lbs.
		2-1/2	3-1/2"	4-1/2"	15/16"	2-11/16"	5-17/32"	4.25 lbs.
	CRC (F)	1-1/4	2-1/8"	3-1/16"	13/32"	2-3/32"	3-13/32"	2.25 lbs.
		2	3-3/16"	4-21/32"	23/32"	3-1/16"	4-27/32"	5 lbs.
		3	4-7/16"	8-13/32"	1-1/8"	5-15/16"	6-15/16"	19 lbs.

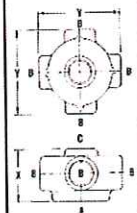
Based on largest/heaviest version of each type.

ORDERING INFO

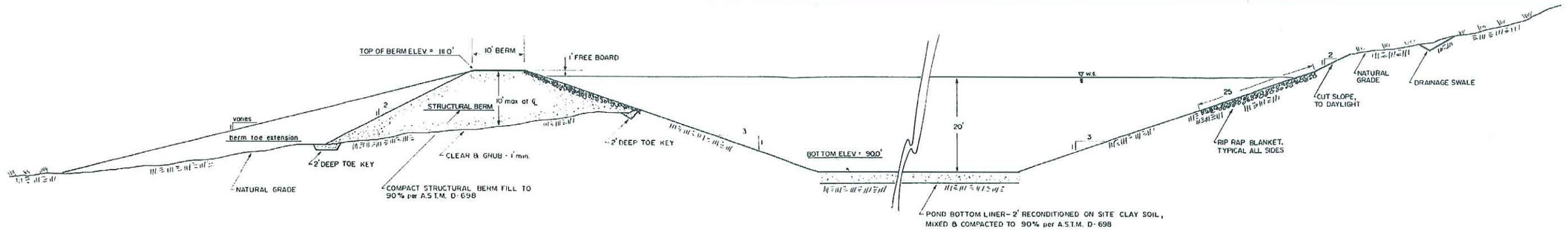
STANDARD SPRAY NOZZLE

3/4	C	–	SS	10
Inlet Conn.	Nozzle Type		Material Code	Capacity Size

2	CRC	–	SS	30-45
Inlet Conn.	Nozzle Type		Material Code	Capacity Size

JUNCTION BOX	WhirlJet Nozzle Type	Junction Box Information								Pipe Arms**	
		Junction Box No.	"A" Inlet Conn. NPT or BSPT	Nozzles Per Junction Box	"B" Outlet Conn. NPT or BSPT	"C" Outlet Conn. NPT or BSPT	X Overall Height	Y Overall Width	Net Weight	No. of Pipe Arms**	Size of Pipe Arms
	3/4C	25(1-1/2-4-3/4)	1-1/2"	4	3/4"	None	3-5/16"	4-1/8"	5-1/2 lbs.	4	3/4"
	3/4C	25(1-1/2-5-3/4)	1-1/2"	5	3/4"	3/4"	3-5/16"	4-1/8"	5-1/2 lbs.	4	3/4"
	1CX	25(2-4-1)	2"	4	1"	None	3-5/16"	4-1/8"	5-1/2 lbs.	4	1"
	1-1/4CX	25(2-4-1-1/4)	2"	4	1-1/4"	None	3-5/16"	4-1/8"	5-1/2 lbs.	4	1-1/4"
	1-1/2CX	25(2-4-1-1/2)	2"	4	1-1/2"	None	3-5/16"	4-1/8"	5-1/2 lbs.	4	1-1/2"
	3/4C	28(2-8-3/4)*	2"	8	3/4"	None	3-1/2"	4-1/2"	8-1/2 lbs.	8	3/4"
	3/4C	29(1-1/2-8-3/4)*	1-1/2"	8	3/4"	None	3-7/8"	4-1/2"	8 lbs.	8	3/4"
	3/4C	29(1-1/2-9-3/4)*	1-1/2"	9	3/4"	3/4"	3-7/8"	4-1/2"	8 lbs.	8	3/4"
	3/4C	29(2-9-3/4)*	2"	9	3/4"	3/4"	3-7/8"	4-1/2"	8 lbs.	8	3/4"
	1-1/2CX	35(3-4-1-1/2)	3"	4	1-1/2"	None	4-1/4"	5-1/2"	8 lbs.	4	1-1/2"
	1-1/2CX	35(3-5-1-1/2)	3"	5	1-1/2"	1-1/2"	4-1/4"	5-1/2"	8 lbs.	4	1-1/2"
	2CX	45(4-4-2)	4"	4	2"	None	5"	6-3/4"	12 lbs.	4	2"
	2CX	45(4-5-2)	4"	5	2"	2"	5"	6-3/4"	12 lbs.	4	2"
	2-1/2CX	65(5-4-2-1/2)	5"	4	2-1/2"	None	6-5/8"	9-1/2"	35 lbs.	4	2-1/2"
	2-1/2CX	65(5-5-2-1/2)	5"	5	2-1/2"	2-1/2"	6-5/8"	9-1/2"	35 lbs.	4	2-1/2"
	2-1/2CX	65(6-4-2-1/2)	6"	4	2-1/2"	None	6-5/8"	9-1/2"	35 lbs.	4	2-1/2"
	2-1/2CX	65(6-5-2-1/2)	6"	5	2-1/2"	2-1/2"	6-5/8"	9-1/2"	35 lbs.	4	2-1/2"
	3CRC	65(6-5-3)	6"	5	3"	3"	6-5/8"	9-1/2"	35 lbs.	4	3"
	4CRC	85(8-4-4)	8"	4	4"	None	7-3/4"	11-1/2"	48 lbs.	4	4"
	4CRC	85(8-5-4)	8"	5	4"	4"	7-3/4"	11-1/2"	48 lbs.	4	4"

* Junction Boxes #28 and #29 have eight side outlets -- all others have four.
** Pipe Arms to be supplied by customer.



TYPICAL SECTION

SCALE 1" = 10'

CONSTRUCTION NOTES

DRAIN POND TO THE SOUTH PRIOR TO FILL CONSTRUCTION

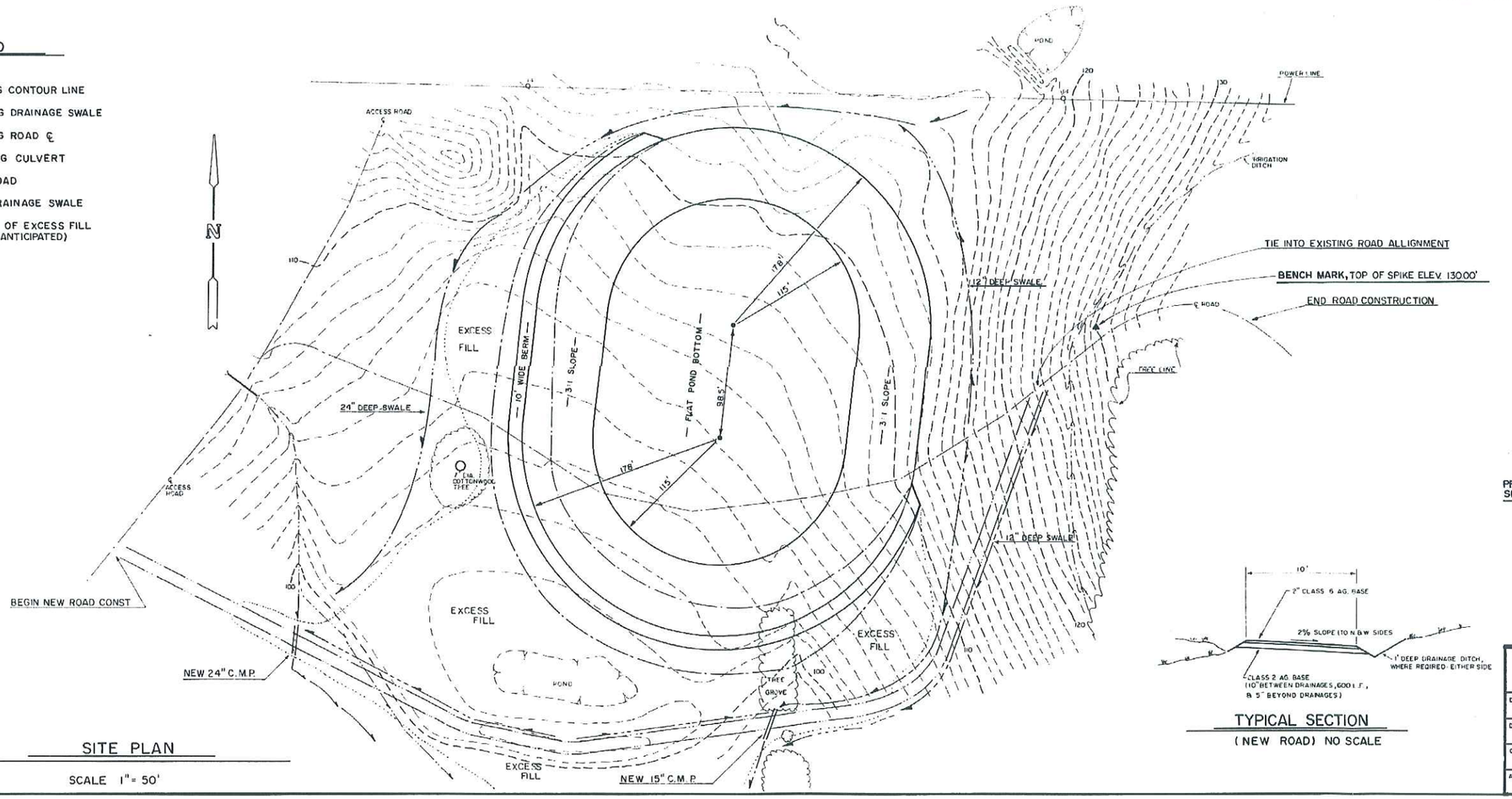
NEW ROAD TO BE LOCATED OVER OLD POND BERM

ROAD SUBGRADE, SUBBASE & BASE TO BE COMPACTED TO 95% PER A.S.T.M. D-698

NEW WOOD RAIL FENCE, LIVESTOCK TIGHT (HORSE & CATTLE), TO BE CONSTRUCTED AROUND POND & FILL NORTH OF NEW ROAD. CONTRACTOR TO SUBMIT DETAIL OF PROPOSED FENCE TYPE FOR ENGINEER APPROVAL PRIOR TO CONST.

LEGEND

- EXISTING CONTOUR LINE
- EXISTING DRAINAGE SWALE
- EXISTING ROAD ℄
- EXISTING CULVERT
- NEW ROAD
- NEW DRAINAGE SWALE
- LIMITS OF EXCESS FILL (ANTICIPATED)

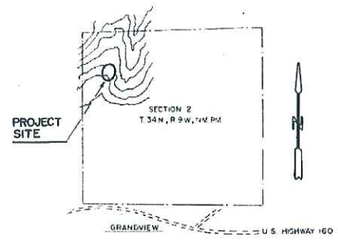


SITE PLAN

SCALE 1" = 50'

TYPICAL SECTION

(NEW ROAD) NO SCALE



VICINITY MAP

SCALE 1" = 2,000'

MICHAEL C. WHITNEY, P.E.
General Civil and Geotechnical Engineering
178 Bodo Drive, Suite B, Durango, Colorado 81301

DRAWN BY: M. W.	CONSTRUCTION PLANS FOR CRADER EVAPORATION POND	
DESIGNED BY: M.W.		SCALE: AS SHOWN
CHECKED BY:	PREPARED FOR BOWEN-EDWARDS ASSOCIATES LA PLATA COUNTY, COLORADO	DATE: 10-8-90
APPROVED BY:		SHEET No. 1 OF 1

Lambert and Associates

CONSULTING GEOTECHNICAL ENGINEERS AND MATERIAL TESTING

GEOTECHNICAL ENGINEERING STUDY

PROPOSED CRADER EVAPORATION POND

LAPLATA COUNTY, COLORADO

Prepared for:

BOWEN-EDWARDS ASSOCIATES

PROJECT NUMBER: D9Ø1Ø5GE

September 6, 199Ø

P.O. BOX 3986
GRAND JUNCTION, CO 81502
(303) 245-6506

P.O. BOX 0045
MONTROSE, CO 81402
(303) 249-2154

463 TURNER, 104 A
DURANGO, CO 81301
(303) 259-5095

TABLE OF CONTENTS

TABLE OF CONTENTS
Page Two

1.0 INTRODUCTION

This report presents the results of the geotechnical engineering study we conducted for the proposed Crader Evaporation Pond. The study was conducted at the request of Mr. Mike Bowen, Bowen-Edwards Associates.

The conclusions, suggestions and recommendations presented in this report are based on the data gathered during our site and laboratory study and on our experience with similar soil conditions. Factual data gathered during the field and laboratory work are summarized in Appendices A and B.

1.1 Proposed Construction

It is our understanding that the proposed evaporation pond will cover about three (3) acres. The embankment for the pond will be constructed by excavating material from the pond area and constructing the embankment with excavated material. The embankment height will be as high as practicable with the interior embankment height up to about twenty (20) feet high. It is our understanding that you desire to limit the seepage losses as much as possible.

1.2 Scope of Services

Our services included geotechnical engineering field and laboratory studies, and analysis and report preparation for the proposed site. The scope of our services is outlined below.

- The field study consisted of describing and sampling the soils encountered in six (6) auger advanced test borings at the proposed pond locations.

- The field study included performing percolation tests in three (3) of the test borings.

- The soils encountered in the borings were described and samples retrieved for the subsequent laboratory study.

- The laboratory study included tests of select soil samples obtained during the field study to help assess the strength potential and the remolded permeability of the soils tested. Chemical tests were performed to help identify the dispersive clay potential of the soils tested.

- This report presents our geotechnical engineering suggestions and recommendations for planning and design of site development including:

  . Site and subsurface conditions at the proposed pond area,
  . Embankment stability and configuration considerations,
  . Seepage loss considerations, and
  . Earthwork suggestions and recommendations or the construction of the embankment.

2.0 SITE CHARACTERISTICS

Site characteristics include observed existing and pre-existing site conditions that may influence the geotechnical engineering aspects of the proposed site development.

2.1 Site Location

The proposed evaporation pond is located about one and one half (1 1/2) miles east of Durango, Colorado in LaPlata County A project vicinity map is shown on Figure 1.

2.2 Site Conditions

At the time of the field study the site contained a sparse cover of native vegetation. The site slopes down to the south at an inclination of about 10 to 1 (horizontal to vertical). An access road is located south of the proposed site. a small berm of an old stockpond is located in the southwest portion of the site. A large cottonwood tree which will be left after construction is located near the existing berm.

