

FORM  
4  
Rev 12/05

## State of Colorado

## Oil and Gas Conservation Commission

1120 Lincoln Street, Suite 801, Denver, Colorado 80203 Phone: (303)894.2100 Fax: (303)894.2109



## SUNDRY NOTICE

Submit original plus one copy. This form is to be used for general, technical and environmental sundry information. For proposed or completed operations, describe in full on Technical Information Page (Page 2 of this form.) Identify well or other facility by API Number or by OGCC Facility ID. Operator shall send an informational copy of all sundry notices for wells located in High Density Areas to the Local Government Designee (Rule 603b)

CEP Fac. ID = 149015

1. OGCC Operator Number: 96850	4. Contact Name: Karolina Blaney	Complete the Attachment Checklist
2. Name of Operator: WPX Energy Rocky Mountain LLC	Phone: 970 683 2295	
3. Address: 1058 County Road 215	Fax: 970 285 9573	OP OGCC
City: Parachute State: CO Zip: 81635		
5. API Number 05-NA	OGCC Facility ID Number 426956	Survey Plat
6. Well/Facility Name:	7. Well/Facility Number Grand Valley Pit #3	Directional Survey
8. Location (Qtr/Sec, Twp, Rng, Meridian): NWNW S1 T7S R96W 6 6TH P.M		Surface Eqpm Diagram
9. County: Garfield	10. Field Name: Grand Valley	Technical Info Page
11. Federal, Indian or State Lease Number:		Other

## General Notice

<input type="checkbox"/> CHANGE OF LOCATION: Attach New Survey Plat (a change of surface qtr/qtr is substantive and requires a new permit)	
Change of Surface Footage from Exterior Section Lines:	<input type="checkbox"/> FNL/FSL <input type="checkbox"/> FEL/FWL
Change of Surface Footage to Exterior Section Lines:	
Change of Bottomhole Footage from Exterior Section Lines:	
Change of Bottomhole Footage to Exterior Section Lines:	attach directional survey
Bottomhole location: Qtr/Sec, Twp, Rng, Mer	
Latitude 39.469051	Distance to nearest property line
Longitude -108.065970	Distance to nearest bldg, public rd, utility or RR
Ground Elevation	Distance to nearest lease line
	Is location in a High Density Area (rule 603b)? Yes/No
	Surface owner consultation date:
GPS DATA:	
Date of Measurement	PDOP Reading Instrument Operator's Name
<input type="checkbox"/> CHANGE SPACING UNIT	<input type="checkbox"/> Remove from surface bond
Formation Formation Code Spacing order number Unit Acreage Unit configuration	Signed surface use agreement attached
<input type="checkbox"/> CHANGE OF OPERATOR (prior to drilling):	<input type="checkbox"/> CHANGE WELL NAME
Effective Date:	NUMBER
Plugging Bond: <input type="checkbox"/> Blanket <input type="checkbox"/> Individual	From:
	To:
	Effective Date:
<input type="checkbox"/> ABANDONED LOCATION:	<input type="checkbox"/> NOTICE OF CONTINUED SHUT IN STATUS
Was location ever built? <input type="checkbox"/> Yes <input type="checkbox"/> No	Date well shut in or temporarily abandoned:
Is site ready for inspection? <input type="checkbox"/> Yes <input type="checkbox"/> No	Has Production Equipment been removed from site? <input type="checkbox"/> Yes <input type="checkbox"/> No
Date Ready for Inspection:	MIT required if shut in longer than two years. Date of last MIT
<input type="checkbox"/> SPUD DATE:	<input type="checkbox"/> REQUEST FOR CONFIDENTIAL STATUS (5 mos from date casing set)
<input type="checkbox"/> SUBSEQUENT REPORT OF STAGE, SQUEEZE OR REMEDIAL CEMENT WORK	
Method used	Cementing tool setting/perf depth
Cement volume	Cement top
Cement bottom	Date
<input type="checkbox"/> RECLAMATION: Attach technical page describing final reclamation procedures per Rule 1004.	
Final reclamation will commence on approximately	
<input type="checkbox"/> Final reclamation is completed and site is ready for inspection.	

## Technical Engineering/Environmental Notice

<input type="checkbox"/> Notice of Intent	<input type="checkbox"/> Report of Work Done
Approximate Start Date:	Date Work Completed:
Details of work must be described in full on Technical Information Page (Page 2 must be submitted.)	
<input type="checkbox"/> Intent to Recomplete (submit form 2)	<input type="checkbox"/> Request to Vent or Flare
<input type="checkbox"/> Change Drilling Plans	<input type="checkbox"/> Repair Well
<input type="checkbox"/> Gross Interval Changed?	<input type="checkbox"/> Rule 502 variance requested
<input type="checkbox"/> Casing/Cementing Program Change	<input checked="" type="checkbox"/> Other: Form 15 COAs
<input type="checkbox"/> E&P Waste Disposal	
<input type="checkbox"/> Beneficial Reuse of E&P Waste	
<input type="checkbox"/> Status Update/Change of Remediation Plans	
for Spills and Releases	

I hereby certify that the statements made in this form are, to the best of my knowledge, true, correct and complete.

Signed: Karolina Blaney

Date: 2/29/2012

Email: Karolina.Blaney@Williams.com

Print Name: Karolina Blaney

Title: Environmental Specialist

COGCC Approved:

Title:

Date:

CONDITIONS OF APPROVAL, IF ANY:

None

TECHNICAL INFORMATION PAGE



FOR OGCC USE ONLY

1. OGCC Operator Number: \_\_\_\_\_ API Number: \_\_\_\_\_

2. Name of Operator: \_\_\_\_\_ OGCC Facility ID # \_\_\_\_\_

3. Well/Facility Name: \_\_\_\_\_ Well/Facility Number: \_\_\_\_\_

4. Location (QtrQtr, Sec, Twp, Rng, Meridian): \_\_\_\_\_

This form is to be completed whenever a Sundry Notice is submitted requiring detailed report of work to be performed or completed. This form shall be transmitted within 30 days of work completed as a "subsequent" report and must accompany Form 4, page 1.

5.

DESCRIBE PROPOSED OR COMPLETED OPERATIONS

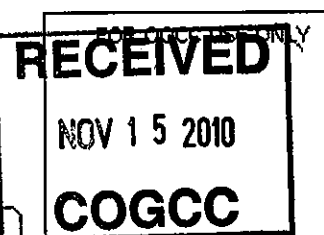
## Attachment A

Approved Form 15

01949098

**State of Colorado**  
**Oil and Gas Conservation Commission**

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



**EARTHEN PIT REPORT/PERMIT**

This form is to be used for both reporting and permitting pits. Rule 903 describes when a Permit with prior approval, or a Report within 30 days, is required for pits. Submit required attachments and forms.

**Complete the Attachment Checklist**

*AK*

**FORM SUBMITTED FOR:**

☒ **Pit Report**

☐ **Pit Permit**

Oper OGCC

Detailed Site Plan	<input checked="" type="checkbox"/>	
Topo Map w/ Pit Location	<input checked="" type="checkbox"/>	
Water Analysis (Form 26)		
Source Wells (Form 26)		
Pit Design/Plan & Cross Sec	<input checked="" type="checkbox"/>	
Design Calculations	<input checked="" type="checkbox"/>	
Sensitive Area Determin.	<input checked="" type="checkbox"/>	
Mud Program		
Form 2A		

OGCC Operator Number: 96850  
Name of Operator: Williams Production RMT  
Address: 1058 County Rd 215  
City: Parachute State: CO Zip: 81635

Contact Name and Telephone:  
Karolina Blaney  
No: 970 683-2295  
Fax: (970) 285-9573

API Number (of associated well): NA OGCC Facility ID (of other associated facility): 149015 = Fac. ID

Pit Location (Qtr Qtr, Sec, Twp, Rng, Meridian): S1, T7S, R96W, 6TH P.M. *NEW NW Sec 1*

Latitude: 39-28-16.71"N 39.469651 Longitude: 108-03-55.27"W 108.065376 County: GARFIELD

Pit Use: ☒ Production ☐ Drilling (Attach mud program) ☐ Special Purpose (Describe Use): \_\_\_\_\_

Pit Type: ☒ Lined ☐ Unlined Surface Discharge Permit: ☐ Yes ☒ No

Offsite disposal of pit contents: ☒ Injection ☐ Commercial Pit/Facility Name: GRAND VALLEY PIT 3 Pit/Facility No: 43

**Attach Form 26 to identify Source Wells and Form 26 to provide Produced Water Analysis results.**

**Existing Site Conditions**

Is the location in a "Sensitive Area?" ☐ Yes ☒ No **Attach data used for determination.**

Distance (in feet) to nearest surface water: 2097 ground water: 15' to 16' water wells: 2546

**LAND USE (or attach copy of Form 2A if previously submitted for associated well) Select one which best describes land use:**

Crop Land: ☐ Irrigated ☐ Dry Land ☐ Improved Pasture ☐ Hay Meadow ☐ CRP  
Non-Crop Land: ☒ Rangeland ☐ Timber ☐ Recreational ☐ Other (describe): \_\_\_\_\_  
Subdivided: ☐ Industrial ☐ Commercial ☐ Residential

**SOILS (or attach copy of Form 2A if previously submitted for associated well)**

Soil map units from USNRCS survey: Sheet No: NA Soil Complex/Series No: 57  
Soils Series Name: 57-POTTS-LIDEFONSO COMPLEX Horizon thickness (in inches): A: 0-4 ; B: 4-28 ; C: 28-60  
Soils Series Name: 35-LIDEFONSO-LAZEAR COMPLEX Horizon thickness (in inches): A: 0-8 ; B: 8-60 ; C: \_\_\_\_\_

**Attach detailed site plan and topo map with pit location.**

**Pit Design and Construction**

Size of pit (feet): Length: 223.4 Width: 166.5 Depth: 15  
Calculated pit volume (bbls): 66,269 Daily inflow rate (bbls/day): VARIABLE  
Daily disposal rates (attach calculations): Evaporation: NA bbls/day Percolation: NA bbls/day  
Type of liner material: SYNTHETIC POLYPROPYLENE ethylene RTR Thickness: 60 MIL

**Attach description of proposed design and construction (include sketches and calculations).**

Method of treatment of produced water prior to discharge into pit (separator, heater treater, other): NA

Is pit fenced? ☒ Yes ☐ No Is pit netted? ☒ Yes ☐ No

I hereby certify that the statements made in this form are, to the best of my knowledge, true, correct, and complete.