2.3 Subsurface Conditions

The subsurface exploration consisted of observing, describing and sampling the soils encountered in six (6) auger advanced test borings and performing percolation tests. The approximate locations of the test borings are shown on Figure 2. The logs describing the soils encountered in the test borings are presented in Appendix A.

The soils encountered in the test borings consisted generally of silty clay with varying amounts of gravel and cobbles.

No formational material was encountered in the test borings to a depth of twenty four (24) feet, the maximum depth explored.

No free subsurface water was encountered in the test borings at the time of our field study.

3.0 EMBANKMENT SLOPE STABILITY

The stability of any slope is dependent on many factors. Typically the stability of a slope is analyzed by calculating the anticipated gravitational forces that tend to drive the mass of soil downhill and the anticipated internal strength of the soil along the expected plane of failure that will resist the downhill movements. If the driving forces are greater than the resisting forces then failure is imminent. Failure can occur as slow deformation, creep, or somewhat spontaneous failure.

Factors that decrease the stability of a slope can generally be classified as those that increase the stress (driving force) on the system or decrease the strength (resisting force) of the soil. Factors that increase the stress may be increased soil weight by wetting of loading or steepening the face of the slope. Factors that decrease the strength of the soil may be increased moisture content of the soil and loosening of the slope soils by weathering and freeze/thaw cycles.

Our analysis of the embankment slopes was based on "Effect of Soil Strength Parameters on Stability of Man-Made Slopes" by Awtar Singh and The Bishops Method of Slices. The soil strength characteristics used in our stability analysis were an internal angle of friction of 5 degrees, a cohesion of 700 pounds per square foot and a moist soil density of 115 pounds per square foot.

3.1 Slope Configuration

Our analysis of the exterior slope was based on the assumed strength characteristics noted above of the soils likely to be used for the embankment material. Our analysis indicates that an exterior slope inclination of 2 to 1 may be used for slope heights up to a maximum of twenty (20) feet.

Our analysis of the interior slope was based on the assumed soil strength characteristics of the soils likely to be used as the embankment materials. Our analysis indicated an interior slope inclination of 3 to 1 may be used for slope heights up to a maximum of twenty (20) feet.

We suggest that you consider protecting the interior slope from erosion by wave or water acting on the slope either by placing a protective cover of geotextile material or rip rap material. The protective cover should extend beyond the limits of water level fluctuation plus some additional margin. The embankment should have a minimum crest width of at least ten (10) feet. The crest width may be wider if necessary to accommodate construction or maintenance traffic. The embankment configuration concept is presented on Figure 3.

4.0 SEEPAGE

Percolation tests were performed as requested by Mr. Bowen in three (3) of the test borings. The results of the percolation tests are presented in Appendix A. Often a heterogeneous (non-

uniform) soil has anisotropic characteristics, such as the permeability may vary significantly between the vertical and horizontal direction. We anticipate that the site soils may have higher permeability than a homogeneous (uniform) mixture of the site soils. Our laboratory test program included a permeability test of remolded soil material obtained during our field study. The laboratory permeability tests indicated a remolded permeability of the material tested of 6.8×10^{-8} cm/sec.

It may be possible to reduce the seepage from the bottom of the pond by constructing a liner. The liner may be constructed by reconditioning the on-site soils by scarifying, moisture conditioning, mixing and recompacting. The mixing, conditioning and recompacting is an attempt to mask over areas where the permeability may be greater by interrupting the indigenous fabric of the on-site soils. The thickness of the liner will depend on the magnitude of seepage loss tolerable or desired. The anticipated seepage loss, based on thickness of liner, water elevation, and permeability of the liner are presented on Figures 4 and 5. Figure 4 presents our estimated theoretical seepage rate after steady state condition has been reached. Figure 5 presents our estimated theoretical time for steady state seepage to occur. The seepage estimates are based on a maximum permeability of the remolded liner material of 6.8×10^{-8} cm/sec. The actual permeability of the proposed liner material should be verified by tests during construction. It may be necessary to

add bentonite or similar clay type amendment to the liner material to reduce the permeability to the value used in our seepage estimates.

If the pond liner, constructed using on-site soil or on-site soil plus bentonite mix, does not provide the desired restriction of seepage losses it may be necessary to line the pond with an impervious geotextile fabric. The fabric should be installed in accordance with the manufactures recommendations We are available to discuss this option with you.

5.0 FOUNDATION AND EARTHWORK

The foundation area of the embankment should be cleared of all vegetable, organic or deleterious material prior to placement of the embankment fill. The clearing operations should extend beyond each edge of the proposed embankment a distance sufficient to insure that the embankment fill is not placed on any deleterious material or at least five (5) feet, whichever is greater. This concept is shown on Figure 6. The soil exposed in the clearing operations should be moisture conditioned, mixed and proof-rolled prior to the placement of the embankment fill. Any loose, low density or pumping areas exposed during the proof-rolling operations should be removed and replaced with compacted embankment fill. We should be called to observe the soils exposed during the clearing operations to verify the foundation

conditions. Suggested guide specifications for placement of compacted fill are provided in Appendix C.

The soil moisture content for compacting the embankment material should range from about optimum to about two (2) to four (4) percent wetter than the optimum moisture content as defined by ASTM D698, Standard Proctor. The proposed embankment material should contain no rocks larger than about six (6) inches. The material should be placed in thin lifts of about six (6) to eight (8) inches maximum thickness, moisture conditioned to the proper moisture content and compacted to at least 95 percent of the maximum dry density as defined by ASTM D698, Standard Proctor. The compaction should be performed using a kneeding type compactor, such as a sheepsfoot roller. The kneeding compaction will help develop a soil structure which is more flexible and less permeable.

If it is desired to begin construction on the embankment during late fall, winter or early spring, it should be noted that freezing of the last lift of the previous day's work is likely. If this is the case, it will be necessary to protect that area of the on-going work from freezing or removing the frozen material prior to the onset of the next day's work. It may be helpful to stockpile dry material and place a loose lift of this dry material to protect the placed and compacted fill from frost. The material may be removed the next morning and returned to stockpile for future use. If the material should be moistened,

by either rain or snow, the material should be stored separately from the dry stockpile material.

5.1 Dispersive Clays

Some clays are dispersive, that is, they erode rapidly when exposed to fresh water. Dispersive clays have a higher content of dissolved sodium in the pore water than ordinary clay soils. They erode by a process in which the individual collidal clay particles go into suspension in practically still water, whereas the erosion process for ordinary clays requires considerable velocity in the eroding water.

The potential for dispersive soils can be somewhat anticipated by testing for dissolved salts in the soil material. The soil materials proposed for the embankment were tested for dissolved salts. The test results are presented on Figure 7 and in Appendix B. Based on "Identification and Nature of Dispersive Soils" by James L. Sherard, Lorn P. Dunnigan, and Rey S. Decker presented in the Journal of the Geotechnical Engineering Division, American Society of Civil Engineers, dated April 1976, the test results indicate that the soils fall into Zone B. Typically, Zone B soils are considered non-dispersive. For this reason, we did not conduct additional tests for the dispersive characteristics of the soils. Based on the test results it is our opinion that the dispersive potential of the soil samples tested is low.

6.0 EMBANKMENT - SUMMARY OF GENERAL CONFIGURATION

The embankment may be constructed with an exterior slope inclination no steeper than 2 to 1 (horizontal to vertical) and an interior slope inclination no steeper than 3 to 1 for a maximum embankment height of twenty (20) feet. The embankment should be constructed with a crest width of at least ten (10) feet. The embankment configuration concept is shown on Figure 3. It may be necessary to construct a pond lining to help reduce the seepage losses from the pond bottom.

7.0 POST DESIGN CONSIDERATIONS

It is our opinion that the proposed embankment is geotechnically feasible to develop if the recommendations presented in this report are followed. We suggest that you consider a representative from our office be present full time during the earthwork operations for geotechnical observations and testing and to correctly interpret the intent of the recommendations presented in this report. We suggest that the geotechnical engineering observation and material testing be the responsibility of the owner, not the contractor, to maintain third party credibility.

This subsoil and foundation study is based on limited sampling, therefore it is necessary to assume that the subsurface conditions do not vary greatly from those encountered in the test borings. Our experience has shown that significant variations

are likely to exist and can become apparent only during additional on-site excavation. For this reason, and because of our familiarity with the project, Lambert and Associates should be retained to observe foundation excavations prior to foundation construction, to observe the geotechnical engineering aspects of the construction, and to be available in the event any unusual or unexpected conditions are encountered. The cost of the geotechnical engineering observations and testing during construction or additional engineering consultation is not included in the fee for this report. We recommend that your construction budget include site visits early during construction for the project geotechnical engineer to observe foundation excavations and for additional site visits to test compacted soil.

It is difficult to predict if unexpected subsurface conditions will be encountered during construction. Since such conditions may be found we suggest that the owner and the contractor make provisions in their budget and construction schedule to accommodate unexpected subsurface conditions.

8.0 LIMITATIONS

It is the owner's and the owner's representatives responsibility to read this report and become familiar with the recommendations and suggestions presented. We should be contacted if any questions arise concerning the geotechnical

engineering aspects of this project as a result of the information presented in this report.

The recommendations outlined above are based on our understanding of the currently proposed construction. We are available to discuss the details of our recommendations with you, and revise them where necessary. This geotechnical engineering report is based on the proposed site development and scope of services as provided to us by Mr. Mike Bowen, on the type of construction planned, existing site conditions at the time of the field study, and on our findings. Should the planned, proposed use of the site be altered, Lambert and Associates must be contacted, since any such changes may make our suggestions and recommendations given inappropriate. This report should be used ONLY for the planned development for which this report was tailored and prepared, and ONLY to meet information needs of the owner and the owner's representatives. In the event that any changes in the future, design or location of the building are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and conclusions of this report are modified or verified in writing. It is recommended that the geotechnical engineer be provided the opportunity for a general review of the final project design and specifications in order that the earthwork and foundation recommendations may be properly interpreted and implemented in the design and specifications.

This report presents both suggestions and recommendations. The suggestions are presented so that the owner and the owner's representatives may compare the cost to the potential risk or benefit for the suggested procedures.

We represent that our services were performed within the limits prescribed by you and with the usual thoroughness and competence of the current accepted practice of the geotechnical engineering profession in the area. No warranty or representation either expressed or implied is included or intended in this report or our contract. We are available to discuss our findings with you. If you have any questions please contact us. The supporting data for this report is included in the accompanying figures and appendices.

This report is a product of Lambert and Associates. Excerpts from this report used in other documents may not convey the intent or proper concepts when taken out of context or they may be misinterpreted or used incorrectly. Reproduction, in part or whole, of this document without prior written consent of Lambert and Associates is prohibited.

We have enclosed a copy of a brief discussion about geotechnical reports published by Association of Soil and Foundation Engineers for your reference.

Please call when further consultation or observations and tests are required.

If you have any questions concerning this report or if we may be of further assistance, please contact us.

Respectfully submitted;

LAMBERT AND ASSOCIATES

Norman W. Johnston, P. E.
Manager Geotechnical Engineer

Reviewed by:

Dennis D. Lambert, P. E.
Principal Geotechnical Engineer

NWJ/nr

IMPORTANT INFORMATION
ABOUT YOUR
GEOTECHNICAL ENGINEERING REPORT

More construction problems are caused by site subsurface conditions than any other factor. As troublesome as subsurface problems can be, their frequency and extent have been lessened considerably in recent years, due in large measure to programs and publications of ASFE/ The Association of Engineering Firms Practicing in the Geosciences.

The following suggestions and observations are offered to help you reduce the geotechnical-related delays, cost-overruns and other costly headaches that can occur during a construction project.

A GEOTECHNICAL ENGINEERING REPORT IS BASED ON A UNIQUE SET OF PROJECT-SPECIFIC FACTORS

A geotechnical engineering report is based on a subsurface exploration plan designed to incorporate a unique set of project-specific factors. These typically include: the general nature of the structure involved, its size and configuration; the location of the structure on the site and its orientation; physical concomitants such as access roads, parking lots, and underground utilities; and the level of additional risk which the client assumed by virtue of limitations imposed upon the exploratory program. To help avoid costly problems, consult the geotechnical engineer to determine how any factors which change subsequent to the date of the report may affect its recommendations.

Unless your consulting geotechnical engineer indicates otherwise, *your geotechnical engineering report should not be used:*

- When the nature of the proposed structure is changed, for example, if an office building will be erected instead of a parking garage, or if a refrigerated warehouse will be built instead of an unrefrigerated one;
- when the size or configuration of the proposed structure is altered;
- when the location or orientation of the proposed structure is modified;
- when there is a change of ownership, or
- for application to an adjacent site.

Geotechnical engineers cannot accept responsibility for problems which may develop if they are not consulted after factors considered in their report's development have changed.

MOST GEOTECHNICAL "FINDINGS" ARE PROFESSIONAL ESTIMATES

Site exploration identifies actual subsurface conditions only at those points where samples are taken, when they are taken. Data derived through sampling and subsequent laboratory testing are extrapolated by geotechnical engineers who then render an opinion about overall subsurface conditions, their likely reaction to proposed construction activity and appropriate foundation design. Even under optimal circumstances actual conditions may differ from those inferred to exist, because no geotechnical engineer, no matter how qualified, and no subsurface exploration program, no matter how comprehensive, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than a report indicates. Actual conditions in areas not sampled may differ from predictions. *Nothing can be done to prevent the unanticipated, but steps can be taken to help minimize their impact.* For this reason, *most experienced owners retain their geotechnical consultants through the construction stage,* to identify variances, conduct additional tests which may be needed, and to recommend solutions to problems encountered on site.

SUBSURFACE CONDITIONS CAN CHANGE

Subsurface conditions may be modified by constantly-changing natural forces. Because a geotechnical engineering report is based on conditions which existed at the time of subsurface exploration, *construction decisions should not be based on a geotechnical engineering report whose adequacy may have been affected by time.* Speak with the geotechnical consultant to learn if additional tests are advisable before construction starts.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes or groundwater fluctuations may also affect subsurface conditions and, thus, the continuing adequacy of a geotechnical report. The geotechnical engineer should be kept apprised of any such events, and should be consulted to determine if additional tests are necessary.