Print Name: Karolina Blaney Signed: Karolina Blaney  
Title: Environmental Specialist Date: 11/8/2010

OGCC Approved: [Signature] Title: Env. Supervisor Date: 1/4/2012

CONDITIONS OF APPROVAL, IF ANY:

**FACILITY NUMBER: 426956**

*See Attached Conditions of Approval*



Conditions of Approval – January 4, 2012

*prz*

Grand Valley Pit # 3; Facility ID: 426956

Pit is constructed in fill. Provide a Professional Engineer (P.E.) stamped review of the as-built construction of the pit and integrity of the pit.

Provide the as-built construction details.

The date provided on the "Sub Grade Acceptance" is the same for the Grand Valley Pit 1, Grand Valley Pit 2, and Grand Valley Pit 3. It appears that the "Sub Grade Acceptance" is applicable for Grand Valley 3. Provide an engineering evaluation (by a P.E.) of the liner installation and "Sub Grade Acceptance."

Provide the historical use and maintenance of the pit.

Provide documentation detailing the historical use and maintenance of the pit, including a timeline of significant maintenance events conducted.

Provide an operation and maintenance (O & M) plan and schedule for the pit.

Provide the daily inflow rate and description of how total fluids management is monitored to evaluate for potential loss through the liner system.

Conduct a 72-hour (minimum) hydrostatic integrity test of the liner system and submit a P.E. review and evaluation of the results of the test.

Leak detection is required for this pit (Rule 904.e.). Provide design and implementation details for leak detection system.

Provide the geologic/hydrogeologic evaluation of the facility which was provided to Garfield County.

*Submit requested information above by March 1, 2012.*  
*prz*

## Attachment B

Professional Engineer stamped review of the as-built construction and integrity of the pit

As-built construction details

Engineering evaluation of the liner installation and Sub Grade Acceptance

February 28, 2012

**WPX Energy Rocky Mountain, LLC**  
**1058 County Road 215**  
**Parachute, CO 81635**

**Attention:** Ms. Karolina Blaney  
**Email:** [Karolina.Blaney@williams.com](mailto:Karolina.Blaney@williams.com)  
**Wk:** 970-683-2295

**Subject:** Engineering Consultation- Existing Pits  
**Grand Valley Pit #1, #2 and #3**  
**Garfield County, Colorado**  
**Terracon Job No. AD125007**

**Ms. Blaney,**

As requested, the Terracon Engineer visited the subject site and made measurements and observations on February 17 and 23, 2012 and reviewed construction reports of the subject ponds/liners in preparation of this report. The purpose of our review was to determine the conditions of the liner compliance with the attached COGCC Form 15 approval as follows for each pit:

1. P.E. stamped review of the as-built construction of the pit and integrity of the pit considering existing fill, and
2. Evaluation of the liner installation and "Sub Grade Acceptance".

## **Site Conditions**

At the time of our visits, the subject pits were existing and operational. GV Pit #1 exterior included a synthetic liner cover. GV Pits #2 and #3 had wildlife netting cover. The area surrounding the subject site can be characterized as largely vacant, semi arid and barren. We found no seeps or other non man made water sources in the immediate vicinity. The subject site is located in a sloping valley floor that drops down toward the south and west. Therefore the resulting locations of maximum fill are on the southwest ends of the pits. We visually found up to 15 feet of fill at pit#1, about 10 feet of fill at pit#2 and up to 12 feet fill thickness at pit#3.



The pits were each found as described in the documents we reviewed. The pits and associated liners were found to be free of apparent damages. We observed the existing liner surface appeared to be in good condition. We did not identify punctures, tears or stress in the three pit liners.

Review of construction documents indicates compaction testing was performed during construction of the liner subgrade level in each of the pits. Three locations at pit#1, 3 locations at pit#2 and two locations at pit#3 liner subgrade were tested and met generally accepted construction practice at the level and time tested (reference attached Lambert and Associates test reports dated May 28, 2009).

Site embankment fills such as in the southwest end of the pits and the dividing areas between pits were not tested. Construction documents (reference Uintah Engineering and Land Surveying, AS-BUILT drawings dated October 28, 2010 for each pit, attached) show existing embankment fill depths varying up to 5 to 10 feet at each of the pits. In our opinion, the amount of time since construction of 2 ½ years with no apparent damages and the level of 24 hour operational monitoring at this site indicate it is very unlikely that any one time event could damage the existing fill to cause a release. However, we do not recommend construction on the embankments unless foundation engineering considers the existence of man made fill. We also believe that a reoccurring yearly reobservation is warranted. We recommend the observations be performed by a Colorado registered P.E. to check for evidence of ongoing fill consolidation or liner tension, considering the lack of construction documentation of fills at the subject site.

The Terracon engineer walked the entire perimeter of each pit#2, and pit#3 and inspected the liner from the anchor trench to the water level. The liners were found to be in excellent condition with no signs of deterioration, tears, or punctures. No protruding or bulging areas were observed on the surface of the liner. All seams were reported to be factory seamed; appeared to be professionally welded and there were no signs of separation or de-lamination. The liner appeared to be properly installed in the anchor trench and backfilled correctly. Normal slack in the liner material was observed. Pit#1 had a synthetic cover and therefore the liner was not accessible. However the above comments are also applicable of our observations of the pit#1 cover.

We reviewed the "Sub Grade Acceptance" forms included in the attached file and talked to the MB Construction representative, Richard Teninty who signed the form at time of completion of construction. We understand the 'acceptance' was based on an observation the soil liner grade did not have sharp protruding points or obvious holes immediately prior to liner lay down. It does not apply to potential underlying support issues.

Review of liner Daily Installation Reports by ClearWater Construction dated Pit#1 (5-29 thru 31, 2009), Pit#2 (6-2,4,5,6,7, 8, 9, and 10, 2009) and Pit#3 (6-12,13, 14 and 15, 2009) indicates the installation including field welds and field tests met our understanding of liner specifications and generally accepted construction practices.

### **Compliance with Form 15 Approval Conditions**

Based on our observations, measurements and review, the subject liners appear to have been installed per the manufacturer's installation recommendations and performing satisfactorily for the last 2 ½ years since construction. We believe the Grand Valley pits#1, 2, and 3 are constructed in accordance with industry standards. Therefore, regarding

1. P.E. stamped review of the as-built construction of the pit and integrity of the pit considering existing fill

The information and limitations contained in this report serves as our review of the as-built construction. Considering existing fill, we believe a reoccurring yearly reobservation made by a Colorado licensed P.E., as described above to check for evidence of fill consolidation, is warranted. The next item,

2. Evaluation of the liner installation and "Sub Grade Acceptance".

As noted above, the attached "Sub Grade Acceptance" forms for each subject pit apply to the observation made immediately prior to lay down of the synthetic liner. We do not believe additional work is warranted at this time in regards to these observations.

We believe this investigation was conducted in a manner consistent with that level of care and skill ordinarily used by geotechnical engineers practicing in this area at this time. No other warranty, either express or implied, is made.

**Engineering Consultation**

Grand Valley Water Management Pits #1, #2 and #3 ■

February 28, 2012 ■ Terracon Job No. AD125007



Sincerely,  
Terracon Consultants, Inc.



**John P. Withers, P.E.**  
**Principal Engineer**

1copy sent

Jpw:jpw

1copy emailed

1cc emailed [david.fox@williams.com](mailto:david.fox@williams.com)

Attachment:

Documents Reviewed in Preparation of Engineering Consultation

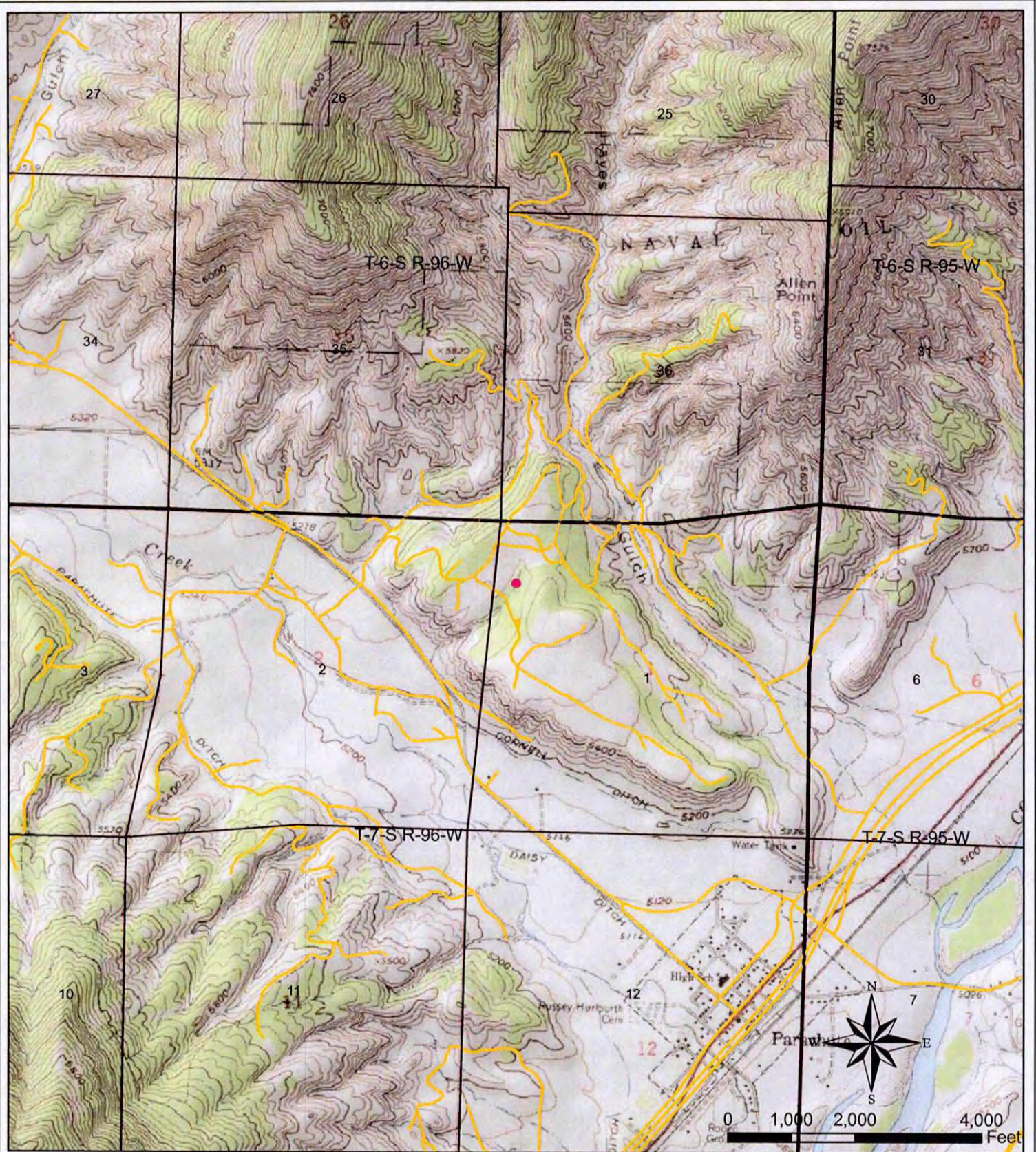
Grand Valley Pit #1

Grand Valley Pit #2

Grand Valley Pit #3

### **Grand Valley Pit #3 Data**





**Legend**

- Pit
- Road

Williams Production RMT

Pit Location Map



March 18, 2009



WILLIAMS PRODUCTION RMT  
PARACHUTE WATER HANDLING FACILITY

POND #3 (AS-BUILT DRAWING)

LOCATED IN THE SW 1/4 NW 1/4 OF  
SECTION 1, T7S, R96W, 6th P.M.

SHEET 1 OF 2

100' 50' 0'  
SCALE: HORIZONTAL  
& VERTICAL  
DATE: 10-28-10  
Drawn By: D.G.W.



WILLIAMS PRODUCTION RMT  
PARACHUTE WATER HANDLING FACILITY

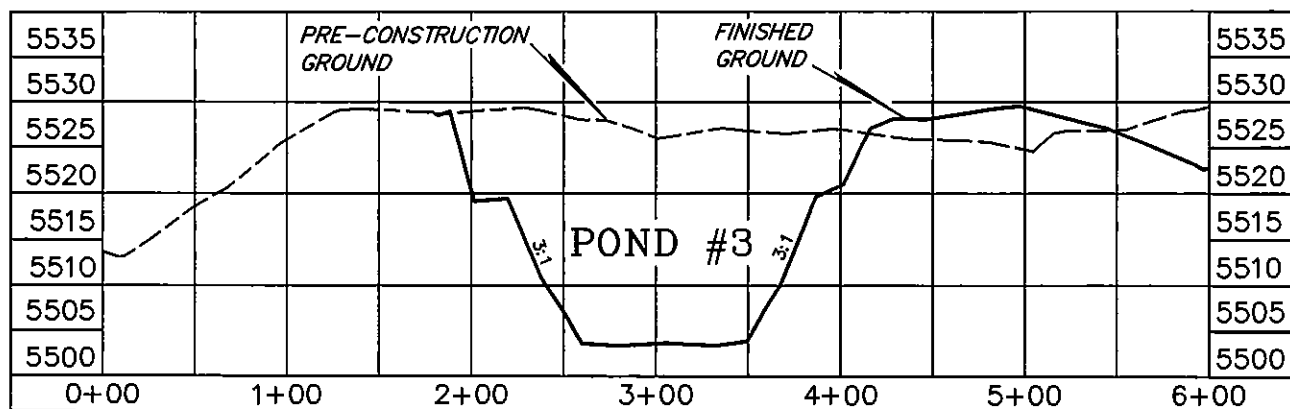
SHEET 2 OF 2

DATE: 10-28-10  
Drawn By: D.G.W.

POND #3 (AS-BUILT DRAWING)  
LOCATED IN THE SW 1/4 NW 1/4 OF  
SECTION 1, T7S, R96W, 6th P.M.

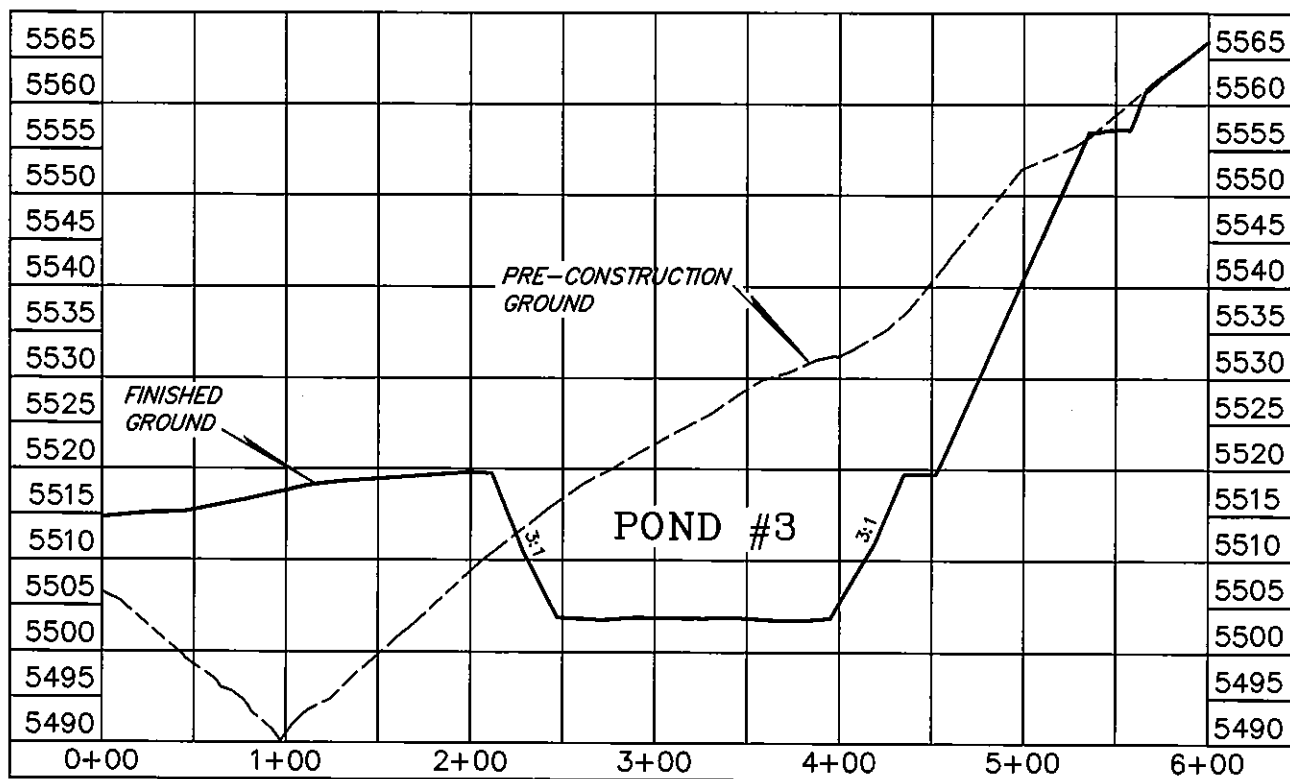
SECTION E-E

100' 50' 0'  
SCALE: 1"=100' (HORIZONTAL)



20'  
10'  
0'  
SCALE: 1"=20' (VERTICAL)

SECTION F-F



POND #3:

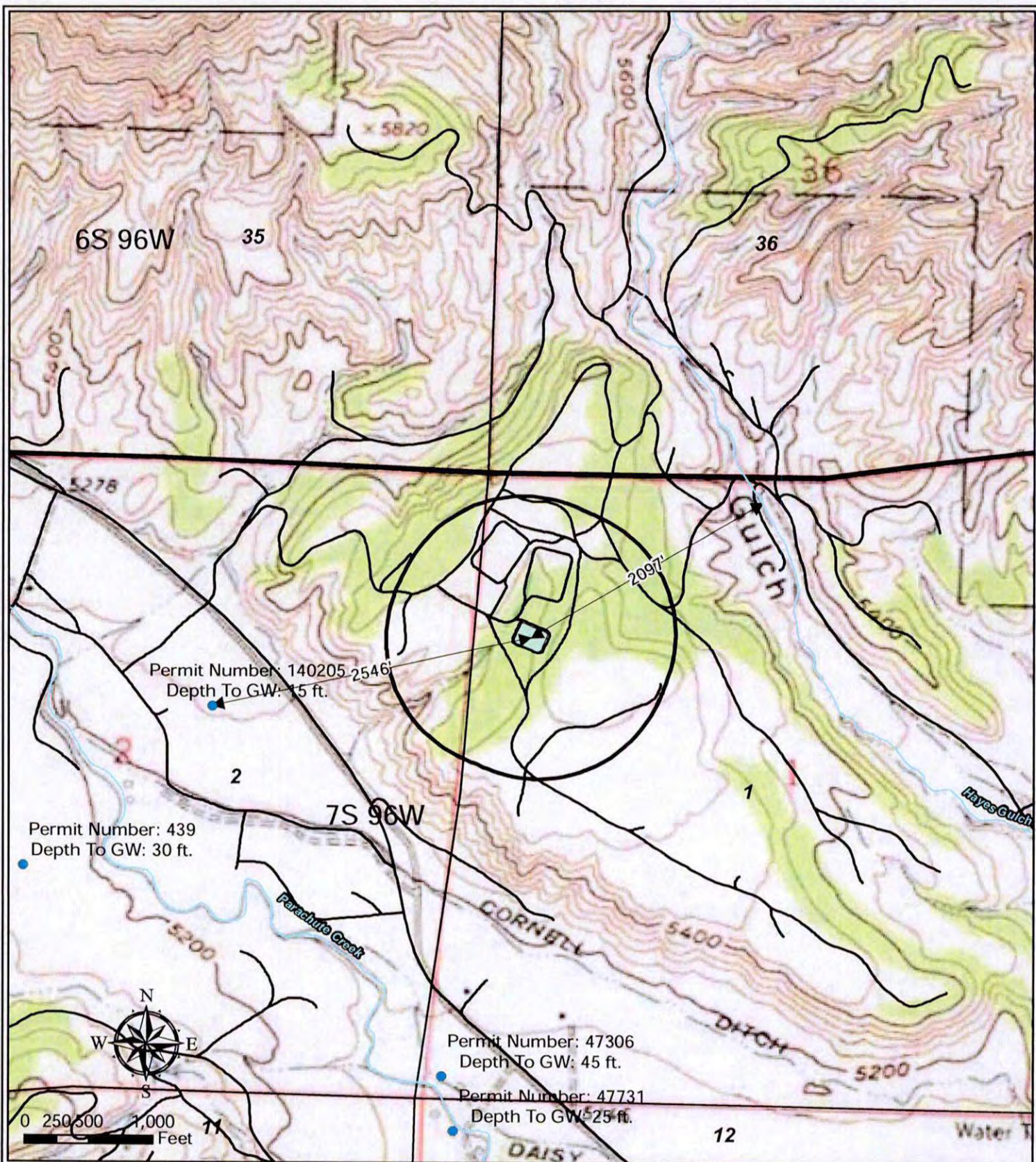
CAPACITY (FULL):

66,269 BBLs (13,780 CUBIC YARDS)

CAPACITY (WITH 2' FREEBOARD):

53,945 BBLs (11,218 CUBIC YARDS)





# Legend

- Water Well
- Stream
- Distance Vector
- Existing Road
- 1000' Buffer
- Produced Water Pond

Williams Production RMT

Produced Water Pond Hydrology Map  
T7S R96W, Section 1





## Sensitive Area Determination Checklist

Williams Production RMT Company		
<b>Person(s) conducting inspection</b>	Mark E. Mumby	11/8/2010
<b>Site Information</b>		
Location:	Grand Valley Pond 3	Time:
Type of Facility:	Produced Water Storage Pond	
<b>Environmental Conditions</b>		
Temperature (°F)		

Has the proposed, new or existing location been designated as a sensitive area?