GEOTECHNICAL SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND PERSONS

Geotechnical engineers' reports are prepared to meet the specific needs of specific individuals. A report prepared for a consulting civil engineer may not be adequate for a construction contractor, or even some other consulting civil engineer. Unless indicated otherwise, this report was prepared expressly for the client involved and expressly for purposes indicated by the client. Use by any other persons for any purpose, or by the client for a different purpose, may result in problems. *No individual other than the client should apply this report for its intended purpose without first conferring with the geotechnical engineer. No person should apply this report for any purpose other than that originally contemplated without first conferring with the geotechnical engineer.*

A GEOTECHNICAL ENGINEERING REPORT IS SUBJECT TO MISINTERPRETATION

Costly problems can occur when other design professionals develop their plans based on misinterpretations of a geotechnical engineering report. To help avoid these problems, the geotechnical engineer should be retained to work with other appropriate design professionals to explain relevant geotechnical findings and to review the adequacy of their plans and specifications relative to geotechnical issues.

BORING LOGS SHOULD NOT BE SEPARATED FROM THE ENGINEERING REPORT

Final boring logs are developed by geotechnical engineers based upon their interpretation of field logs (assembled by site personnel) and laboratory evaluation of field samples. Only final boring logs customarily are included in geotechnical engineering reports. *These logs should not under any circumstances be redrawn* for inclusion in architectural or other design drawings, because drafters may commit errors or omissions in the transfer process. Although photographic reproduction eliminates this problem, it does nothing to minimize the possibility of contractors misinterpreting the logs during bid preparation. When this occurs, delays, disputes and unanticipated costs are the all-too-frequent result.

To minimize the likelihood of boring log misinterpretation, *give contractors ready access to the complete geotechnical engineering report* prepared or authorized for their use. Those who do not provide such access may proceed under the *mistaken* impression that simply disclaiming responsibility for the accuracy of subsurface information always insulates them from attendant liability. Providing the best available information to contractors helps prevent costly construction problems and the adversarial attitudes which aggravate them to disproportionate scale.

READ RESPONSIBILITY CLAUSES CLOSELY

Because geotechnical engineering is based extensively on judgment and opinion, it is far less exact than other design disciplines. This situation has resulted in wholly unwarranted claims being lodged against geotechnical consultants. To help prevent this problem, geotechnical engineers have developed model clauses for use in written transmittals. These are *not* exculpatory clauses designed to foist geotechnical engineers' liabilities onto someone else. Rather, they are definitive clauses which identify where geotechnical engineers' responsibilities begin and end. Their use helps all parties involved recognize their individual responsibilities and take appropriate action. Some of these definitive clauses are likely to appear in your geotechnical engineering report, and you are encouraged to read them closely. Your geotechnical engineer will be pleased to give full and frank answers to your questions.

OTHER STEPS YOU CAN TAKE TO REDUCE RISK

Your consulting geotechnical engineer will be pleased to discuss other techniques which can be employed to mitigate risk. In addition, ASFE has developed a variety of materials which may be beneficial. Contact ASFE for a complimentary copy of its publications directory.

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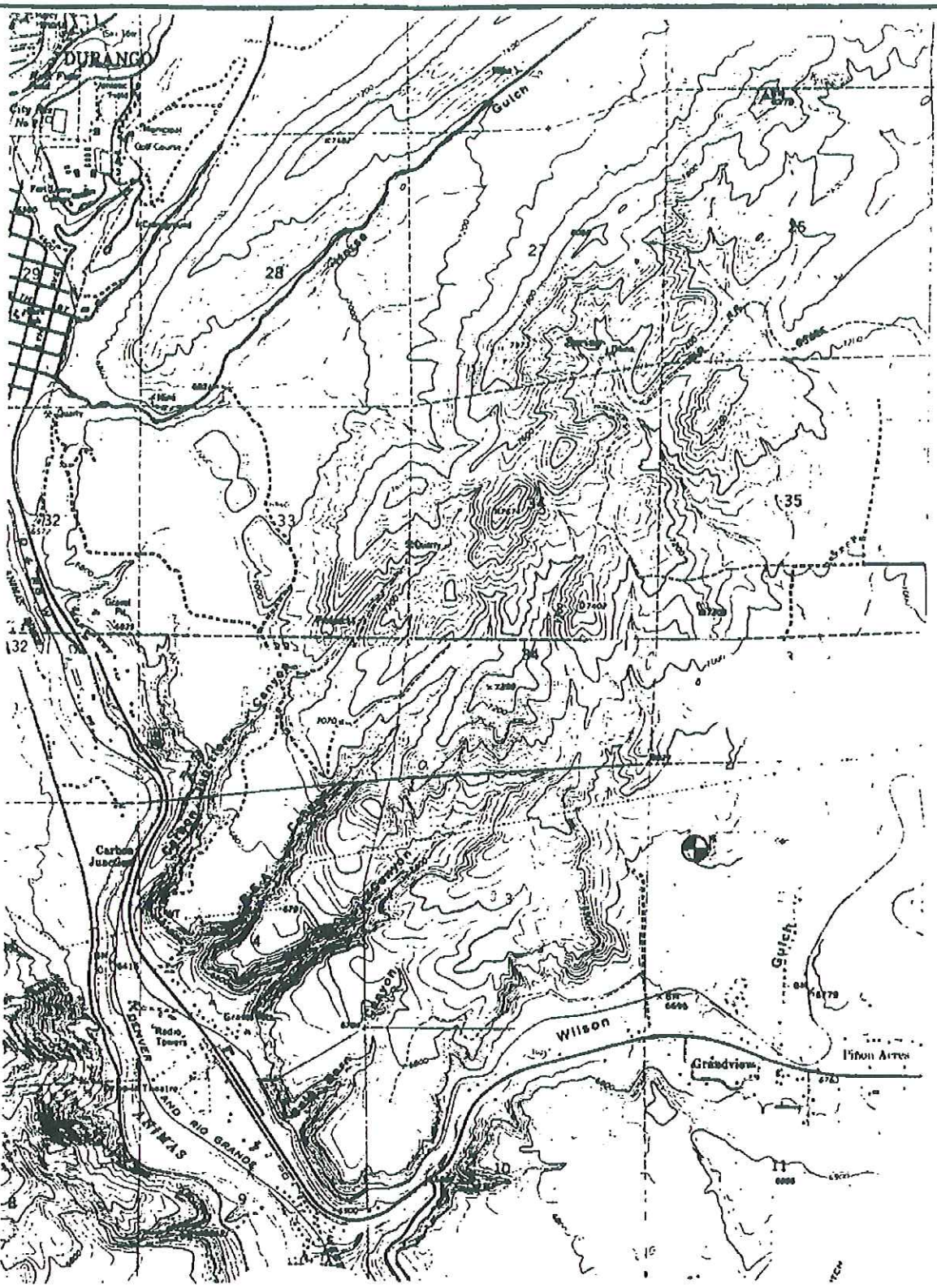


Approximate location of project

This map was reproduced from a map provided by United States Geologic Survey and is intended to present geotechnical data only

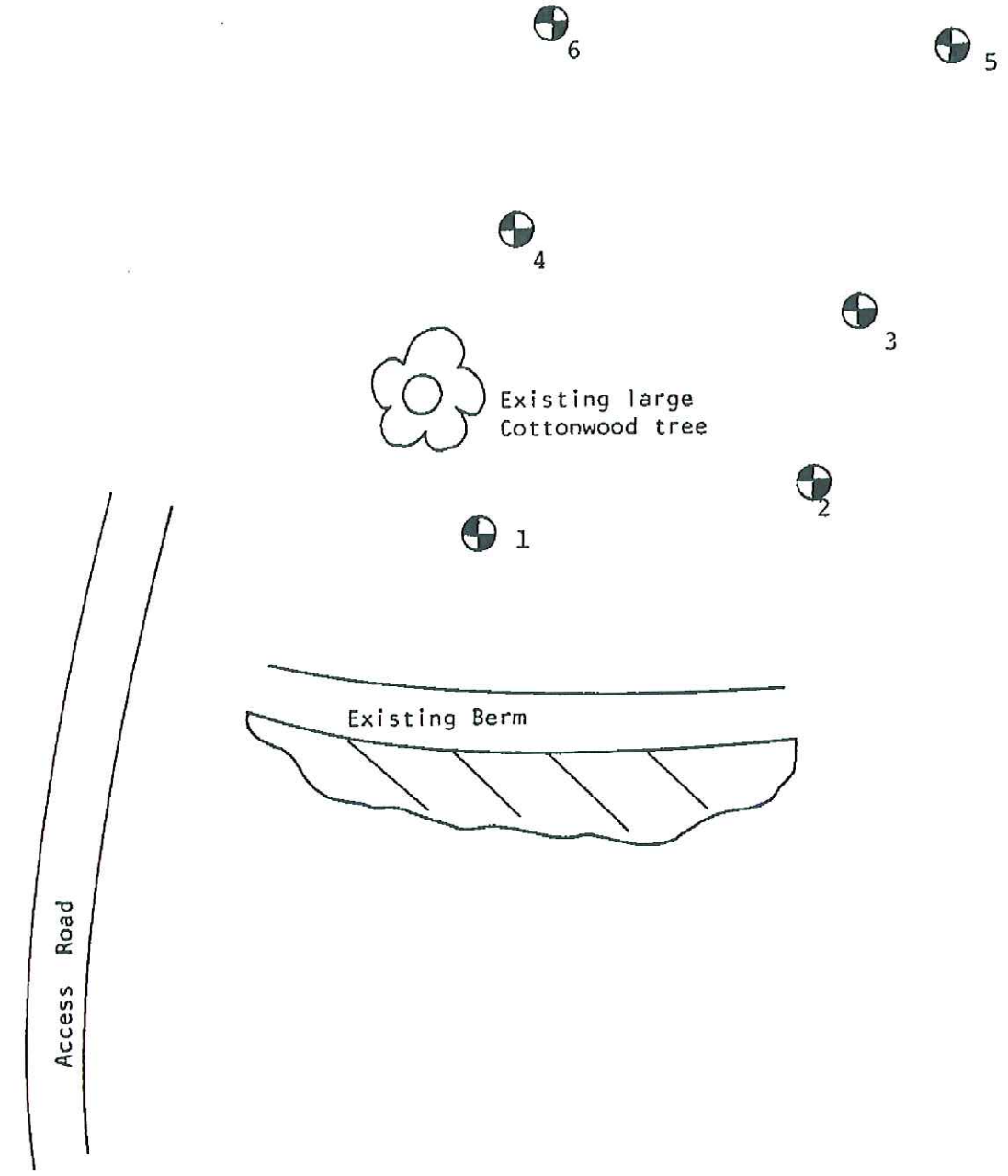
N

PROJECT VICINITY MAP

NO SCALE

Lambert and Associates

Project No.:	M90105GE
Date:	9/6/90
Figure:	1



6 Indicates approximate location of test borings

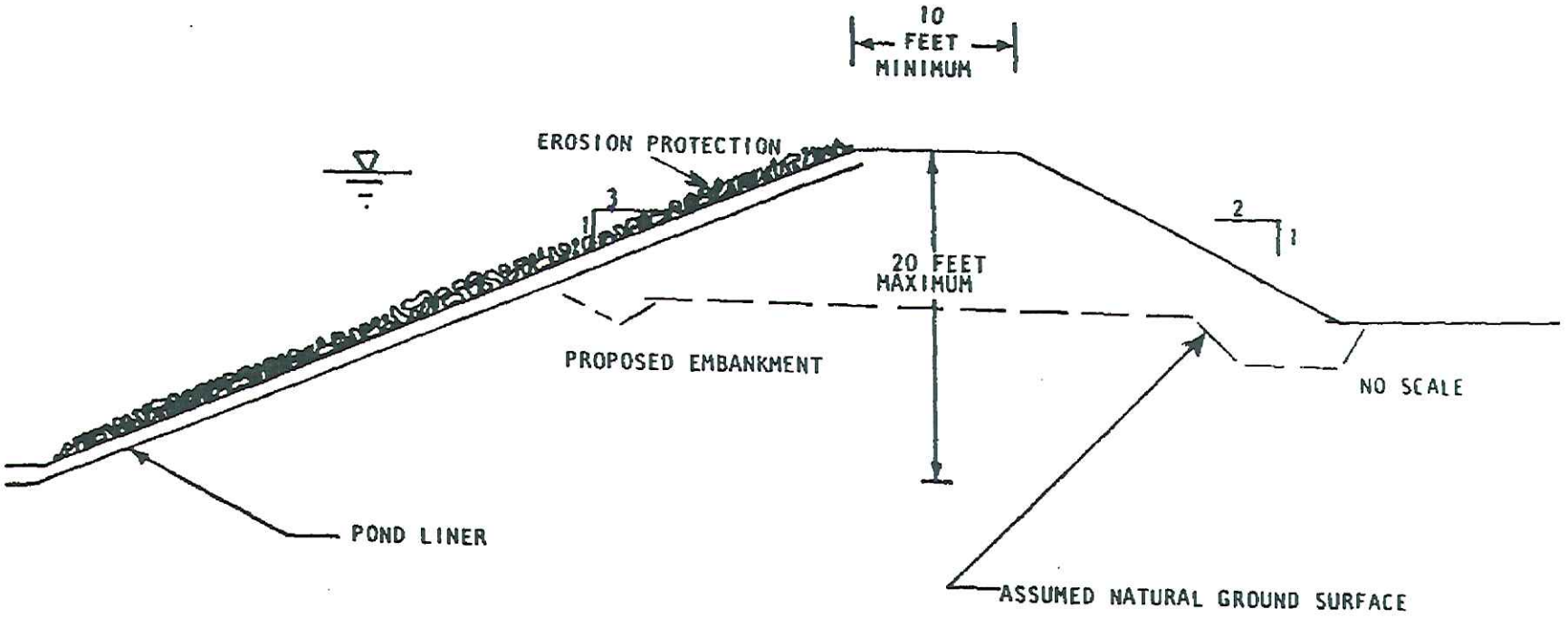
This sketch was excerpted from notes taken in the field and is intended to present geotechnical data only