☐ Yes      ☒ No

### **SURFACE WATER**

1. Are there any surface water features or SWSAs adjacent to or within ¼ mile of the proposed/new or existing facility?

☒ Yes      ☐ No

If yes, list type of surface water feature(s), i.e. rivers, creeks, streams, seeps, springs, wetlands: One unnamed ephemeral drainage

If yes, describe location relative to facility: The unnamed ephemeral drainage is located ~570 feet southwest of the existing facility

2. Could a potential release from the facility reach surface water features?

☐ Yes      ☒ No

If yes, describe the pathway a release from the facility would likely follow to determine if the potential to impact surface water is high or low.

3. Is the potential to impact surface water from a facility release high or low?

☐ High      ☒ Low

## GROUNDWATER

1. Will the proposed/new or existing facility have any pits which will contain hydrocarbons and chlorides or other E&P wastes?  
☒ Yes      ☐ No  
If yes, List the pit type(s): Produced Water Storage Pond
2. Is the site of the proposed facility underlain by an unconfined aquifer or recharge zone?  
☐ Yes      ☒ No
3. Is the hydraulic conductivity of the underlying soil or geologic material  $\leq 1.0 \times 10^{-7}$  cm/sec?  
☐ Yes      ☒ No
4. Is the proposed facility located within 1/8 mile of a domestic water well or 1/4 mile of a public water supply well which would use the same aquifer?  
☐ Yes      ☒ No
5. Is the proposed facility located within a 100 year floodplain?  
☐ Yes (*Sensitive Area*)      ☒ No (*If no, proceed to question #6.*)
6. Is the depth to groundwater known?  
☐ Yes (*If yes, follow instructions provided in 5(a) of this section.*)  
☒ No (*If no, follow instructions provided in 5(b) of this section.*)
  - (a) If yes, could a potential release from the proposed facility reach groundwater?  
☐ Yes      ☐ No  
If yes, explain:
  - (b) If no:
    - (i) Evaluate surrounding soils, topography, and vegetation which may suggest the presence of shallow groundwater.
    - (ii) Gather information from surrounding well data in order to determine a depth to groundwater, i.e. State Engineers Office.
    - (iii) Drill a soil boring to determine depth to groundwater or
    - (iv) Model hydro geologic conditions to determine if the potential to impact groundwater is high or low.
7. Is the potential to impact ground water from the facility in the event of a release high or low?  
☐ High      ☒ Low

**Additional Comments:**

There is one surface water feature that was indentified during a previous site visit and desk top review. The surface water features was identified as an unnamed ephemeral drainage. The unnamed ephemeral drainage is shown on the older topographical maps to be within 500 feet of the existing facility. By COGCC decision this would place the facility within a sensitive area. However, with the construction of the three produced water ponds; the ground surface has been recontoured and the drainage as it is shown on the topographical map no longer exists. The distance to the remnants of the drainage to the south southeast of the facility is now approximately 570 feet away. A potential release if it were to migrate out of the pond would tend to migrate to the flat lying areas adjacent to the pond. Therefore the potential for a release to reach the remnants of the ephemeral drainage to the south of the facility would be practically non-existent.

Groundwater data from the state engineer's office indicates that there are no permitted water wells within ¼ mile of the existing facility. The closest permitted water well is 2,546 feet to the southwest of the facility. Based on observations during a previous site visit, field data collected from recent site investigation activities, and pit construction, it appears that the depth to groundwater, if present, in the immediate vicinity of the facility is at a depth greater than 50 feet. The pond is also lined further reducing any potential to impact groundwater.

Based on the information collected during the previous site investigation and desktop review, the potential to impact surface water features has been deemed to be low to practically non-existent high. Based on the topographical setting of the proposed facility the potential to impact ground water has been deemed low as well. Therefore the proposed facility should be designated as being in a non-sensitive area.

Inspector Signature(s): M/E Mjmt Date: 11/8/2010

## LINER SPECIFICATIONS



# High Density Polyethylene Smooth Liner™



## Product Data

Property	Test Method	Values				
Thickness (min. ave.), mil (mm)	ASTM D5199*	30 (.75)	40 (1.0)	60 (1.5)	80 (2.0)	100 (2.5)
Thickness (lowest indiv.), mil (mm)	ASTM D5199*	27 (.68)	36 (.90)	54 (1.35)	72 (1.80)	90 (2.25)
*The thickness values may be changed due to project specifications (i.e., absolute minimum thickness)						
Density, g/cc, minimum	ASTM D792, Method B	0.94	0.94	0.94	0.94	0.94
Tensile Properties (ave. both directions)	ASTM D6693, Type IV					
Strength @ Yield (min. ave.), lb/in width (N/mm)	2 in/minute	66 (11.6)	88 (15.4)	132 (23.1)	176 (30.8)	220 (38.5)
Elongation @ Yield (min. ave.), % (GL=1.3in)	5 specimens in each direction	13	13	13	13	13
Strength @ Break (min. ave.), lb/in width (N/mm)		120 (21)	160 (28)	240 (42)	320 (56)	400 (70)
Elongation @ Break (min. ave.), % (GL=2.0in)		700	700	700	700	700
Tear Resistance (min. ave.), lbs. (N)	ASTM D1004	23 (102)	30 (133)	45 (200)	60 (267)	72 (320)
Puncture Resistance (min. ave.), lbs. (N)	ASTM D4833	60 (267)	80 (356)	120 (534)	160 (712)	190 (845)
Carbon Black Content (range in %)	ASTM D4218	2 - 3	2 - 3	2 - 3	2 - 3	2 - 3
Carbon Black Dispersion (Category)	ASTM D5596	Only near spherical agglomerates for 10 views: 9 views in Cat. 1 or 2, and 1 view in Cat. 3				
Stress Crack Resistance (Single Point NCTL), hours	ASTM D5397, Appendix	300	300	300	300	300
Oxidative Induction Time, minutes	ASTM D3895, 200°C, 1 atm O <sub>2</sub>	≥100	≥100	≥100	≥100	≥100
Melt Flow Index, g/10 minutes	ASTM D1238, 190°C, 2.16kg	≤1.0	≤1.0	≤1.0	≤1.0	≤1.0
Oven Aging	ASTM D5721	80	80	80	80	80
with HP OIT, (% retained after 90 days)	ASTM D5885, 150°C, 500psi O <sub>2</sub>					
UV Resistance	GRI GM11	20hr. Cycle @ 75°C/4 hr. dark condensation @ 60°C				
with HP OIT, (% retained after 1600 hours)	ASTM D5885, 150°C, 500psi O <sub>2</sub>	50	50	50	50	50

These product specifications meet or exceed GRI's GM13

## Supply Information (Standard Roll Dimensions)

Thickness		Width		Length		Area (approx.)		Weight (average)	
mil	mm	ft	m	ft	m	ft <sup>2</sup>	m <sup>2</sup>	lbs	kg
30	.75	23	7	803.8	245	18,461	1,715	3,050	1,383
40	1.0	23	7	649.6	198	14,919	1,386	3,075	1,395
60	1.5	23	7	419.9	128	9,645	896	3,006	1,364
80	2.0	23	7	321.5	98	7,384	686	3,067	1,391
100	2.5	23	7	249.3	76	5,727	532	3,006	1,364

### Notes:

All rolls are supplied with two slings. All rolls are wound on a 6 inch core. Special roll lengths are available on request.  
All roll lengths and widths have a tolerance of ±1%

All information, recommendations and suggestions appearing in this literature concerning the use of our products are based upon tests and data believed to be reliable; however, it is the users responsibility to determine the suitability for their own use of the products described herein. Since the actual use by others is beyond our control, no guarantee or warranty of any kind, expressed or implied, is made by Agru/America as to the effects of such use or the results to be obtained, nor does Agru/America assume any liability in connection herewith. Any statement made herein may not be absolutely complete since additional information may be necessary or desirable when particular or exceptional conditions or circumstances exist or because of applicable laws or government regulations. Nothing herein is to be construed as permission or as a recommendation to infringe any patent.

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## LINER TEST



## **Installation Reports**

*for*

***Hayes Evap Pit***



### Daily Installation Report

Date: 6/12/09  
Project: HAYES EVAP PIT POND 3  
Owner: WILLIAMS PRODUCTION  
Engineer:  
Contractor: MB CONSTRUCTION  
Installation Supervisor: ROGER BARNES  
Material: 60 MIL HDT, 8OZ TEXTILE

Fusion Weld  X  Extrusion Weld

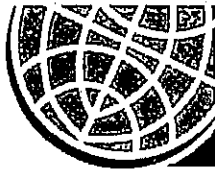
#### **DAILY SEAM STRENGTH TEST**

Date of Test	Time of Test	Ambient Air Temp.	Unit Temp.	Pre-Heat Temp.	Unit Speed	Peel Value Inside/Outside	Shear Value	Welding Tech.	Unit No.	Pass/Fail
6/12/09	6:00	55	800		6.7	134/135	154	JH	1662	P
						130/135	185			
						140/124				
						/				
6/12/09	6:00	55	800		7.0	153/138	163	RG	1547	P
						134/134	171			
						147/140				
						/				
						/				
						/				
						/				
						/				
						/				

#### **DAILY RECAP**

Quantity Installed	Weather	Contract Labor Hours	Equipment Maintenance / Greasing
	75&SUNNY	0	T-300

Comments: ONSITE AT 6:00AM INSTALLED LINER UNTIL 9:30AM BECAUSE I NEEDED MORE LINER . WE PULLED TEXTILE FOR THE REST OF DAY. ALL TEXTILE IS PULLED IN.



### Daily Installation Report

Date: 6/13/09  
Project: HAYES EVAP PIT POND 3  
Owner: WILLIAMS PRODUCTION  
Engineer:  
Contractor: MB CONSTRUCTION  
Installation Supervisor: ROGER BARNES  
Material: 60 MIL HDT, 8OZ TEXTILE

Fusion Weld  X

Extrusion Weld  X

#### DAILY SEAM STRENGTH TEST

Date of Test	Time of Test	Ambient Air Temp	Unit Temp	Pre-Heat Temp	Unit Speed	Peel Value Inside/Outside	Shear Value	Welding Tech	Unit No.	Pass/Fail
6/13/09	6:10	57	800		7.0	134/131	173	RG	1547	P
						130/130	169			
						135/134				
						/				
6/13/09	6:15	57	800		7.5	131/130	154	JH	1662	P
						134/134	151			
						136/124				
						/				
6/13/09	1:40	79	500	400		80/	136	SS	1549	P
						82/	132			
						90/				
						/				

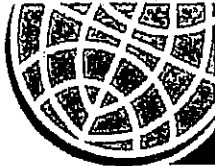
#### DAILY RECAP

Quantity Installed	Weather	Contract Labor/Hours	Equipment Maintenance/Greasing
	79&WINDY	0	T-300

Comments: RAN WEST TIE IN, PULLED LINER UNTIL 12:00. WINDY AFTER LUNCH SO WE AIRTESTED, REPAIRED & V-BOXED. ALL LINER IS 100%. PICKED UP TRASH & SANDBAGGED.

CLI / CLEARWATER

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### Daily Installation Report

Date: 6/14/09  
Project: HAYES EVAP PIT POND 3  
Owner: WILLIAMS PRODUCTION  
Engineer:  
Contractor: MB CONSTRUCTION  
Installation Supervisor: ROGER BARNES  
Material: 60 MIL HDT, 80Z TEXTILE

Fusion Weld  X  Extrusion Weld  X

#### DAILY SEAM STRENGTH TEST

Date of Test	Time of Test	Ambient Air Temp	Unit Temp	Pre-Heat Temp	Unit Speed	Peel Value In/Out	Shear Value	Welding Tech	Unit No	Pass/Fail
6/14/09	6:00	59	800		7.5	133/144	164	JH	1662	P
						137/122	166			
						146/133				
						/				
6/14/09	6:00	59	800		7.0	134/142	168	RG	1547	P
						137/127	162			
						133/136				
						/				
6/14/09	2:08	81	500	400		96/	137	JL	1549	P
						106/	140			
						110/				
						/				

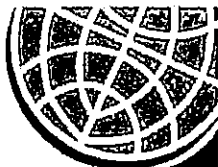
#### DAILY RECAP

Quantity Installed	Weather	Contract Labor Hours	Equipment Maintenance / Greasing
	80&SUNNY	0	T-300

Comments: PULLED LINER UNTIL 12:30. DID REPAIRS AND TESTING THE REST OF DAY.  
OFFSITE AT 4:00PM. THE POND IS BLACKED OUT

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### Daily Installation Report

Date: 6/15/09  
Project: HAYES EVAP PIT POND 3  
Owner: WILLIAMSM PRODUCTION  
Engineer:  
Contractor: MB CONSTRUCTION  
Installation Supervisor: ROGER BARNES  
Material: 60 MIL HD 80Z TEXTILE

Fusion Weld  X  Extrusion Weld

#### **DAILY SEAM STRENGTH TEST**

Date of Test	Time of Test	Ambient Air Temp.	Unit Temp.	Pre-Heat Temp.	Unit Speed	Peel Value lb/in	Shear Value	Welding Tech.	Unit No.	Pass/Fail
6/15/09	6:00	54	800		7.0	123/128	169	RG	1547	P
						125/120	163			
						115/109				
6/15/09	6:00	54	800			126/128	138	JH	1662	P
						127/113	148			
						131/132				
6/15/09	7:40	66	525	400		99/	146	JL	1549	P
						124/	144			
						99/				
6/15/09	12:45	80	525	350		111/	138	JL	1549	P
						111/	134			
						131/				

#### **DAILY RECAP**

Quantity Installed	Weather	Contract Labor Hours	Equipment Maintenance / Greasing
0	80&SUNNY	0	T-300

Comments: RAN EAST TIE IN. AIRTESTED, DID REPAIRS, V-BOXED AND BUILT BOOT. PICKED UP TRASH AND SANDBAGS. LOADED TRAILERS. JOB IS DONE.



### Daily Installation Report

Date: 6/11/09  
Project: HAYES EVAP PIT POND 3  
Owner: WILLIAMS PRODUCTION  
Engineer:  
Contractor: MB CONSTRUCTION  
Installation Supervisor: ROGER BARNES  
Material: 60 MIL HDT, 8OZ TEXTILE

Fusion Weld \_\_\_\_\_ Extrusion Weld \_\_\_\_\_

#### DAILY SEAM STRENGTH TEST

Date of Test	Time of Test	Ambient Air Temp.	Unit Temp.	Pre-Heat Temp.	Unit Speed	Peel Value Inside/Outside	Shear Value	Welding Tech	Unit No.	Pass/Fail
						/				
						/				
						/				
						/				
						/				
						/				
						/				
						/				
						/				
						/				
						/				
						/				
						/				

#### DAILY RECAP

Quantity Installed	Weather	Contract Labor Hours	Equipment Maintenance / Greasing
0	RAIN	0	T-300

Comments: ONSITE AT 6:00AM -RAIN SERVICED BOBCAT AND WAITED FOR RAIN TO STOP UNTIL 8:00AM. OFFSITE- CAME BACK AT 12:00 MORE RAIN NO WORK

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### Daily Installation Report

Date: 6/12/09  
Project: HAYES EVAP PIT POND 3  
Owner: WILLIAMS PRODUCTION  
Engineer:  
Contractor: MB CONSTRUCTION  
Installation Supervisor: ROGER BARNES  
Material: 60 MIL HDT, 80Z TEXTILE

Fusion Weld   X   Extrusion Weld       

#### DAILY SEAM STRENGTH TEST

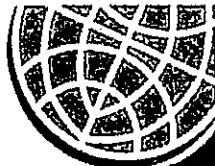
Date of Test	Time of Test	Ambient Air Temp.	Unit Temp.	Pre-Heat Temp.	Unit Speed	Peel Value <small>(inches/minute)</small>	Shear Value	Welding Tech.	Unit No.	Pass/Fail
6/12/09	6:00	55	800		6.7	134/135	154	JH	1662	P
						130/135	185			
						140/124				
						/				
6/12/09	6:00	55	800		7.0	153/138	163	RG	1547	P
						134/134	171			
						147/140				
						/				
						/				
						/				
						/				
						/				

#### DAILY RECAP

Quantity Installed	Weather	Contract Labor Hours	Equipment Maintenance / Greasing
	75&SUNNY	0	T-300

Comments: ONSITE AT 6:00AM INSTALLED LINER UNTIL 9:30AM BECAUSE I NEEDED MORE LINER. WE PULLED TEXTILE FOR THE REST OF DAY. ALL TEXTILE IS PULLED IN.





### Daily Installation Report

Date: 6/13/09  
Project: HAYES EVAP PIT POND 3  
Owner: WILLIAMS PRODUCTION  
Engineer:  
Contractor: MB CONSTRUCTION  
Installation Supervisor: ROGER BARNES  
Material: 60 MIL HDT, 80Z TEXTILE

Fusion Weld  X  Extrusion Weld  X

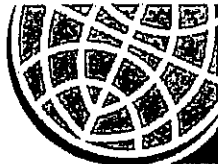
#### DAILY SEAM STRENGTH TEST

Date of Test	Time of Test	Ambient Air Temp	Unit Temp	Pre-Heat Temp	Unit Speed	Peel Value In / Outside	Shear Value	Welding Tech	Unit No.	Pass/Fail
6/13/09	6:10	57	800		7.0	134/131	173	RG	1547	P
						130/130	169			
						135/134				
						/				
6/13/09	6:15	57	800		7.5	131/130	154	JH	1662	P
						134/134	151			
						136/124				
						/				
6/13/09	1:40	79	500	400		80/	136	SS	1549	P
						82/	132			
						90/				
						/				

#### DAILY RECAP

Quantity Installed	Weather	Contract Labor Hours	Equipment Maintenance / Greasing
	79&WINDY	0	T-300

Comments: RAN WEST TIE IN, PULLED LINER UNTIL 12:00. WINDY AFTER LUNCH SO WE AIRTESTED, REPAIRED & V-BOXED. ALL LINER IS 100%. PICKED UP TRASH & SANDBAGGED.



### Daily Installation Report

Date: 6/14/09  
Project: HAYES EVAP PIT POND 3  
Owner: WILLIAMS PRODUCTION  
Engineer:  
Contractor: MB CONSTRUCTION  
Installation Supervisor: ROGER BARNES  
Material: 60 MIL HDT, 8OZ TEXTILE

Fusion Weld  X  Extrusion Weld  X

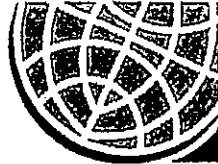
#### DAILY SEAM STRENGTH TEST

Date of Test	Time of Test	Ambient Air Temp.	Unit Temp.	Pre-Heat Temp.	Unit Speed	Peel Value Inches/Inch	Shear Value	Welding Tech.	Unit No.	Pass/Fail
6/14/09	6:00	59	800		7.5	133/144	164	JH	1662	P
						137/122	166			
						146/133				
						/				
6/14/09	6:00	59	800		7.0	134/142	168	RG	1547	P
						137/127	162			
						133/136				
						/				
6/14/09	2:08	81	500	400		96/	137	JL	1549	P
						106/	140			
						110/				
						/				

#### DAILY RECAP

Quantity Installed	Weather	Contract Labor Hours	Equipment Maintenance / Greasing
	80&SUNNY	0	T-300

Comments: PULLED LINER UNTIL 12:30. DID REPAIRS AND TESTING THE REST OF DAY.  
OFFSITE AT 4:00PM. THE POND IS BLACKED OUT



### Daily Installation Report

Date: 6/15/09  
Project: HAYES EVAP PIT POND 3  
Owner: WILLIAMSM PRODUCTION  
Engineer:  
Contractor: MB CONSTRUCTION  
Installation Supervisor: ROGER BARNES  
Material: 60 MIL HD 80Z TEXTILE

Fusion Weld  X  Extrusion Weld

#### DAILY SEAM STRENGTH TEST

Date of Test	Time of Test	Ambient Air Temp	Unit Temp	Pre-Heat Temp	Unit Speed	Peel Value Inches/Inch	Shear Value	Welding Tech	Unit No	Pass/Fail
6/15/09	6:00	54	800		7.0	123/128	169	RG	1547	P
						125/120	163			
						115/109				
6/15/09	6:00	54	800			126/128	138	JH	1662	P
						127/113	148			
						131/132				
6/15/09	7:40	66	525	400		99/	146	JL	1549	P
						124/	144			
						99/				
6/15/09	12:45	80	525	350		111/	138	JL	1549	P
						111/	134			
						131/				

#### DAILY RECAP

Quantity Installed	Weather	Contract Labor Hours	Equipment Maintenance / Greasing
0	80&SUNNY	0	T-300

Comments: RAN EAST TIE IN. AIRTESTED, DID REPAIRS, V-BOXED AND BUILT BOOT. PICKED UP TRASH AND SANDBAGS. LOADED TRAILERS. JOB IS DONE.