TEST BORING LOCATION SKETCH

Lambert and Associates

Project No.:	M90105GE
Date:	9/6/90
Figure:	2

Lambert and Associates



EMBANKMENT CONFIGURATION CONCEPT

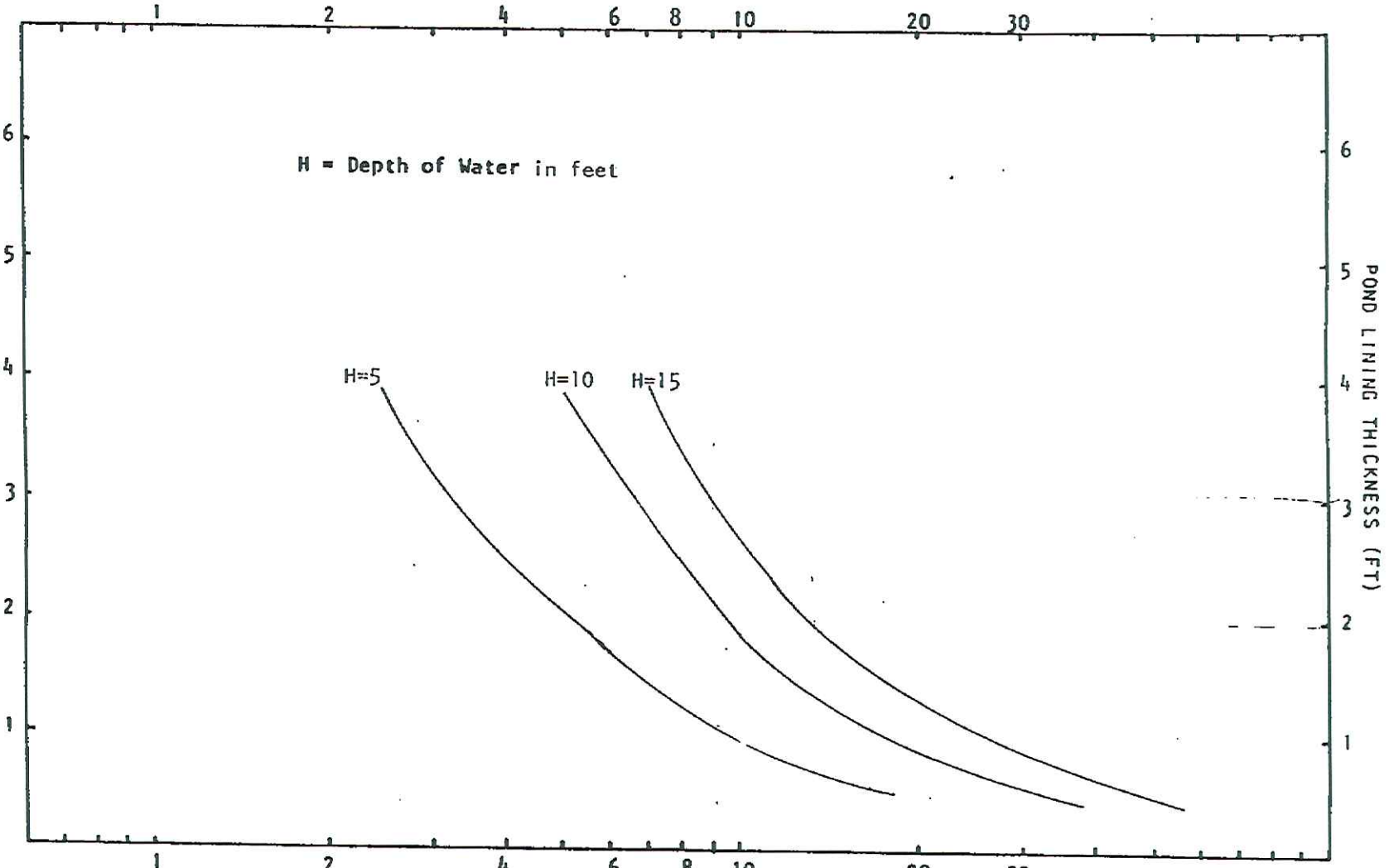
Project No.: [illegible]
Date: 9/6/90
Figure: 3

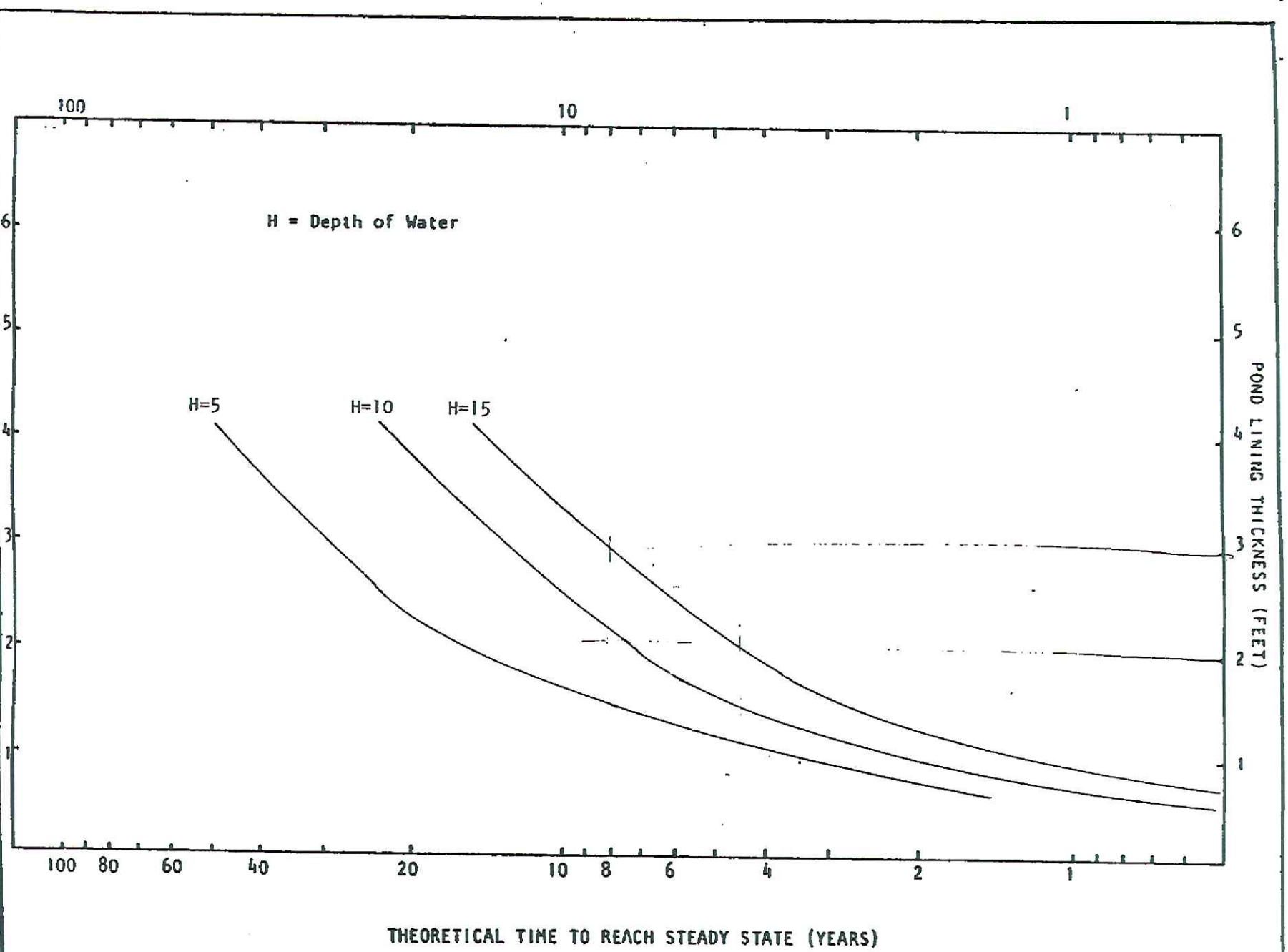
Lambert and Associates

Project No: 3590105E

Date: 9/6/90

Figure: 4



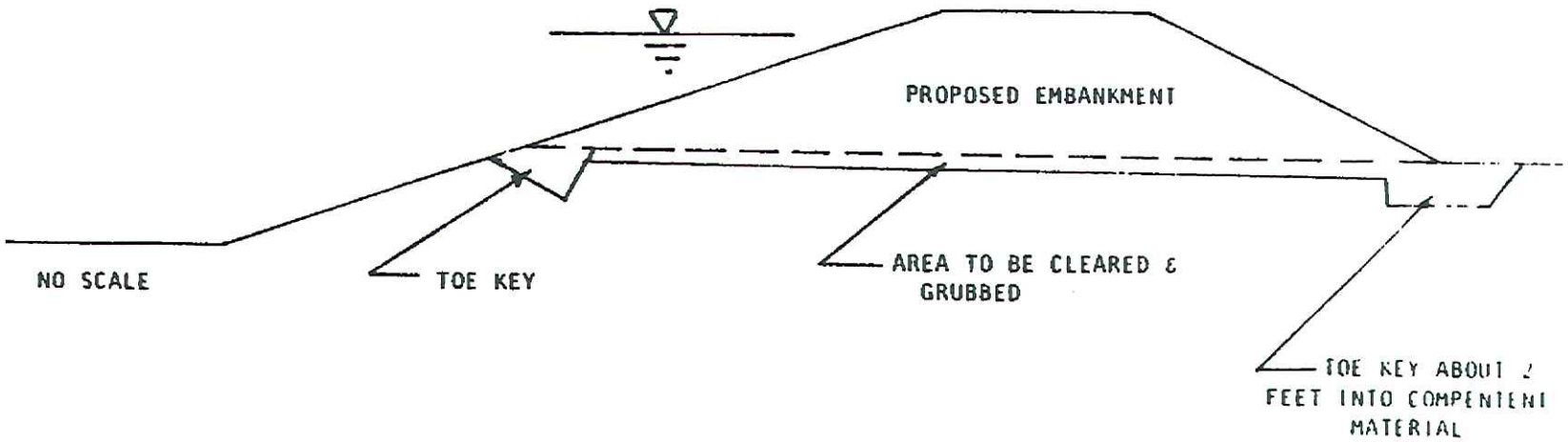


Lambert and Associates

Project No: M90105GE
Done: 9/8/90
Figure: 5

Lambert and Associates

Project No.: 09010525
Date: 8/29/90
Figure: 6



CLEARING & GRUBBING CONCEPT

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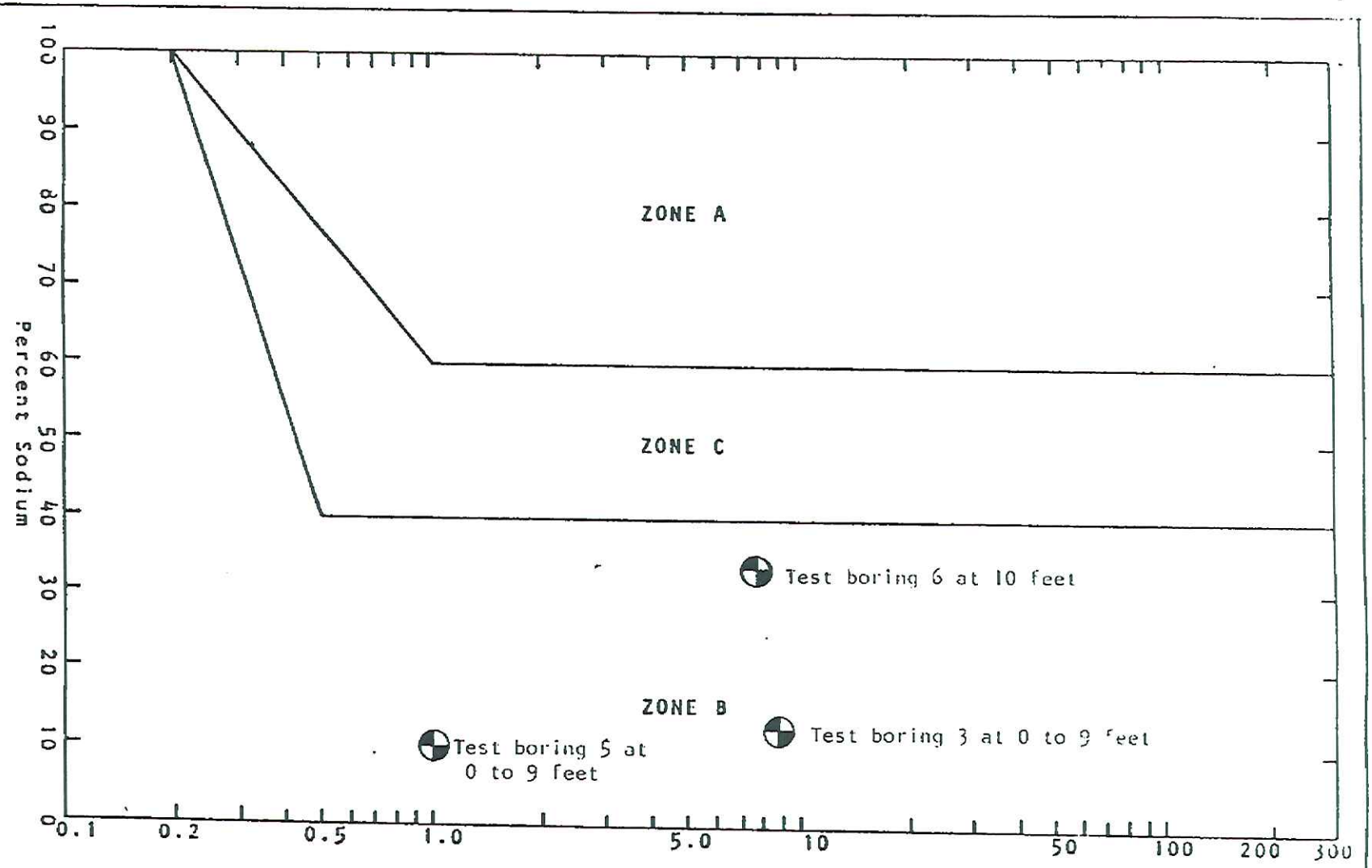
DISSOLVED SALTS/DISPERSIVE SOILS



ZONE A: Much experience shows that damage and failed dams all over the world have been constructed of these dispersive soils.

ZONE B: The great majority of these soils are non-dispersive. These are the soils generally considered "ordinary erosion resistant clays", but include silts of low plasticity (ML), also non-dispersive.

ZONE C: Soils in this group may range from dispersive to non-dispersive.

Test results with plots located outside of Zone B should have additional tests performed.

Project No.: M90105GE
Date: 9/6/90
Figure: 7

APPENDIX A

The field study was performed on July 24, 1990. The field study consisted of logging and sampling the soils encountered in six (6) test borings. The approximate location of the test borings are shown on Figure 2. The logs of the soils encountered in the test borings are presented on Figures A2 through A7.

Field percolation tests were performed in the test borings on July 25, 1990. The test borings were filled with water at the time of drilling and allowed to soak for about twenty four (24) hours. The borings were refilled and a four (4) hour percolation test was performed. The results of the percolation tests are presented on Figure A8.

The test borings were logged by Lambert and Associates and samples of significant soil types were obtained. The bulk disturbed samples were obtained from the test borings.