## Quality Control Air Testing

POND#3

Project: HAYES EVAP PIT  
 Owner: WILLIAMS PRODUCTION  
 Engineer:  
 Contractor: MB CONSTRUCTION  
 Supervisor: ROGER BARNES  
 Material: 60 MIL HDT, 80Z TEXTILE

Date of Test	Start Time	End Time	Seam No.	Seam Length	A C	A L	V B	S T	Pass/Fail	Welding Technician	Welder No.	Welder Speed	Welder Temp.
6/13/09	1:35	1:40	16-18	0-18	X				33-32	W TIE IN JH	1662	7.5	800
"	"	"	15-18	18-26	X				31-30	" JH	"	"	"
"	1:45	1:50	15-17	26-49	X				32-32	" JH	"	"	"
"	"	"	1-17	49-60	X				33-31	" JH	"	"	"
"	1:57	2:20	1-14	60-75	X				31-30	" JH	"	"	"
"	2:00	2:05	1-13	75-97	X				31-30	" JH	"	"	"
"	2:05	2:10	1-12	97-120	X				31-30	" JH	"	"	"
"	2:08	2:13	1-11	120-143	X				32-32	" JH	"	"	"
"	2:13	2:18	1-2	143-165	X				32-31	" JH	"	"	"
"	2:17	2:23	1-3	165-189	X				32-32	" RG	1547	7.0	800
"	2:22	2:27	1-4	189-211	X				32-31	" RG	"	"	"
"	2:30	2:35	1-5	211-234	X				33-32	" RG	"	"	"
"	2:40	2:45	1-6	234-245	X				33-32	" RG	"	"	"
"	"	"	6-9	245-262	X				31-31	" RG	"	"	"
"	2:50	2:55	7-9	262-277	X				31-30	" RG	"	"	"
"	2:53	2:58	7-10	277-299	X				32-32	" RG	"	"	"
"	2:56	3:01	8-10	299-308	X				31-30	W TIE IN END RG	1547	7.0	800
"	2:53	2:58	9-10	30'	X				32-31	N WALL TO W TIE IN RG	"	"	"
"	2:47	2:53	1-9	55'	X				32-31	" JH	1662	7.5	800
"	1:45	1:50	17-18	26'	X				33-33	S WALL TO W TIE IN JH	"	"	"
6/13/09	1:57	2:03	1-17	52	X				52	" RG	1547	7.0	800

AC=Air Channel Test AL=Air Lance Test VB=Vacuum Box Test ST=Spark Test





### Quality Control Air Testing

Project: HAYES EVAP PIT POND 3  
 Owner: WILLIAMS PRODUCTION  
 Engineer:  
 Contractor: MB CONSTRUCTION  
 Supervisor: ROGER BARNES  
 Material: 60 MIL HDT, 80Z TETILE

Date of Test	Start Time	End Time	Seam No.	Seam Length	A C	A L	V B	S T	Pass/Fail	Welding Technician	Welder No.	Welder Speed	Welder Temp.
6/13/09	1:35	1:40	15-16	19'	X				31-31	W WALL RG	1547	7.0	800
"	1:45	1:50	14-15	43'	X				32-31	" JH	1662	7.5	800
"	2:00	2:05	13-14	53'	X				32-31	" RG	1547	7.0	800
"	2:05	2:10	12-13	53'	X				32-32	" JH	1662	7.5	800
"	2:07	2:12	11-12	54'	X				33-32	" RG	1547	7.0	800
"	2:13	2:18	2-11	54'	X				33-32	" JH	1662	7.5	800
"	2:17	2:23	2-3	54'	X				33-32	" JH	"	"	"
"	2:22	2:27	3-4	53'	X				33-32	" RG	1547	7.0	800
"	2:30	2:35	4-5	53'	X				32-31	" JH	1662	7.2	800
"	2:29	2:34	5-6	54'	X				32-31	" RG	1547	7.0	800
"	2:50	2:55	6-7	42'	X				32-32	" JH	1662	7.5	800
"	2:57	3:02	7-8	11'	X				32-31	" RG	1547	7.0	800
"	3:20	3:25	1-19	292'	X				33-32	FLOOR JH	1662	7.5	800
"	3:25	3:30	19-20	12'	X				33-31	" RG	1547	7.0	800
"	"	"	"	12-292	X				33-31	"	"	"	"
"	3:35	3:40	20-22	181'	X				32-31	" JH	1662	7.5	800
"	"	"	20-21	181-292	X				32-32	" JH	"	"	"
"	3:51	3:56	22-23	181'	X				32-32	" RG	1547	7.0	800
"	"	"	21-23	181-225	X				32-31	" RG	"	"	"
"	3:54	3:59	21-24	225-292	X				32-31	" RG	"	"	"
6/13/09	3:35	3:40	21-22	23'	X				31-30	CROSS JH	1662	7.5	800

AC=Air Channel Test AL=Air Lance Test VB=Vacuum Box Test ST=Spark Test





### Quality Control Air Testing

Project: HAYES EVAP PIT POND 3  
 Owner: WILLIAMS PRODUCTION  
 Engineer:  
 Contractor: MB CONSTRUCTION  
 Supervisor: ROGER BARNES  
 Material: 60 MIL HDT, 80Z TEXTILE

Date of Test	Start Time	End Time	Seam No.	Seam Length	A C	A L	V B	S T	Pass/Fail	Welding Technician	Welder No.	Welder Speed	Welder Temp.
6/13/09	3:54	3:59	23-24	23'	X				32-31	CROSS RG	1547	7.0	800
"	4:04	4:09	23-25	225'	X				32-31	FLOOR RG	"	"	"
"	"	"	24-25	225-292	X				32-32	"	"	"	"
"	4:14	4:19	25-27	243'	X				31-30	"	"	"	"
"	"	"	25-26	243-292	X				33-32	"	"	"	"
"	"	"	26-27	23'	X				31-30	CROSS RG	"	"	"
"	4:30	4:35	27-28	162'	X				32-31	FLOOR RG	"	"	"
"	4:47	4:53	27-29	162-243	X				32-31	"	"	"	"
"	"	"	26-29	243-292	X				33-33	"	"	"	"
"	4:50	4:55	28-29	23'	X				33-33	CROSS JH	1662	7.6	800
"	4:48	4:53	28-31	51'	X				34-32	FLOOR	"	"	"
"	4:37	4:41	28-30	51-162	X				31-30	" JH	"	"	"
"	4:36	4:43	29-30	162-292	X				33-31	" JH	"	"	"
"	4:47	4:52	31-30	23'	X				34-33	CROSS JH	"	"	"
6/14/09	2:15	2:20	31-30	51'	X				32-31	FLOOR JH	"	"	"
"	"	"	30-32	51-292	X				34-32	" JH	"	"	"
"	2:17	2:22	32-33	122	X				34-32	" RG	1547	7.0	800
"	"	"	33-34	23'	X				32-30	CROSS RG	"	"	"
"	"	"	32-34	122-163	X				32-31	FLOOR RG	"	"	"
"	2:30	2:35	34-35	23'	X				34-33	CROSS	"	"	"
6/14/09	2:33	2:38	32-35	163-209	X				34-34	FLOOR RG	1547	7.0	800

AC=Air Channel Test AL=Air Lance Test VB=Vacuum Box Test ST=Spark Test





### Quality Control Air Testing

Project: HAYES EVAP PIT POND 3  
 Owner: WILLIAMS PRODUCTION  
 Engineer:  
 Contractor: MB CONSTRUCTION  
 Supervisor: ROGER BARNES  
 Material: 60 MIL HDT, 80Z TEXTILE

Date of Test	Start Time	End Time	Seam No.	Seam Length	A C	A L	V B	S T	Pass/Fail	Welding Technician	Welder No.	Welder Speed	Welder Temp.
6/14/09	2:43	2:48	35-36	23'	X				33-32	CROSS RG	1547	7.0	800
"	2:47	2:52	32-36	209-242	X				34-32	FLOOR RG	"	"	"
"	2:55	3:00	36-37	23'	X				32-30	CROSS JH	1662	7.5	800
"	"	"	32-37	242-292	X				33-31	FLOOR JH	"	"	"
"	2:31	2:36	33-38	120	X				33-32	FLOOR JH	"	"	"
"	"	"	34-38	120-162	X				34-33	"	"	"	"
"	"	"	35-38	162-209	X				34-33	"	"	"	"
"	2:47	2:52	36-38	209-242	X				34-34	"	"	"	"
"	2:55	3:00	37-38	242-292	X				34-32	"	"	"	"
"	3:04	3:09	41-38	222'	X				35-33	" RG	1547	7.0	800
6/15/09	8:53	8:58	41-39	23'	X				33-33	CROSS RG	"	"	"
6/14/09	3:04	3:09	38-39	222-292	X				32-30	FLOOR RG	"	"	"
6/15/09	7:35	7:40	55-57	0-9	X				32-31	E TIE IN RG	1547	"	"
"	"	"	54-57	9-23	X				34-34	"	"	"	"
"	7:44	7:49	54-56	23-44	X				33-32	"	"	"	"
"	7:53	7:58	53-56	44-56	X				34-33	"	"	"	"
"	"	"	53-40	56-71	X				34-34	"	"	"	"
"	8:03	8:08	52-40	71-93	X				34-32	"	"	"	"
"	8:11	8:16	51-40	93-116	X				33-33	"	"	"	"
"	8:13	8:18	50-40	116-139	X				33-31	"	"	"	"
6/15/09	8:17	8:22	41-40	139-162	X				34-32	E TIE IN CONT. JH	1662	7.0	800

AC=Air Channel Test AL=Air Lance Test VB=Vacuum Box Test ST=Spark Test





## Quality Control Air Testing

Project: HAYES EVAP PIT POND 3  
 Owner: WILLIAMS PRODUCTION  
 Engineer:  
 Contractor: MB CONSTRUCTION  
 Supervisor: ROGER BARNES  
 Material: 60 MIL HT,D 80Z TEXTILE

Date of Test	Start Time	End Time	Seam No.	Seam Length	A C	A L	V B	S T	Pass/Fail	Welding Technician	Welder No.	Welder Speed	Welder Temp.
6/15/09	8:38	8:43	40-42	162-183	X				34-34	E TIE IN CONT. JH	1662	7.0	800
"	"	"	40-43	183-206	X				34-32	" JH	"	"	"
"	8:48	8:53	40-44	206-220	X				32-31	"	"	"	"
"	9:00	9:05	39-45	220-229	X				33-32	"	"	"	"
"	9:08	9:13	45-48	229-259	X				33-32	"	"	"	"
"	"	"	45-48	259-264	X				33-32	"	"	"	"
"	9:18	9:23	46-49	264-288	X				33-32	"	"	"	"
"	9:18	9:23	47-49	288-298	X				33-32	E TIE IN END JH	1662	7.0	800
"	8:53	8:58	39-48	56'	X				34-33	N WALL TO E TIE IN JH	"	"	"
"	9:10	9:15	48-49	32'	X				33-31	" RG	1547	7.0	800
"	9:18	9:23	46-47	10'	X				32-31	E WALL JH	1662	7.5	800
"	9:08	9:13	45-46	36'	X				33-33	" JH	"	"	"
"	8:53	8:58	44-45	56'	X				34-34	" RG	1547	7.5	800
"	8:48	8:53	43-44	55'	X				33-33	" JH	1662	7.5	800
"	8:38	8:43	42-43	53'	X				33-31	" RG	1547	7.0	800
"	"	"	41-42	54'	X				34-33	" JH	1662	7.5	800
"	8:17	8:22	41-50	52'	X				32-31	" "	"	"	"
"	8:13	8:18	50-51	51'	X				34-33	" RG	1547	7.0	800
"	8:03	8:08	51-52	50'	X				33-33	" JH	1662	7.5	800
"	"	"	52-53	50'	X				35-33	" RG	1547	7.0	800
"	7:48	7:53	53-54	39'	X				32-31	" RG	"	"	"

AC=Air Channel Test AL=Air Lance Test VB=Vacuum Box Test ST=Spark Test





### Quality Control Air Testing

Project: HAYES EVAP PIT POND 3  
Owner: WILLIAMS PRODUCTION  
Engineer:  
Contractor: MB CONSTRUCTION  
Supervisor: ROGER BARNES  
Material: 60 MIL HDT, 8OZ TEXTILE

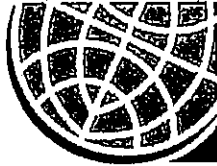
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**POND#3**  
**Panel Placement Log**

**Project:** HAYES EVAP PIT  
**Owner:** WILLIAMS PRODUCTION  
**Engineer:**  
**Contractor:** MB CONSTRUCTION  
**Supervisor:** ROGER BARNES  
**Material:** 60 MIL HDT, 80Z TEXTILE

Panel No.	Roll Number	Date	Material Type	Width	Length
1	0118	6/12/09	60 MIL HD	23	300'
2	"	"	"	"	59'
3	"	"	"	"	58'
4	9747	"	"	"	59'
5	"	"	"	"	60'
6	"	"	"	"	59'
7	"	"	"	"	47'
*P7-8	"	"	"	"	21'
9	0224	"	"	"	59'
10	"	"	"	"	36'
11	"	"	"	"	59'
12	"	"	"	"	58'
13	"	"	"	"	59'
14	"	"	"	"	58'
15	"	"	"	"	47'
16	"	"	"	"	22'
17	0109	"	"	"	58'
18	"	6/12/09	"	"	34'
19	"	6/13/09	"	"	300'
20	0121	"	"	"	300'
21	"	"	"	"	120'
22	0119	"	"	"	182'
23	"	"	"	"	238'
24	0116	"	"	"	71'
25	"	6/13/09	"	"	298'



### Panel Placement Log

Project: HAYES EVAP PIT  
Owner: WILLIAMS PRODUCTION  
Engineer:  
Contractor: MB CONSTRUCTION  
Supervisor: ROGER BARNES  
Material: 60 MIL HDT, 80Z TEXTILE

Panel No	Roll Number	Date	Material Type	Width	Length
26	0116	6/13/09	60 MIL HD	23	51'
27	0115	"	"	"	247'
28	"	"	"	"	173'
29	0110	"	"	"	132'
30	"	"	"	"	245'
31	9745	"	"	"	55'
32	0120	6/14/09	"	"	294'
33	"	"	"	"	126'
34	0110	"	"	"	43'
35	0105	"	"	"	50'
36	9747	"	"	"	38'
37	0123	"	"	"	52'
38	"	"	"	"	293'
39	"	"	"	"	75'
40	0111	"	"	"	220'
41	"	"	"	"	57'
42	"	"	"	"	57'
43	"	"	"	"	59'
44	9748	"	"	"	60'
45	"	"	"	"	61'
46	"	"	"	"	44'
*P4647	"	"	"	"	14'
48	"	"	"	"	63'
49	"	"	"	"	39'
50	"	"	"	"	56'

CLI / CLEARWATER

1062 Singing Hills Road Parker, Colorado 80138 / 1-800-524-8672 / 303-841-2022 / Fax 303-841-5780 / [www.coloradolining.com](http://www.coloradolining.com)



## Panel Placement Log

**Project:** HAYES EVAP PIT POND 3  
**Owner:** WILLIAMS PRODUCTION  
**Engineer:**  
**Contractor:** MB CONSTRUCTION  
**Supervisor:** ROGER BARNES  
**Material:** 60 MIL EDT, 8OZ TEXTILE

[illegible]

pond #3

p-1		p-19										p-20										p-21										p-22										p-23										p-24										p-25										p-26										p-27										p-28										p-31										p-32										p-33										p-37										p-38										p-39										p-48										p-49										p-50										p-51										p-52										p-53										p-54										p-55										p-56										p-57										p-58										p-59										p-60										p-61										p-62										p-63										p-64										p-65										p-66										p-67										p-68										p-69										p-70										p-71										p-72										p-73										p-74										p-75										p-76										p-77										p-78										p-79										p-80										p-81										p-82										p-83										p-84										p-85										p-86										p-87										p-88										p-89										p-90										p-91										p-92										p-93										p-94										p-95										p-96										p-97										p-98										p-99										p-100										p-101										p-102										p-103										p-104										p-105										p-106										p-107										p-108										p-109										p-110										p-111										p-112										p-113										p-114										p-115										p-116										p-117										p-118										p-119										p-120										p-121										p-122										p-123										p-124										p-125										p-126										p-127										p-128										p-129										p-130										p-131										p-132										p-133										p-134										p-135										p-136										p-137										p-138										p-139										p-140										p-141										p-142										p-143										p-144										p-145										p-146										p-147										p-148										p-149										p-150										p-151										p-152										p-153										p-154										p-155										p-156										p-157										p-158										p-159										p-160										p-161										p-162										p-163										p-164										p-165										p-166										p-167										p-168										p-169										p-170										p-171										p-172										p-173										p-174										p-175										p-176										p-177										p-178										p-179										p-180										p-181										p-182										p-183										p-184										p-185										p-186										p-187										p-188										p-189										p-190										p-191										p-192										p-193										p-194										p-195										p-196										p-197										p-198										p-199										p-200										p-201										p-202										p-203										p-204										p-205										p-206										p-207										p-208										p-209										p-210										p-211										p-212										p-213										p-214										p-215										p-216										p-217										p-218										p-219										p-220										p-221										p-222										p-223										p-224										p-225										p-226										p-227										p-228										p-229										p-230										p-231										p-232										p-233										p-234										p-235										p-236										p-237										p-238										p-239										p-240										p-241										p-242										p-243										p-244										p-245										p-246										p-247										p-248										p-249										p-250										p-251										p-252										p-253										p-254										p-255										p-256										p-257										p-258										p-259										p-260										p-261										p-262										p-263										p-264										p-265										p-266										p-267										p-268										p-269										p-270										p-271										p-272										p-273										p-274										p-275										p-276										p-277										p-278										p-279										p-280										p-281										p-282										p-283										p-284										p-285										p-286										p-287										p-288										p-289										p-290										p-291										p-292										p-293										p-294										p-295										p-296										p-297										p-298										p-299										p-300										p-301										p-302										p-303										p-304										p-305										p-306										p-307										p-308										p-309										p-310										p-311										p-312										p-313										p-314										p-315										p-316										p-317										p-318										p-319										p-320										p-321										p-322										p-323										p-324										p-325										p-326										p-327										p-328										p-329										p-330										p-331										p-332										p-333										p-334										p-335										p-336										p-337										p-338										p-339										p-340										p-341										p-342										p-343										p-344										p-345										p-346										p-347										p-348										p-349										p-350										p-351										p-352										p-353										p-354										p-355										p-356										p-357										p-358										p-359										p-360										p-361										p-362										p-363										p-364										p-365										p-366										p-367										p-368										p-369			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### Sub grade Acceptance

Date: 6/17/09

Project: HAYES EVAP PIT  
Owner: WILLIAMS PRODUCTION  
Engineer:  
Contractor: MB CONSTRUCTION  
Installation Supervisor: ROGER BARNES  
Material: 60 MIL HDT, 8 OZ TEXTILE

Is surface acceptable for placement of geomembranes? Yes ☒ No ☐

Comments \_\_\_\_\_

Date: 6/17/09

Accepted By Representative of Owner/Owner (Signature) Richard Teninty

I certify that I am a representative with the authority to provide this acceptance and recognize that if this is not a true statement that I will be held personally responsible for the integrity of the inspection.