The engineering field description and major soil classification are based on our interpretation of the materials encountered and are prepared according to the Unified Soil Classification System, ASTM D2488. Since the description and classification which appear on the test boring logs are intended to be that which most accurately describes a given interval of the test boring (frequently an interval of several feet) discrepancies do occur in the Unified Soil Classification System

nomenclature between that interval and a particular sample in the interval. For example, an interval on the test boring logs may be identified as a silty sand (SM) while one sample taken within the interval may have individually been identified as a sandy silt (ML). This discrepancy is frequently allowed to remain to emphasize the occurrence of local textural variations in the interval.

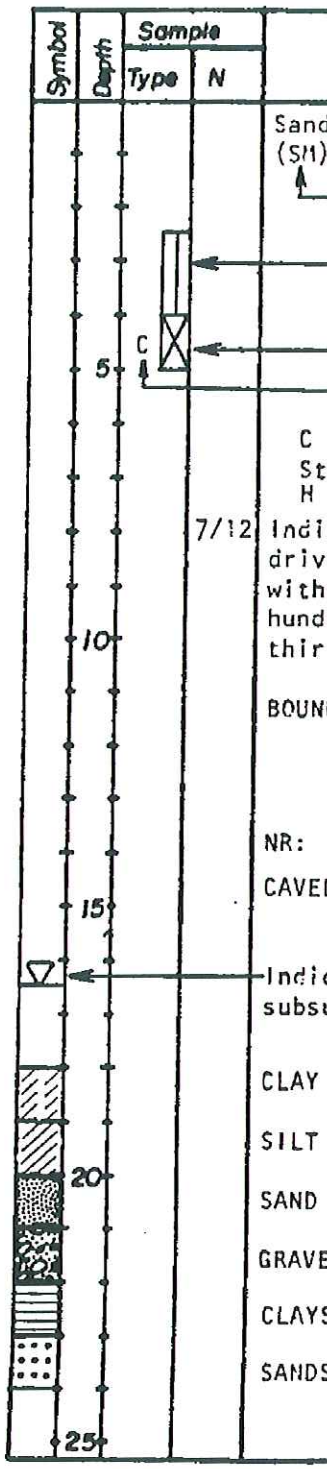
The stratification lines presented on the logs are intended to present our interpretation of the subsurface conditions encountered in the test borings. The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

KEY TO
LOG OF TEST BORING

Date Drilled _____ Field Engineer _____ Boring Number _____

Location _____ Elevation _____

Diameter _____ Total Depth _____ Water Table _____



Soil Description

Sand, silty, medium dense, moist, tan, (SM)
↑ Unified Soil Classification

Indicates Bulk Bag Sample

Indicates Drive Sample

Indicates Sampler Type:

C - Modified California
St - Standard Split Spoon
H - Hand Sampler

7/12 Indicates seven blows required to drive the sampler twelve inches with a hammer that weighs one hundred forty pounds and is dropped thirty inches.

BOUNCE: Indicates no further penetration occurred with additional blows with the hammer

NR: Indicates no sample recovered

CAVED: Indicates depth the test boring caved after drilling

Indicates the location of free subsurface water when measured

NOTE: Symbols are often used only to help visually identify the described information presented on the log.

Laboratory Test Results

Notes in this column indicate tests performed and test results if not plotted.

DD: Indicates dry density in pounds per cubic foot

MC: Indicates moisture content as percent of dry unit weight

LL: Indicates Liquid Limit

PL: Indicates Plastic Limit

PI: Indicates Plasticity Index

Project Name _____ Project Number _____ Figure A1

Lambert and Associates

LOG OF TEST BORING

Date Drilled 7-24-90 **Field Engineer** Trautner **Boring Number** 1

Location S.W. Area **Elevation** _____

Diameter 4" **Total Depth** 9' **Water Table** None Encountered

Depth (ft)	Sample Type	Sample N	Soil Description	Laboratory Test Results
	B A G		Clay, silty, soft, moist to very moist, brown(CL) 12" of organics	
5	C	5/12	Increase in stiffness	
	C	5/6 10/6		
10			Bottom of test boring at 9'	
15				
20				
25				

Project Name Crader Pond **Project Number** D90105GE **Figure** A2

Lambert and Associates

CONSULTING GEOTECHNICAL ENGINEERS AND MATERIAL TESTING

LOG OF TEST BORING

Date Drilled 7-24-90 Field Engineer Trautner Boring Number 2

Location S.E. Area Elevation

Diameter 4" Total Depth 24' Water Table None Encountered

Depth	Sample Type	Sample N	Soil Description	Laboratory Test Results
	BUCKET		Clay, silty, stiff, medium moist, brown(CL) 12" of organics	
5			Increase in stiffness	
10	C	28/12		
15			Scattered cobbles	
20				
25			Bottom of test boring at 24'	

Project Name Crader Pond Project Number D90105GE Figure A3

Lambert and Associates

CONSULTING GEOTECHNICAL ENGINEERS AND MATERIAL TESTING

LOG OF TEST BORING

Date Drilled 7-24-90 **Field Engineer** Trautner **Boring Number** 3

Location W. Central Area **Elevation** _____

Diameter 4" **Total Depth** 11' **Water Table** None Encountered

Depth (ft)	Sample Type	Sample N	Soil Description	Laboratory Test Results
5	BAG		Clay, silty, medium stiff, medium moist, dark brown (CL) 12" of organics	
10	C	7/6 5/6	Clay, sandy, medium stiff, medium moist, light brown (CL-SC)	
15			Bottom of test boring at 11'	
20				
25				

Project Name Crader Pond **Project Number** D90105GE **Figure** A4

Lambert and Associates

CONSULTING GEOTECHNICAL ENGINEERS AND MATERIAL TESTING

LOG OF TEST BORING

Date Drilled 7-24-90 Field Engineer Trautner Boring Number 4

Location E. Central Area Elevation

Diameter 4" Total Depth 13' Water Table None Encountered

Depth (ft)	Sample Type	Sample N	Soil Description	Laboratory Test Results
5	BUCKET		Clay, silty, medium stiff, moist, brown(CL) 12" of organics	
10			Clay, sandy, medium stiff, medium moist, brown(CL-SC)	
15				
20			Bottom of test boring at 13'	
25				

Project Name Crader Pond Project Number D90105GE Figure A5

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LOG OF TEST BORING

Date Drilled 7-24-90 Field Engineer Trautner Boring Number 5

Location N.E. Area Elevation

Diameter 4" Total Depth 11' Water Table None Encountered

Depth	Sample Type	Sample N	Soil Description	Laboratory Test Results
5			Clay, silty, medium stiff, medium moist, brown(CL) 12" of organics	
10	C	10% 12%	Clay and sand, scattered pea gravel, medium stiff, moist, brown	
15			Bottom of test boring at 11'	
20				
25				

Project Name Crader Pond Project Number D90105GE Figure A6

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LOG OF TEST BORING

Date Drilled 7-24-90 Field Engineer Trautner Boring Number 6

Location N. W. Area Elevation

Diameter 4" Total Depth 11' Water Table None Encountered

Symbol	Depth	Sample Type	Sample N	Soil Description	Laboratory Test Results
	5	BUCKET		Clay, silty, medium stiff, medium moist, brown(CL) 12" of organics	
	10	C	19/12		
	15			Bottom of test boring at 11'	
	20				
	25				

Project Name Crader Pond Project Number D90105GE Figure A7

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PERCOLATION TEST RESULTS

TEST BORING	TOTAL DEPTH OF TEST BORING (FEET)	SOIL ENCOUNTERED IN BOTTOM OF BORING	PERCOLATION RATE MIN/INCH
1	9	Clay, silty	10
3	11	Clay, sandy	5
5	11	Clay, sand	5

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Project No.:	M90105GE
Date:	9/6/90
Figure:	A8

APPENDIX B

The laboratory study consisted of performing:

- Moisture-density relationship tests,
- Remolded triaxial strength tests,
- Remolded permeability tests,
- Sieve analysis tests,
- Atterberg Limits tests, and
- Chemical tests

It should be noted that samples obtained using a drive type sleeve sampler may experience some disturbance during the sampling operations. The test results obtained using these samples are used only as indicators of the in situ soil characteristics.

TESTING

Moisture Density Relationship Tests

Moisture density relationship tests were conducted on select soil subgrade samples obtained during our field study. The moisture density relationship tests were conducted in accordance with ASTM Test Method D1557. The results of the moisture density relationship tests are presented on Figure B1.

Triaxial Compression Strength Tests

Triaxial compression strength properties of remolded samples were evaluated in general accordance with testing procedures defined by ASTM Test Method D2850. The tests were performed

using a stain controlled triaxial compression testing machine. The triaxial compression strength test results are presented on Figure B2.

Laboratory Falling Head Permeability Tests

Remolded laboratory permeability tests were conducted on a composite sample of bulk samples obtained from test boring 2 at a depth of 0 to 10 feet. The sample was remolded from bulk disturbed samples and the permeability tests were conducted in general accordance with ASTM Test Method D2434. The results of the permeability tests indicate a permeability of about 6.3×10^{-8} centimeters per second.

Sieve Analysis Tests

Sieve analysis tests were conducted on selected samples of the material obtained or the test borings. The sieve analysis tests were conduced in general accordance with ASTM Test Method D422. The results of the sieve analysis tests are presented on Figures B3 through B5.

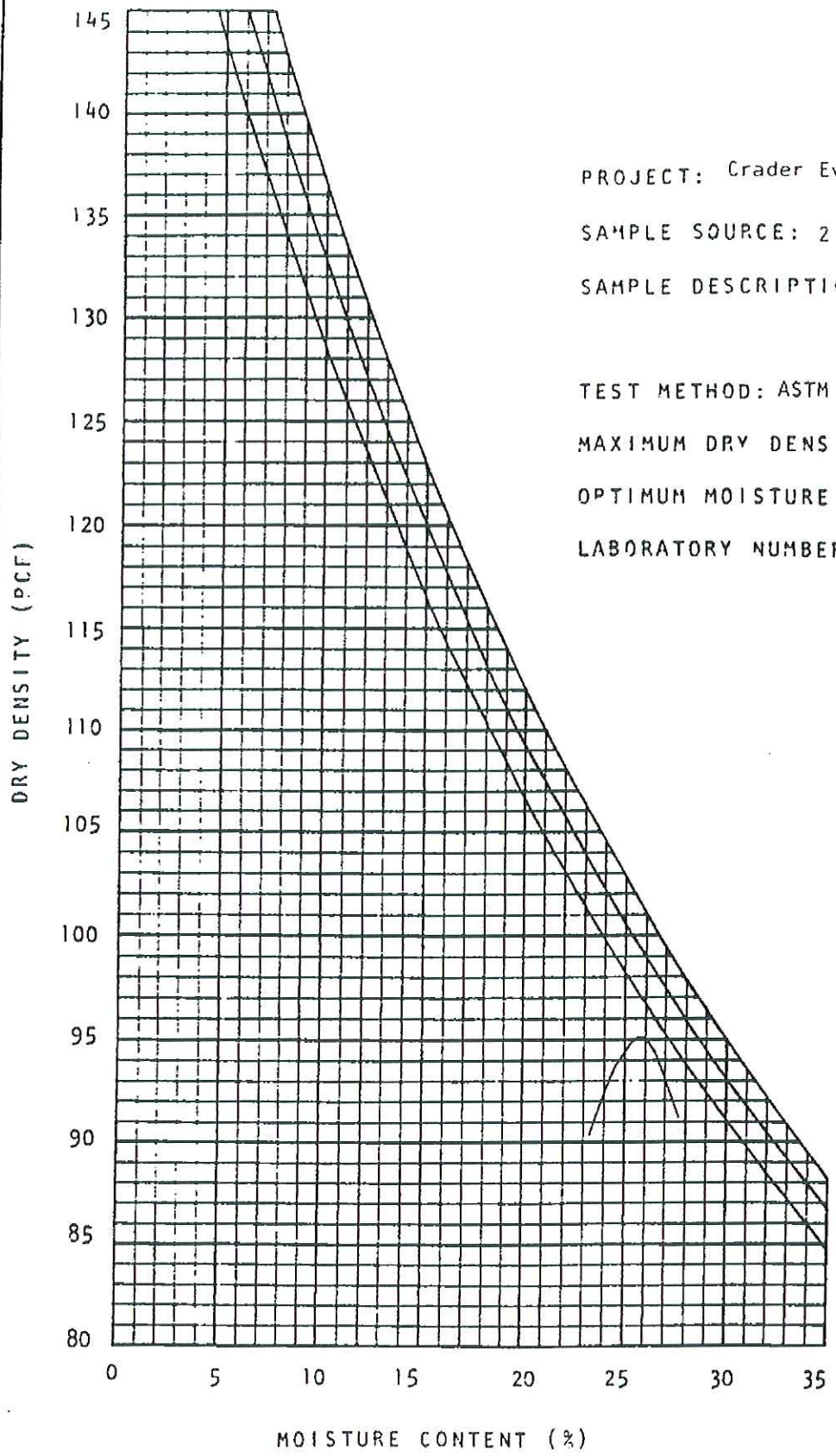
Atterberg Limits Tests

Atterberg Limits tests were conducted on samples obtained during our field study. The Atterberg limits tests were conducted in general accordance with ASTM Test Method D4318 and D424. The results of the Atterberg limits tests are presented on Figures B3 through B5.

Chemical Tests

Chemical tests for calcium, magnesium, potassium and sodium were performed by Grand Junction Laboratories on select samples obtained during the field study. The results of the chemical tests are tabulated below.

	TEST BORING 3 at 0 to 9 feet	TEST BORING 5 at 0 to 9 feet	TEST BORING 6 at 10 feet
SODIUM	1.035 meg/L	.109 meg/L	2.506 meg/L
CALCIUM	6.786 meg/L	.905 meg/L	3.378 meg/L
MAGNESIUM	.792 meg/L	0	1.387 meg/L
POTASSIUM	0.054 meg/L	.026 meg/L	.141 meg/L



PROJECT: Crader Evaporation

SAMPLE SOURCE: 2 at 0-10 feet, bucket

SAMPLE DESCRIPTION: Brown, clay

TEST METHOD: ASTM D698A

MAXIMUM DRY DENSITY: 95.0 pcf

OPTIMUM MOISTURE CONTENT: 25.5%

LABORATORY NUMBER: 9542E

2.6
2.7
2.8
Zero Air Voids for Specific Gravity

Lambert and Associates

Project No.:	M90105GE
Date:	9/6/90
Figure:	B1

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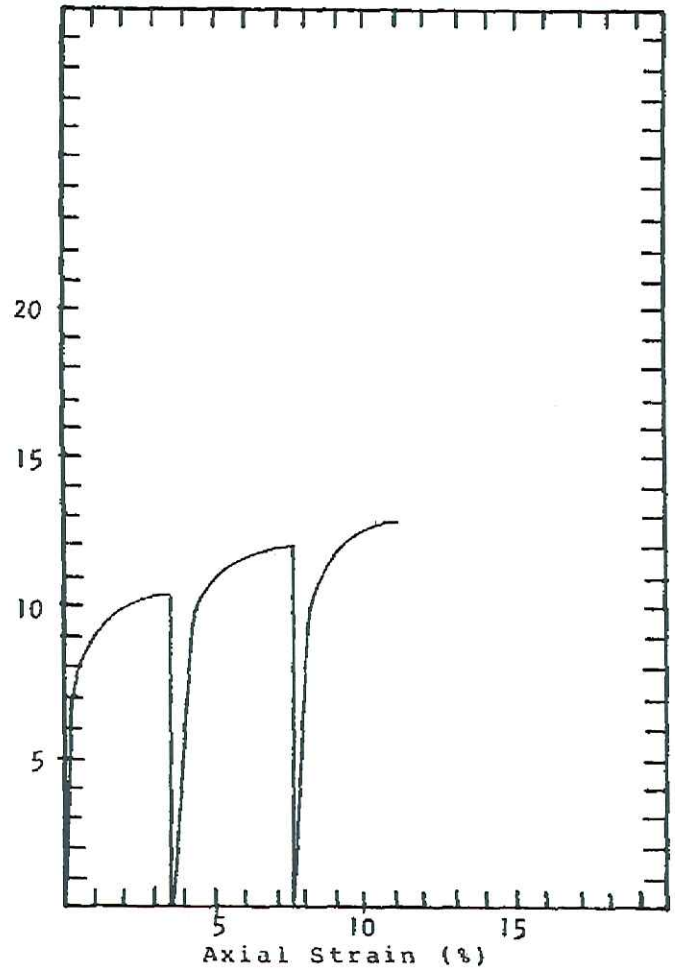
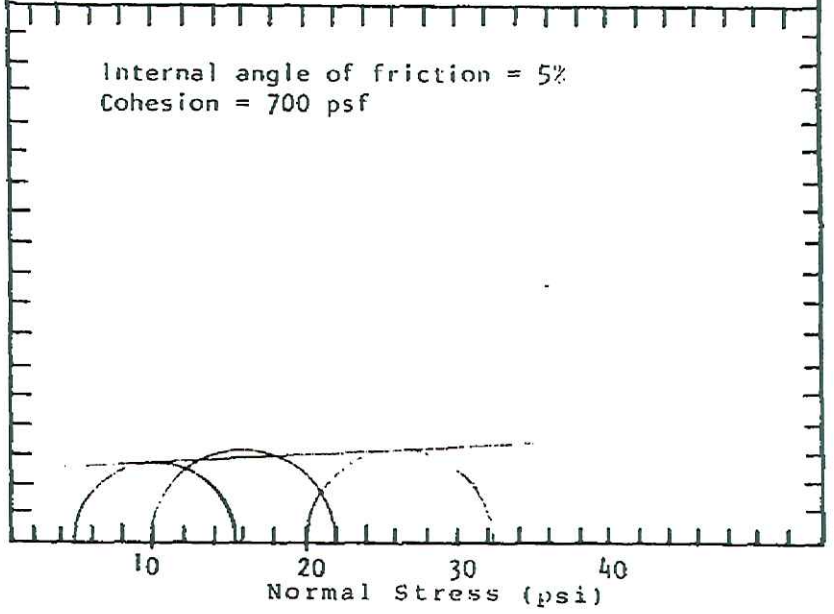
Boring Number & Depth	Initial Moisture Content	Initial Dry Density PCF	Confining Pressure PSI	Deviator Stress PSI	Pore Pressure PSI
TH1 @ 3 feet	23.1	92.2	5.0	10.53	20.0
			10.0	12.00	20.0
			20.0	12.57	20.0





Sample Description: Clay,brown

Type of Test: Staged

COMPRESSION TEST

Project No.: R9105Gt
Date: 9/6/90
Figure: B2

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TEST RESULTS

PROJECT Crader Evaporation Pond PROJECT NO. D90105GE DATE 8/1/90

LOCATION Durango, Colorado SOURCE 2 @ 0-10 feet bucket

SAMPLE NO. 9542 E SPECIFICATION*

SIEVE ANALYSIS

U. S. STD. SIEVE SIZE	CUMULATIVE PERCENT PASSING
3/8"	100
NO. 4	99.9
NO.10	99.6
NO.40	97
NO.200	79

Moisture Content: 12.7%

Sampled On: 7/24/90

Dark brown clay

ATTERBERG LIMITS TESTS

Liquid Limit = 57

Plastic Limit = 17

Plasticity Index = 40

Figure B3

*It is our understanding that the noted specification is the project specification.

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TEST RESULTS

PROJECT Crader Evaporation Pond PROJECT NO. D90105GE DATE 8/1/90

LOCATION Durango, Colorado SOURCE 4 @ 0-10 feet bucket

SAMPLE NO. 9542J SPECIFICATION* _____

SIEVE ANALYSIS

U. S. STD. SIEVE SIZE	CUMULATIVE PERCENT PASSING
1/2"	100
3/8"	99
NO. 4	99
NO.10	97
NO.40	86
NO.100	68
NO.200	54

Moisture Content: 14.4%

Sampled On: 7/24/90

Brown clay, slightly sandy

ATTERBERG LIMITS TESTS

Liquid Limit = 38

Plastic Limit = 18

Plasticity Index = 20

Figure B4

*It is our understanding that the noted specification is the project specification.

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TEST RESULTS

PROJECT Crader Evaporation Pond PROJECT NO. D90105GE DATE 8/2/90

LOCATION Durango, Colorado SOURCE 6 @ 0-10 feet

SAMPLE NO. 9542N SPECIFICATION*

SIEVE ANALYSIS

U. S. STD. SIEVE SIZE	CUMULATIVE PERCENT PASSING
3/8"	100
NO. 4	99.5
NO.10	98
NO.40	86
NO.200	59

Moisture Content: 11.3%

Sampled On: 7/24/90

Brown Clay with organics

ATTERBERG LIMITS TESTS

Liquid Limit = 34

Plastic Limit = 15

Plasticity Index = 19

Figure B5

*It is our understanding that the noted specification is the project specification.

ATTACHMENT F

OPERATING PLAN

CRADER POND WATER TREATMENT FACILITY

The Crader Pond Evaporation facility will be used by Chevron to treat the excess production water that the operating injection well cannot accommodate.

The production operations of natural gas wells generate brackish water commonly referred to as produced water. Produced water from nearby Chevron gas wells will be sent to the Crader Pond facility for storage and evaporation.

The Crader Pond facility will consist of the existing pond with a capacity of 350,000 barrels. Produced water will be transferred via pipelines to the evaporation pond. Estimated inflow is approximately 0-1000 barrels per day. When the water is at the facility it will be pumped with one 20 horsepower pump through 20 jet nozzles at a height less than 7 feet. A high water level shut off valve will be installed to ensure that two feet of freeboard is maintained at all times. Wind monitoring equipment and an actuated control valve will also be installed to control wind drift. The entire facility will be electrified to provide power to the newly installed equipment on site.

The facility will be permitted under the authority of La Plata Land Use Codes. Chevron will maintain compliance with the conditions of the state and county authorizations and the operator will be familiar with the conditions placed on the operations of the facility.

The produced water facility will be visited daily by production operators. The current facility is enclosed within woven wire fence with gates to allow access. The facility will also be marked by signage according to the requirements of COGCC Rule 210 (c).

Recordkeeping will be performed according to the requirements of COGCC Rule 907 (b).

Emergency response procedures will be contained within the Spill Prevention, Control and Countermeasure Plan (SPCC) that has been developed for the facility in accordance with Colorado Department of Public Health and Environment and U. S. EPA guidelines. The SPCC presents operational guidance and procedures for avoiding and responding to potential spills. The SPCC also presents emergency response procedures and 24 hour contact information. Additionally, the facility will operate under the conditions set by La Plata County on the following page.

La Plata County Conditions of Approval

- Installation of a high water level shut off valve to ensure that two feet of freeboard is maintained in the pond at all times.
- Installation of wind monitoring equipment and an actuated jet nozzle control valve to control wind drift.
- Installation of electricity for the entire facility.
- Spray from jet nozzles shall not exceed seven feet in height.
- Noise levels shall be in compliance with state and residential noise standards.
- If odors are detected from facility, mitigation efforts shall be taken immediately.
- Installation of 20 horse power pump.
- Installation of 20 jet nozzles and associated piping and valves.

ATTACHMENT G

STORED MATERIAL PROFILE

CRADER POND WATER TREATMENT FACILITY

The water stored at the Crader Pond Evaporation Facility will consist of produced water from up to 25 completed gas wells in the close proximity of the Crader Pond Facility. A representative production water sample was collected from each of the 25 gas wells that will potentially be stored and treated at Crader Pond. Analytical results of these produced water samples are summarized in the following tables. Copies of analytical lab reports for these samples are available upon request.

Crader Pond
Groundwater Analitical Summary

Gas Well: Lapaloma 1-2
API# 05-067-07758

Date Sampled	1/8/2007	
Sample ID	L 1-2	
Time Sampled	1440	Detection Limit
Chloride (mg/L)	480	1
Sulfate (mg/L)	BDL	5
Alkalinity, Bicarbonate (mg/L)	2000	10
Alkalinity, Carbonate (mg/L)	0	0
pH (su)	8.2	
Specific Conductance (umhos/cm)	4800	
Dissolved Solids (mg/L)	3000	1
Arsenic (mg/L)	0.0024	0.005
Calcium (mg/L)	7.3	0.5
Magnesium (mg/L)	1.6	0.1
Potassium (mg/L)	8.8	0.5
Selenium (mg/L)	BDL	0.02
Sodium (mg/L)	1000	0.5
Benzene (mg/L)	0.0011	0.0005
Toluene (mg/L)	BDL	0.005
Ethylbenzene (mg/L)	BDL	0.0005
Total Xylene (mg/L)	0.0028	0.0015

mg/L - milligrams per liter
su -standard units
BDL - below detection limit

Crader Pond
Groundwater Analitical Summary

Gas Well: Chaney 1-1
API# 05-067-07742

Date Sampled	**1/8/2007**	
Sample ID	C 1-1	
Time Sampled	1430	**Detection Limit**
Chloride (mg/L)	220	1
Sulfate (mg/L)	BDL	5
Alkalinity, Bicarbonate (mg/L)	2000	10
Alkalinity, Carbonate (mg/L)	0	0
pH (su)	8.2	
Specific Conductance (umhos/cm)	4000	
Dissolved Solids (mg/L)	2500	1
Arsenic (mg/L)	0.0015	0.005
Calcium (mg/L)	8.3	0.5
Magnesium (mg/L)	1.4	0.1
Potassium (mg/L)	13	0.5
Selenium (mg/L)	BDL	0.02
Sodium (mg/L)	900	0.5
Benzene (mg/L)	0.0018	0.0005
Toluene (mg/L)	BDL	0.005
Ethylbenzene (mg/L)	BDL	0.0005
Total Xylene (mg/L)	0.0037	0.0015

mg/L - milligrams per liter
su -standard units
BDL - below detection limit

Crader Pond
Groundwater Analitical Summary

Gas Well: Frizell 7-2
API# 05-067-07731

Date Sampled	1/8/2007	
Sample ID	F 7-2	
Time Sampled	1420	Detection Limit
Chloride (mg/L)	170	1
Sulfate (mg/L)	BDL	5
Alkalinity, Bicarbonate (mg/L)	1600	10
Alkalinity, Carbonate (mg/L)	0	0
pH (su)	8.2	
Specific Conductance (umhos/cm)	3200	
Dissolved Solids (mg/L)	2000	1
Arsenic (mg/L)	0.0011	0.005
Calcium (mg/L)	7.4	0.5
Magnesium (mg/L)	1.2	0.1
Potassium (mg/L)	3.3	0.5
Selenium (mg/L)	BDL	0.02
Sodium (mg/L)	700	0.5
Benzene (mg/L)	0.00098	0.0005
Toluene (mg/L)	BDL	0.005
Ethylbenzene (mg/L)	BDL	0.0005
Total Xylene (mg/L)	0.0021	0.0015

mg/L - milligrams per liter
su -standard units
BDL - below detection limit

Crader Pond
Groundwater Analitical Summary

Gas Well: Clark 7-1
API# 05-067-07788

Date Sampled	**1/8/2007**	
Sample ID	C 7-1	
Time Sampled	1405	**Detection Limit**
Chloride (mg/L)	55	1
Sulfate (mg/L)	BDL	5
Alkalinity, Bicarbonate (mg/L)	1600	10
Alkalinity, Carbonate (mg/L)	0	0
pH (su)	8.1	
Specific Conductance (umhos/cm)	2800	
Dissolved Solids (mg/L)	1700	1
Arsenic (mg/L)	BDL	0.005
Calcium (mg/L)	5.6	0.5
Magnesium (mg/L)	0.95	0.1
Potassium (mg/L)	3.2	0.5
Selenium (mg/L)	BDL	0.02
Sodium (mg/L)	680	0.5
Benzene (mg/L)	BDL	0.0005
Toluene (mg/L)	BDL	0.005
Ethylbenzene (mg/L)	BDL	0.0005
Total Xylene (mg/L)	BDL	0.0015

mg/L - milligrams per liter
su -standard units
BDL - below detection limit

Crader Pond
Groundwater Analitical Summary

Gas Well: Frienmuth 1-7
API# 05-067-06574

Date Sampled	1/8/2007	
Sample ID	F 1-7	
Time Sampled	1400	Detection Limit
Chloride (mg/L)	30	1
Sulfate (mg/L)	BDL	5
Alkalinity, Bicarbonate (mg/L)	1400	10
Alkalinity, Carbonate (mg/L)	0	0
pH (su)	8	
Specific Conductance (umhos/cm)	2400	
Dissolved Solids (mg/L)	1500	1
Arsenic (mg/L)	0.0011	0.005
Calcium (mg/L)	7.8	0.5
Magnesium (mg/L)	1.2	0.1
Potassium (mg/L)	12	0.5
Selenium (mg/L)	BDL	0.02
Sodium (mg/L)	560	0.5
Benzene (mg/L)	BDL	0.0005
Toluene (mg/L)	BDL	0.005
Ethylbenzene (mg/L)	BDL	0.0005
Total Xylene (mg/L)	BDL	0.0015

mg/L - milligrams per liter
su -standard units
BDL - below detection limit

Crader Pond
Groundwater Analitical Summary

Gas Well: Hill 8-2
API# 05-067-07732

Date Sampled	1/8/2007	
Sample ID	H 8-2	
Time Sampled	1350	Detection Limit
Chloride (mg/L)	8.8	1
Sulfate (mg/L)	BDL	5
Alkalinity, Bicarbonate (mg/L)	1400	10
Alkalinity, Carbonate (mg/L)	0	0
pH (su)	8.1	
Specific Conductance (umhos/cm)	2400	
Dissolved Solids (mg/L)	1500	1
Arsenic (mg/L)	0.0048	0.005
Calcium (mg/L)	8.9	0.5
Magnesium (mg/L)	1.6	0.1
Potassium (mg/L)	5.6	0.5
Selenium (mg/L)	BDL	0.02
Sodium (mg/L)	540	0.5
Benzene (mg/L)	0.00055	0.0005
Toluene (mg/L)	BDL	0.005
Ethylbenzene (mg/L)	BDL	0.0005
Total Xylene (mg/L)	BDL	0.0015

mg/L - milligrams per liter
su -standard units
BDL - below detection limit

Crader Pond
Groundwater Analitical Summary

Gas Well: Hill 8-3
API# 05-067-08502

Date Sampled	1/8/2007	
Sample ID	H 8-3	
Time Sampled	1220	Detection Limit
Chloride (mg/L)	160	1
Sulfate (mg/L)	BDL	5
Alkalinity, Bicarbonate (mg/L)	1600	10
Alkalinity, Carbonate (mg/L)	0	0
pH (su)	7.8	
Specific Conductance (umhos/cm)	3100	
Dissolved Solids (mg/L)	1900	1
Arsenic (mg/L)	0.059	0.005
Calcium (mg/L)	49.0	0.5
Magnesium (mg/L)	1.8	0.1
Potassium (mg/L)	11	0.5
Selenium (mg/L)	BDL	0.02
Sodium (mg/L)	750	0.5
Benzene (mg/L)	0.0055	0.0005
Toluene (mg/L)	0.017	0.005
Ethylbenzene (mg/L)	0.00053	0.0005
Total Xylene (mg/L)	0.0057	0.0015

mg/L - milligrams per liter
su -standard units
BDL - below detection limit

Crader Pond
Groundwater Analitical Summary

Gas Well: Hill 5-3
API# 05-067-08391

Date Sampled	1/8/2007	
Sample ID	H 5-3	
Time Sampled	1210	Detection Limit
Chloride (mg/L)	31	1
Sulfate (mg/L)	BDL	5
Alkalinity, Bicarbonate (mg/L)	1400	10
Alkalinity, Carbonate (mg/L)	0	0
pH (su)	8.5	
Specific Conductance (umhos/cm)	2400	
Dissolved Solids (mg/L)	1500	1
Arsenic (mg/L)	BDL	0.005
Calcium (mg/L)	6.2	0.5
Magnesium (mg/L)	0.7	0.1
Potassium (mg/L)	2.9	0.5
Selenium (mg/L)	BDL	0.02
Sodium (mg/L)	580	0.5
Benzene (mg/L)	BDL	0.0005
Toluene (mg/L)	BDL	0.005
Ethylbenzene (mg/L)	BDL	0.0005
Total Xylene (mg/L)	BDL	0.0015

mg/L - milligrams per liter
su -standard units
BDL - below detection limit

Crader Pond
Groundwater Analitical Summary

Gas Well: Hill 5-2
API# 05-067-07762

Date Sampled	1/8/2007	
Sample ID	H 5-2	
Time Sampled	1150	Detection Limit
Chloride (mg/L)	39	1
Sulfate (mg/L)	BDL	5
Alkalinity, Bicarbonate (mg/L)	1300	10
Alkalinity, Carbonate (mg/L)	0	0
pH (su)	8.5	
Specific Conductance (umhos/cm)	2400	
Dissolved Solids (mg/L)	1400	1
Arsenic (mg/L)	BDL	0.005
Calcium (mg/L)	5.3	0.5
Magnesium (mg/L)	0.61	0.1
Potassium (mg/L)	4	0.5
Selenium (mg/L)	BDL	0.02
Sodium (mg/L)	560	0.5
Benzene (mg/L)	BDL	0.0005
Toluene (mg/L)	BDL	0.005
Ethylbenzene (mg/L)	BDL	0.0005
Total Xylene (mg/L)	BDL	0.0015

mg/L - milligrams per liter
su -standard units
BDL - below detection limit

Crader Pond
Groundwater Analitical Summary

Gas Well: St. Ours 1-3
API# 05-067-08501

Date Sampled	**1/8/2007**	
Sample ID	SO 1-3	
Time Sampled	1140	**Detection Limit**
Chloride (mg/L)	110	1
Sulfate (mg/L)	BDL	5
Alkalinity, Bicarbonate (mg/L)	1800	10
Alkalinity, Carbonate (mg/L)	0	0
pH (su)	8.3	
Specific Conductance (umhos/cm)	3400	
Dissolved Solids (mg/L)	2100	1
Arsenic (mg/L)	0.0014	0.005
Calcium (mg/L)	6.3	0.5
Magnesium (mg/L)	1.1	0.1
Potassium (mg/L)	8.3	0.5
Selenium (mg/L)	BDL	0.02
Sodium (mg/L)	790	0.5
Benzene (mg/L)	BDL	0.0005
Toluene (mg/L)	BDL	0.005
Ethylbenzene (mg/L)	BDL	0.0005
Total Xylene (mg/L)	BDL	0.0015

mg/L - milligrams per liter
su -standard units
BDL - below detection limit

Crader Pond
Groundwater Analitical Summary

Gas Well: Royce State 36-1
API# 05-067-06564

Date Sampled	1/8/2007	
Sample ID	RS 36-1	
Time Sampled	1130	Detection Limit
Chloride (mg/L)	66	1
Sulfate (mg/L)	BDL	5
Alkalinity, Bicarbonate (mg/L)	1000	10
Alkalinity, Carbonate (mg/L)	0	0
pH (su)	8.3	
Specific Conductance (umhos/cm)	2000	
Dissolved Solids (mg/L)	1200	1
Arsenic (mg/L)	BDL	0.005
Calcium (mg/L)	6.0	0.5
Magnesium (mg/L)	1.2	0.1
Potassium (mg/L)	2.4	0.5
Selenium (mg/L)	BDL	0.02
Sodium (mg/L)	460	0.5
Benzene (mg/L)	BDL	0.0005
Toluene (mg/L)	BDL	0.005
Ethylbenzene (mg/L)	BDL	0.0005
Total Xylene (mg/L)	BDL	0.0015

mg/L - milligrams per liter
su -standard units
BDL - below detection limit

Crader Pond
Groundwater Analitical Summary

Gas Well: Royce State 36-2
API# 05-06707473

Date Sampled	1/8/2007	
Sample ID	RS 36-2	
Time Sampled	1115	Detection Limit
Chloride (mg/L)	260	1
Sulfate (mg/L)	BDL	5
Alkalinity, Bicarbonate (mg/L)	1700	10
Alkalinity, Carbonate (mg/L)	0	0
pH (su)	8.3	
Specific Conductance (umhos/cm)	3600	
Dissolved Solids (mg/L)	2200	1
Arsenic (mg/L)	0.0062	0.005
Calcium (mg/L)	8.1	0.5
Magnesium (mg/L)	2.1	0.1
Potassium (mg/L)	12	0.5
Selenium (mg/L)	BDL	0.02
Sodium (mg/L)	820	0.5
Benzene (mg/L)	BDL	0.0005
Toluene (mg/L)	BDL	0.005
Ethylbenzene (mg/L)	BDL	0.0005
Total Xylene (mg/L)	BDL	0.0015

mg/L - milligrams per liter
su -standard units
BDL - below detection limit

Crader Pond
Groundwater Analitical Summary

Gas Well: State 36-5
API# 05-067-08400

Date Sampled	**1/8/2007**	
Sample ID	S 36-5	
Time Sampled	1105	**Detection Limit**
Chloride (mg/L)	17	1
Sulfate (mg/L)	BDL	5
Alkalinity, Bicarbonate (mg/L)	830	10
Alkalinity, Carbonate (mg/L)	0	0
pH (su)	8.1	
Specific Conductance (umhos/cm)	1500	
Dissolved Solids (mg/L)	920	1
Arsenic (mg/L)	0.001	0.005
Calcium (mg/L)	3.8	0.5
Magnesium (mg/L)	0.91	0.1
Potassium (mg/L)	9.1	0.5
Selenium (mg/L)	BDL	0.02
Sodium (mg/L)	370	0.5
Benzene (mg/L)	BDL	0.0005
Toluene (mg/L)	BDL	0.005
Ethylbenzene (mg/L)	BDL	0.0005
Total Xylene (mg/L)	BDL	0.0015

mg/L - milligrams per liter
su -standard units
BDL - below detection limit

Crader Pond
Groundwater Analitical Summary

Gas Well: State 36-4
API# 05-067-08401

Date Sampled	1/8/2007	
Sample ID	S 36-4	
Time Sampled	1050	Detection Limit
Chloride (mg/L)	210	1
Sulfate (mg/L)	BDL	5
Alkalinity, Bicarbonate (mg/L)	1200	10
Alkalinity, Carbonate (mg/L)	0	0
pH (su)	8.3	
Specific Conductance (umhos/cm)	2700	
Dissolved Solids (mg/L)	1600	1
Arsenic (mg/L)	0.0014	0.005
Calcium (mg/L)	5.0	0.5
Magnesium (mg/L)	1.5	0.1
Potassium (mg/L)	11	0.5
Selenium (mg/L)	BDL	0.02
Sodium (mg/L)	570	0.5
Benzene (mg/L)	0.00071	0.0005
Toluene (mg/L)	BDL	0.005
Ethylbenzene (mg/L)	BDL	0.0005
Total Xylene (mg/L)	BDL	0.0015

mg/L - milligrams per liter
su -standard units
BDL - below detection limit

Crader Pond
Groundwater Analitical Summary

Gas Well: State 36-2
API# 05-067-07466

Date Sampled	1/8/2007	
Sample ID	S 36-2	
Time Sampled	1015	Detection Limit
Chloride (mg/L)	280	1
Sulfate (mg/L)	BDL	5
Alkalinity, Bicarbonate (mg/L)	1800	10
Alkalinity, Carbonate (mg/L)	0	0
pH (su)	8.4	
Specific Conductance (umhos/cm)	3800	
Dissolved Solids (mg/L)	2300	1
Arsenic (mg/L)	0.006	0.005
Calcium (mg/L)	13.0	0.5
Magnesium (mg/L)	1.9	0.1
Potassium (mg/L)	4.7	0.5
Selenium (mg/L)	BDL	0.02
Sodium (mg/L)	860	0.5
Benzene (mg/L)	BDL	0.0005
Toluene (mg/L)	BDL	0.005
Ethylbenzene (mg/L)	BDL	0.0005
Total Xylene (mg/L)	BDL	0.0015

mg/L - milligrams per liter
su -standard units
BDL - below detection limit

Crader Pond
Groundwater Analitical Summary

Gas Well: Crader 3-2
API# 05-067-07759

Date Sampled	**1/9/2007**	
Sample ID	C 3-2	
Time Sampled	1010	**Detection Limit**
Chloride (mg/L)	380	1
Sulfate (mg/L)	BDL	5
Alkalinity, Bicarbonate (mg/L)	1200	10
Alkalinity, Carbonate (mg/L)	0	0
pH (su)	7.9	
Specific Conductance (umhos/cm)	3200	
Dissolved Solids (mg/L)	1800	1
Arsenic (mg/L)	BDL	0.005
Calcium (mg/L)	12.0	0.5
Magnesium (mg/L)	2.1	0.1
Potassium (mg/L)	5.1	0.5
Selenium (mg/L)	BDL	0.02
Sodium (mg/L)	700	0.5
Benzene (mg/L)	0.0023	0.0005
Toluene (mg/L)	BDL	0.005
Ethylbenzene (mg/L)	BDL	0.0005
Total Xylene (mg/L)	0.0044	0.0015

mg/L - milligrams per liter
su -standard units
BDL - below detection limit

Crader Pond
Groundwater Analitical Summary

Gas Well: Montoya 10-3
API# 05-06708845

Date Sampled	1/9/2007	
Sample ID	M 10-3	
Time Sampled	1100	Detection Limit
Chloride (mg/L)	1400	1
Sulfate (mg/L)	BDL	5
Alkalinity, Bicarbonate (mg/L)	2200	10
Alkalinity, Carbonate (mg/L)	0	0
pH (su)	7.9	
Specific Conductance (umhos/cm)	7700	
Dissolved Solids (mg/L)	4600	1
Arsenic (mg/L)	0.0083	0.005
Calcium (mg/L)	14.0	0.5
Magnesium (mg/L)	3.2	0.1
Potassium (mg/L)	12	0.5
Selenium (mg/L)	BDL	0.02
Sodium (mg/L)	1700	0.5
Benzene (mg/L)	0.0013	0.0005
Toluene (mg/L)	BDL	0.005
Ethylbenzene (mg/L)	BDL	0.0005
Total Xylene (mg/L)	0.0037	0.0015

mg/L - milligrams per liter
su -standard units
BDL - below detection limit

Crader Pond
Groundwater Analitical Summary

Gas Well: Mason 2-4
API# 05-067-08667

Date Sampled	**1/9/2007**	
Sample ID	M 2-4	
Time Sampled	0935	**Detection Limit**
Chloride (mg/L)	160	1
Sulfate (mg/L)	BDL	5
Alkalinity, Bicarbonate (mg/L)	1700	10
Alkalinity, Carbonate (mg/L)	0	0
pH (su)	8.2	
Specific Conductance (umhos/cm)	3300	
Dissolved Solids (mg/L)	2000	1
Arsenic (mg/L)	BDL	0.005
Calcium (mg/L)	8.0	0.5
Magnesium (mg/L)	2	0.1
Potassium (mg/L)	20	0.5
Selenium (mg/L)	BDL	0.02
Sodium (mg/L)	800	0.5
Benzene (mg/L)	0.0041	0.0005
Toluene (mg/L)	BDL	0.005
Ethylbenzene (mg/L)	BDL	0.0005
Total Xylene (mg/L)	0.003	0.0015

mg/L - milligrams per liter
su -standard units
BDL - below detection limit

Crader Pond
Groundwater Analitical Summary

Gas Well: Montoya 10-2
API# 05-067-07785

Date Sampled	1/9/2007	
Sample ID	M 10-2	
Time Sampled	1045	**Detection Limit**
Chloride (mg/L)	48	1
Sulfate (mg/L)	BDL	5
Alkalinity, Bicarbonate (mg/L)	1700	10
Alkalinity, Carbonate (mg/L)	0	0
pH (su)	7.8	
Specific Conductance (umhos/cm)	3000	
Dissolved Solids (mg/L)	1800	1
Arsenic (mg/L)	BDL	0.005
Calcium (mg/L)	9.8	0.5
Magnesium (mg/L)	2	0.1
Potassium (mg/L)	6.1	0.5
Selenium (mg/L)	BDL	0.02
Sodium (mg/L)	740	0.5
Benzene (mg/L)	0.00076	0.0005
Toluene (mg/L)	BDL	0.005
Ethylbenzene (mg/L)	BDL	0.0005
Total Xylene (mg/L)	0.0062	0.0015

mg/L - milligrams per liter
su -standard units
BDL - below detection limit

Crader Pond
Groundwater Analitical Summary

Gas Well: Eagles 1-2
API# 05-067-07086

Date Sampled	1/9/2007	
Sample ID	E 1-2	
Time Sampled	0835	Detection Limit
Chloride (mg/L)	320	1
Sulfate (mg/L)	BDL	5
Alkalinity, Bicarbonate (mg/L)	2200	10
Alkalinity, Carbonate (mg/L)	0	0
pH (su)	8.2	
Specific Conductance (umhos/cm)	4700	
Dissolved Solids (mg/L)	2900	1
Arsenic (mg/L)	BDL	0.005
Calcium (mg/L)	7.5	0.5
Magnesium (mg/L)	1.6	0.1
Potassium (mg/L)	9.6	0.5
Selenium (mg/L)	BDL	0.02
Sodium (mg/L)	1100	0.5
Benzene (mg/L)	0.001	0.0005
Toluene (mg/L)	BDL	0.005
Ethylbenzene (mg/L)	BDL	0.0005
Total Xylene (mg/L)	0.0039	0.0015

mg/L - milligrams per liter
su -standard units
BDL - below detection limit

Crader Pond
Groundwater Analitical Summary

Gas Well: Federal 3-1
API# 05-067-07086

Date Sampled	1/9/2007	
Sample ID	F 3-1	
Time Sampled	1020	Detection Limit
Chloride (mg/L)	180	1
Sulfate (mg/L)	BDL	5
Alkalinity, Bicarbonate (mg/L)	2000	10
Alkalinity, Carbonate (mg/L)	0	0
pH (su)	8.1	
Specific Conductance (umhos/cm)	3500	
Dissolved Solids (mg/L)	2100	1
Arsenic (mg/L)	BDL	0.005
Calcium (mg/L)	8.9	0.5
Magnesium (mg/L)	2	0.1
Potassium (mg/L)	5	0.5
Selenium (mg/L)	BDL	0.02
Sodium (mg/L)	860	0.5
Benzene (mg/L)	0.00078	0.0005
Toluene (mg/L)	BDL	0.005
Ethylbenzene (mg/L)	BDL	0.0005
Total Xylene (mg/L)	0.0046	0.0015

mg/L - milligrams per liter
su -standard units
BDL - below detection limit

Crader Pond
Groundwater Analitical Summary

Gas Well: Burnett 2-1
API# 05-067-07769

Date Sampled	1/9/2007	
Sample ID	B 2-1	
Time Sampled	0905	Detection Limit
Chloride (mg/L)	330	1
Sulfate (mg/L)	BDL	5
Alkalinity, Bicarbonate (mg/L)	1700	10
Alkalinity, Carbonate (mg/L)	0	0
pH (su)	8.1	
Specific Conductance (umhos/cm)	4000	
Dissolved Solids (mg/L)	2400	1
Arsenic (mg/L)	BDL	0.005
Calcium (mg/L)	9.7	0.5
Magnesium (mg/L)	2	0.1
Potassium (mg/L)	18	0.5
Selenium (mg/L)	BDL	0.02
Sodium (mg/L)	940	0.5
Benzene (mg/L)	0.0012	0.0005
Toluene (mg/L)	BDL	0.005
Ethylbenzene (mg/L)	BDL	0.0005
Total Xylene (mg/L)	0.0028	0.0015

mg/L - milligrams per liter
su -standard units
BDL - below detection limit

Crader Pond
Groundwater Analitical Summary

Gas Well: Crader 2-3
API# 05-067-08398

Date Sampled	1/9/2007	
Sample ID	C 2-3	
Time Sampled	1000	Detection Limit
Chloride (mg/L)	70	1
Sulfate (mg/L)	61	5
Alkalinity, Bicarbonate (mg/L)	BDL	10
Alkalinity, Carbonate (mg/L)	1400	0
pH (su)	8.1	
Specific Conductance (umhos/cm)	2600	
Dissolved Solids (mg/L)	1500	1
Arsenic (mg/L)	BDL	0.005
Calcium (mg/L)	11.0	0.5
Magnesium (mg/L)	2	0.1
Potassium (mg/L)	8.6	0.5
Selenium (mg/L)	BDL	0.02
Sodium (mg/L)	630	0.5
Benzene (mg/L)	BDL	0.0005
Toluene (mg/L)	BDL	0.005
Ethylbenzene (mg/L)	BDL	0.0005
Total Xylene (mg/L)	BDL	0.0015

mg/L - milligrams per liter
su -standard units
BDL - below detection limit

Crader Pond
Groundwater Analitical Summary

Gas Well: Crader 2-2
API# 05-067-07757

Date Sampled	1/9/2007	
Sample ID	C 2-2	
Time Sampled	0940	Detection Limit
Chloride (mg/L)	150	1
Sulfate (mg/L)	BDL	5
Alkalinity, Bicarbonate (mg/L)	1400	10
Alkalinity, Carbonate (mg/L)	0	0
pH (su)	7.9	
Specific Conductance (umhos/cm)	2500	
Dissolved Solids (mg/L)	1500	1
Arsenic (mg/L)	BDL	0.005
Calcium (mg/L)	9.7	0.5
Magnesium (mg/L)	1.8	0.1
Potassium (mg/L)	11	0.5
Selenium (mg/L)	BDL	0.02
Sodium (mg/L)	600	0.5
Benzene (mg/L)	0.0021	0.0005
Toluene (mg/L)	BDL	0.005
Ethylbenzene (mg/L)	0.0014	0.0005
Total Xylene (mg/L)	0.01	0.0015

mg/L - milligrams per liter
su -standard units
BDL - below detection limit

Crader Pond
Groundwater Analitical Summary

Gas Well: Federal 4-1
API# 05-067-07513

Date Sampled	1/9/2007	
Sample ID	F 4-1	
Time Sampled	1030	Detection Limit
Chloride (mg/L)	70	1
Sulfate (mg/L)	BDL	5
Alkalinity, Bicarbonate (mg/L)	1900	10
Alkalinity, Carbonate (mg/L)	0	0
pH (su)	8	
Specific Conductance (umhos/cm)	3100	
Dissolved Solids (mg/L)	1900	1
Arsenic (mg/L)	BDL	0.005
Calcium (mg/L)	12.0	0.5
Magnesium (mg/L)	2.1	0.1
Potassium (mg/L)	0.022	0.5
Selenium (mg/L)	0.02	0.02
Sodium (mg/L)	760	0.5
Benzene (mg/L)	0.0015	0.0005
Toluene (mg/L)	BDL	0.005
Ethylbenzene (mg/L)	BDL	0.0005
Total Xylene (mg/L)	0.0053	0.0015

mg/L - milligrams per liter
su -standard units
BDL - below detection limit

ATTACHMENT H

FINANCIAL ASSURANCE

CRADER POND WATER TREATMENT FACILITY

Please refer to Form 3 submitted to the COGCC, on behalf of Chevron Midcontinent, LP, for bond number 6452185.

ATTACHMENT I

CLOSURE PLAN

CRADER POND WATER TREATMENT FACILITY

The estimated life of the facility is between 10 and 20 years. Reclamation will consist of the following:

- Removal of all surface equipment.
- Restoration to approximate original conditions.
- Complying with all prevailing COGCC and La Plata County regulations governing final reclamation.

Financial assurance in the amount of $50,000 per rule 704 is provided in Attachment H and is intended to be sufficient to guarantee the proper reclamation, closure and abandonment of the facility.

ATTACHMENT J

LOCAL GOVERNMENT ZONING COMPLIANCE & LOCAL GOVERNMENT PERMITS AND NOTICE

CRADER POND WATER TREATMENT FACILITY

The facility modifications are currently permitted under the authority of La Plata County via Administrative Approval and include the conditions set by the county listed in Attachment F. Chevron will maintain compliance with the conditions of the county authorization and the operator will be familiar with the conditions placed on the operations of the facility.

A copy of the letter from La Plata County is attached here for reference.

LA PLATA COUNTY
PLANNING DEPARTMENT
970.382.6263 • FAX 970.382.6298• TDD 970.382.6218

January 22, 2007

Cordilleran Compliance Services
Attention: Ken Kreie
826 21 ½ Road
Grand Junction, CO 81505

RE: Chevron USA Inc., Crader Pond Major Facility Modification

Dear Mr. Kreie:

La Plata County hereby administratively approves Chevron's request for a Modification to the subject facility subject to certain conditions of approval. The Modification shall include the installation of the following equipment:

- One 20 hp pump
- 20 jet nozzles and associated piping and valves

Conditions of Approval:

- Install a high water level shut off valve to ensure that two feet of freeboard is maintained in the pond at all times
- Install wind monitoring equipment and an actuated jet nozzle control valve to control wind drift
- Electrify the entire facility within six months of the date of this letter
- Spray from the jet nozzles shall not exceed seven feet in height
- Noise levels shall be in compliance with state residential noise standards
- If odors are detected from the facility, then mitigation efforts shall be taken immediately

1060 E. 2ND AVE. • DURANGO, CO • 81301

Please note that this Modification is contingent upon there being no adverse land use impacts from the subject facility as defined by the La Plata Land Use Code. If adverse land use impacts arise, then a subsequent Modification may be required. Please call with any questions or comments you may have.

Sincerely:
LA PLATA COUNTY COMMUNITY DEVELOPMENT DEPT.

Chandler Marechal
Oil and Gas Planner

ATTACHMENT K

SURFACE OWNER AUTHORIZATION

CRADER POND WATER TREATMENT FACILITY

HEP Pure, L.P.
500 West Illinois
Midland, TX 79701

October 3, 2005

Ms. Rowean Crader
Crader Properties, LLC
28481 State Highway 160
Durango, CO 81301

Re: Crader Pond Indenture

Dear Ms. Crader,

Reference is made to that certain Indenture dated November 1, 1990, by and between Crader Properties & Investments, Lessor, and K/M Water Services, now HEP Pure, L.P. successor to Hallwood Energy Corporation, Lessee. By Letter Agreement dated August 18, 2000, Crader Properties & Investments, now Crader Properties, LLC, renewed, and extended said Indenture for an additional five (5) years ending November 1, 2005 and increased the annual rental to $7,500.00.

It is the desire of Crader Properties, LLC and HEP Pure, L.P. to renew and extend said Indenture for an additional five (5) years ending November 1, 2010. Now therefore, in consideration of the mutual covenants and agreements contained herein and other valuable consideration, Crader Properties, LLC hereby renews and extends the Indenture, as amended, until November 1, 2010, all other terms and conditions of said Indenture remain unchanged.

As indication of renewal and extension of the Indenture by Crader Properties, LLC please sign in the space provided below and return one original of this letter to the undersigned.

Very truly yours,

Barry McKay
Land Manager

EXTENDED AND RENEWED this 11 day of October, 2005

By: Rowean Crader, Mgr. Crader Properties LLC
Crader Properties, LLC

Hallwood Energy Corporation

4610 South Ulster Street · Suite 200 -- P.O. Box 378111
Denver, Colorado 80237 - (303) 850-7373

August 18, 2000

Crader Properties LLC
28481 US Hwy 160
Durango, CO 81301
Attn: Rowean Crader

Re: Crader Pond Letter Agreement 11/1/90
La Plata County, CO

Dear Ms. Crader:
Enclosed is Hallwood's check in the amount of $23,500 which represents the annual rental and usage fee for the Crader Pond. This payment is being made pursuant to the terms of the Agreement between Crader Properties & Investments and K/M Water Services dated November 1, 1990 ("Disposal Agreement").

Please note that Hallwood has elected to renew the Disposal Agreement for an additional five years commencing November 1, 2000. The enclosed payment reflects the increased annual rental of $7500 per year and the disposal fees for the wells producing water into the evaporation pond as calculated on the attached spreadsheet.

Please indicate your receipt of this payment along with your acknowledgement that this Disposal Agreement has been renewed for a five year period beginning November 1, 2000 through November 1, 2005.

Sincerely,
HALLWOOD ENERGY CORPORATION

Connie Heath
Land Manager

ACCEPTED AND AGREED TO THIS 21st DAY OF Sept, 2000.
By: Rowean Crader
Crader Properties LLC

Hallwood Energy Corporation

4610 South Ulster Street • Suite 200 • P.O. Box 378111
Denver, Colorado 80237 • (303) 850-7373

August 18, 2000

Crader Properties LLC
28481 US Hwy 160
Durango, CO 81301
Attn: Rowean Crader

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La Plata County, CO

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Please indicate your receipt of this payment along with your acknowledgement that this Disposal Agreement has been renewed for a five year period beginning November 1, 2000 through November 1, 2005.

Sincerely,
HALLWOOD ENERGY CORPORATION

Connie Heath
Land Manager

ACCEPTED AND AGREED TO THIS 30 DAY OF August, 2000.
By: Rowean Crader Mgr
Crader Properties LLC

WATER PRODUCTION SED/SFC 2000

WELLS	TOTAL /WELL	AVERAGE /WELL	AMOUNT OWED
CHANEY 1-1	35,003	168	$1,000
LA PALOMA 1-2	26,395	127	$1,000
BURNETT 2-1	17,051	82	$1,000
CRADER 2-2	20,878	106	$1,000
FEDERAL 3-1	8,397	44	$1,000
CRADER 3-2	9,711	46	$1,000
FEDERAL 4-1	5,550	29	$1,000
HILL 5-2	53,005	251	$2,000
CLARK 7-1	55,726	265	$2,000
FRIZELL 7-2	23,002	108	$1,000
HILL 8-2	9,460	45	$1,000
MONTOYA 10-2	6,942	36	$1,000
ROYCE STATE 36-2	20,226	95	$1,000
STATE 36-2	31,529	150	$1,000
YEARLY TOTAL			$16,000
BASE CHARGE			$7,500
GRAND TOTAL			$23,500