Print Name/Title: RICHARD TENINTY SUPERVISOR

Company: MB

Witnessed By Representative of CLC (Signature) Roger Barnes

Print Name/Title: ROGER BARNES SUPER

**This document only applies to the acceptability of the surface conditions for the installation of the geosynthetic products. Colorado Lining Construction (CLC) does not accept responsibility for anchor trench elevation or design, elevation points for construction, sub-grade compaction, moisture content of neither the sub-grade nor the surface maintenance during deployment. The structural integrity of the sub-grade and maintenance of these conditions are the responsibility of the owner, engineer or contractor. Furthermore, any incidental damage to the liner or seams (e.g. groundwater, gases, cover soil placement and sub-grade movement) during or after the installation is not covered by any warranty expressed or implied and the design, engineering and construction are the responsibility of the owner, engineer and/or contractor.**

CORPORATE OFFICE

1062 Singing Hills Road Parker, Colorado 80138 800 524 8672 303 841 2022 Fax 303 841 5780 [www.coloradolining.com](http://www.coloradolining.com)



### Geomembrane Installation Approval

Project: HAYES EVAP PIT  
Owner: WILLIAMS PRODUCTION  
Engineer:  
Contractor: MB CONSTRUCTION  
Supervisor: ROGER BARNES  
Material: 60 MIL HDT, 8 OZ TEXTILE

The Geomembrane on this project has been installed, inspected and tested in accordance with Industry Standards and Manufacturer recommendations.

Date: 6/17/09

Accepted By: Richard Teninty  
(Signature)

Print Name/Title: RICHARD TENINTY

Company: MB

Comments:  
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**All warranties to begin on the date of completion.  
Warranties to be issued upon receipt of final payment**





# HIS MEMORANDUM

is an acknowledgment that a Bill of Lading has been issued and is not the Original Bill of Lading, nor a copy or duplicate, covering the property named herein, and is intended solely for filing or record.

PICK UP @ PLANT

9/18/2009

B/L NO.

001473

NAME OF CARRIER

CARRIER'S NO.

DATE

RECEIVED, subject to the classifications and lawfully filed tariffs in effect on the date of issue of this Bill of Lading, the property described below, in apparent good order, except as noted (contents and condition of contents of packages unknown), marked, consigned, and destined as indicated below which said carrier (the word carrier is used throughout this contract as meaning any person or corporation in possession of the property under the contract) agrees to carry to its usual place of delivery at said destination, if on its route, otherwise to deliver to the consignee on the route to said destination. It is mutually agreed as to each carrier of all or any of said property over all or any portion of said route to destination, and as to each party at any time interested in all or a portion of said property, that every service to be performed hereunder, shall be subject to all the terms and conditions of the Uniform Domestic Straight Bill of Lading set forth (1) in Uniform Freight Classifications in effect on the date of issue of this Bill of Lading, or (2) in the applicable motor carrier classification or tariff if this is a motor carrier shipment. The shipper hereby certifies that he is familiar with all the terms and conditions of the said bill of lading, set forth in the classification or tariff, and the said terms and conditions are hereby agreed to by the shipper and accepted for himself and his assigns.

FROM:

SHIPPER

(ORIGIN)

AGRU/AMERICA, INC.

2000 East Newlands Drive

Fernley, NV 89408

(775)835-8282

TO:

CONSIGNEE

STREET

DESTINATION

COLORADO LINING COMPANY

CUSTOMER TO PICK UP AT PLANT

DESTINATION: PARACHUTE, CO

Resale Certificate on File

USA

DAN BOYLE-303-841-2022

ZIP

DELIVERING

CARRIER

ROUTE

VEHICLE

NUMBER

NO. PACKAGES	+ HM	KIND OF PACKAGE, DESCRIPTION OF ARTICLES SPECIAL MARKS AND EXCEPTIONS	*WEIGHT (SUBJECT TO CORR.)	CLASS OR RATE	✓	CHARGES (FOR CARRIER USE ON
154,317		7 METER SMTH LINER HD 60MIL BLK	46,367			
264		WELD ROD MFG BLACK HDPE 5MM	264			
		Item Key	Roll Number	Quantity		
		L-HD-SMTH-060-7M	919747-09	9,645		
		L-HD-SMTH-060-7M	919748-09	9,645		
		L-HD-SMTH-060-7M	919749-09	9,645		
		L-HD-SMTH-060-7M	919750-09	9,645		
		L-HD-SMTH-060-7M	919751-09	9,645		
		L-HD-SMTH-060-7M	919752-09	9,645		
		L-HD-SMTH-060-7M	919753-09	9,645		
		L-HD-SMTH-060-7M	919754-09	9,645		
		L-HD-SMTH-060-7M	920101-09	9,645		
		L-HD-SMTH-060-7M	920102-09	9,645		
		L-HD-SMTH-060-7M	920103-09	9,645		
		L-HD-SMTH-060-7M	920104-09	9,645		
		L-HD-SMTH-060-7M	920105-09	9,645		
		L-HD-SMTH-060-7M	920106-09	9,645		
		L-HD-SMTH-060-7M	920107-09	9,645		
		L-HD-SMTH-060-7M	920108-09	9,645		
		Total Weight: 46,631 LB				
		Total Units: 160000/1250000				
		Order No.: 12123 Order Date: 05/06/09 Request Date: 05/06/09				
		Location: NV P.O. No.: 24875				

EMIT C.O.D. TO:



AGRU/AMERICA, INC.

2000 East Newlands Drive

Fernley, NV 89408

(775)835-8282

C.O.D. Amt \$

C.O.D. FEE

☐ Prepaid  
☒ Collect \$

If the shipment moves between two ports by a carrier by other than the law requires that the bill of lading shall state the weight of the property as "carrier's or shipper's weight".

NOTE: Where the rate is dependent on value, shippers are required to state specifically in writing the agreed or declared value of the property.  
The agreed or declared value of the property is hereby specifically stated by the shipper to be not exceeding \$ \_\_\_\_\_ per \_\_\_\_\_

Subject to Section 7 of conditions, if this shipment is to be delivered to the consignee without recourse on the consignor, the consignor shall sign the following statement: The carrier shall not make delivery of this shipment without payment of freight and all other lawful charges.

TOTAL CHARGES \$

Freight charges are PREPAID unless marked collect. ☐ Check box if charges are Collect

Shipper's Imprint in lieu of stamp; not a part of bill of lading approved by the Interstate Commerce Commission.

(Signature of Consignor)

Shipper is to certify that the above named materials are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation, according to the applicable regulations of the Department of Transportation.

## SOIL TEST

# Lambert and Associates

CONSULTING GEOTECHNICAL ENGINEERS AND MATERIAL TESTING

## DAILY FIELD REPORT - FIELD DENSITY TESTS

Date: <i>Thursday, May/28/09</i>	Arrive Time: <i>11:45 AM</i>
Project Name: <i>Evaporation Pond</i>	Depart Time:
Project Number: <i>G09032MT</i>	Weather: <i>Overcast</i>
Client: <i>MB Construction</i>	Temp:
General Contractor:	Client Representative:
Specialty Contractor: <i>MB Construction</i>	Supervisor:
Source of Fill Material:	Specialty Superintendent or Foreman: <i>Dick Teninty</i>
Plans and Specs: <i>N/A</i>	Dated:
Contractor's Equipment Used: <i>Dozers, scrapers, backhoe, water truck and vibratory smooth drum compactor</i>	
Lambert and Associates Equipment Used - Manufacturer: <i>CPN</i> Serial Number or Unit Number: <i>18</i>	
Test Results were Verbally Given On-Site to: <i>Dick Teninty</i>	
Expected Conditions Observed: <i>Yes</i>	
Unexpected Conditions Observed: <i>No</i>	
Unusual Conditions Observed: <i>No</i>	
If yes, who was contacted?	
Follow-up from Prior Visit:	Retests Performed: <i>Yes</i>
Concerns for Next Visit: <i>None</i>	Retests Needed:
Other personnel contacted on-site: name/firm	
Notes: <i>I performed nuclear field density tests, as requested by Dick Teninty with MB Construction, of material being placed for the construction of Evaporation Ponds Numbers One (1), Two (2) and Three (3). Please refer to the test results sheets for approximate test location and test results. The test results indicate only the relative compaction and soil moisture content of the material tested at the elevation and location tested at the time of our site visit.</i>	
Lambert and Associates Technician: <i>Hayes</i>	

## RELATIVE COMPACTION TEST RESULTS

PROJECT: Evaporation Pond

PROJECT NO: G09032MT

DATE: Thursday, May/28/09

SITE LOCATION: Parachute

ENGINEERING TECHNICIAN: Hayes

CLIENT: MB Construction

NUCLEAR GAUGE USED: 18

TEST NO	TEST LOCATION	DEPTH OR ELEVATION	PROBE DEPTH (IN)	LABORATORY PROCTOR DENSITY (PCF)	OPTIMUM MOISTURE CONTENT (%)	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	RELATIVE COMPACTION (%)	SOIL TYPE
	<i>Approximate Test Locations</i>								
	<i>Pond #1</i>								
2	Test #1 May/28/09 sketch	At Grade	8	121.5	12.0	113.5	12.9	93	Clay, Sandy, Gravelly, Brown
3	Test #2 May/28/09 sketch	"	8	121.5	12.0	117.0	14.0	96	" "
4	Test #3 May/28/09 sketch	"	8	118.0	13.0	104.9	14.1	89	Clay, Sandy, Brown
5	Retest of #4, this date	"	8	118.0	13.0	105.1	14.0	89	" "
	<i>Pond #2</i>								
6	Test #1 May/28/09 sketch	"	8	121.5	12.0	113.2	16.0	93	Clay, Sandy, Gravelly, Brown
7	Test #2 May/28/09 sketch	"	8	120.0	12.0	108.6	17.5	91	Clay, Sandy, Brown
8	Test #3 May/28/09 sketch	"	8	121.5	12.0	111.2	12.3	92	Clay, Sandy, Gravelly, Brown
	<i>Pond #3</i>								
9	Test #1 May/28/09 sketch	"	8	120.0	12.0	108.2	15.9	90	Clay, Sandy, Brown
10	Test #2 May/28/09 sketch	"	8	120.0	12.0	116.7	11.7	97	" "

REMARKS: The test results indicate only the density and moisture content for the location and elevation tested only.

**Lambert and Associates**

PROJECT NUMBER: G09032MT



# Lambert and Associates

CONSULTING GEOTECHNICAL ENGINEERS AND MATERIAL TESTING

**Client:** MB Construction

**Date Received:** May/8/09

**Project:** Evaporation Pond

**Date Tested:** May/13/09

**Project Number:** G09032MT

**Sample Number:** 1465

**Location:** Parachute, CO

**Sample Source:** MB Sample Number 3

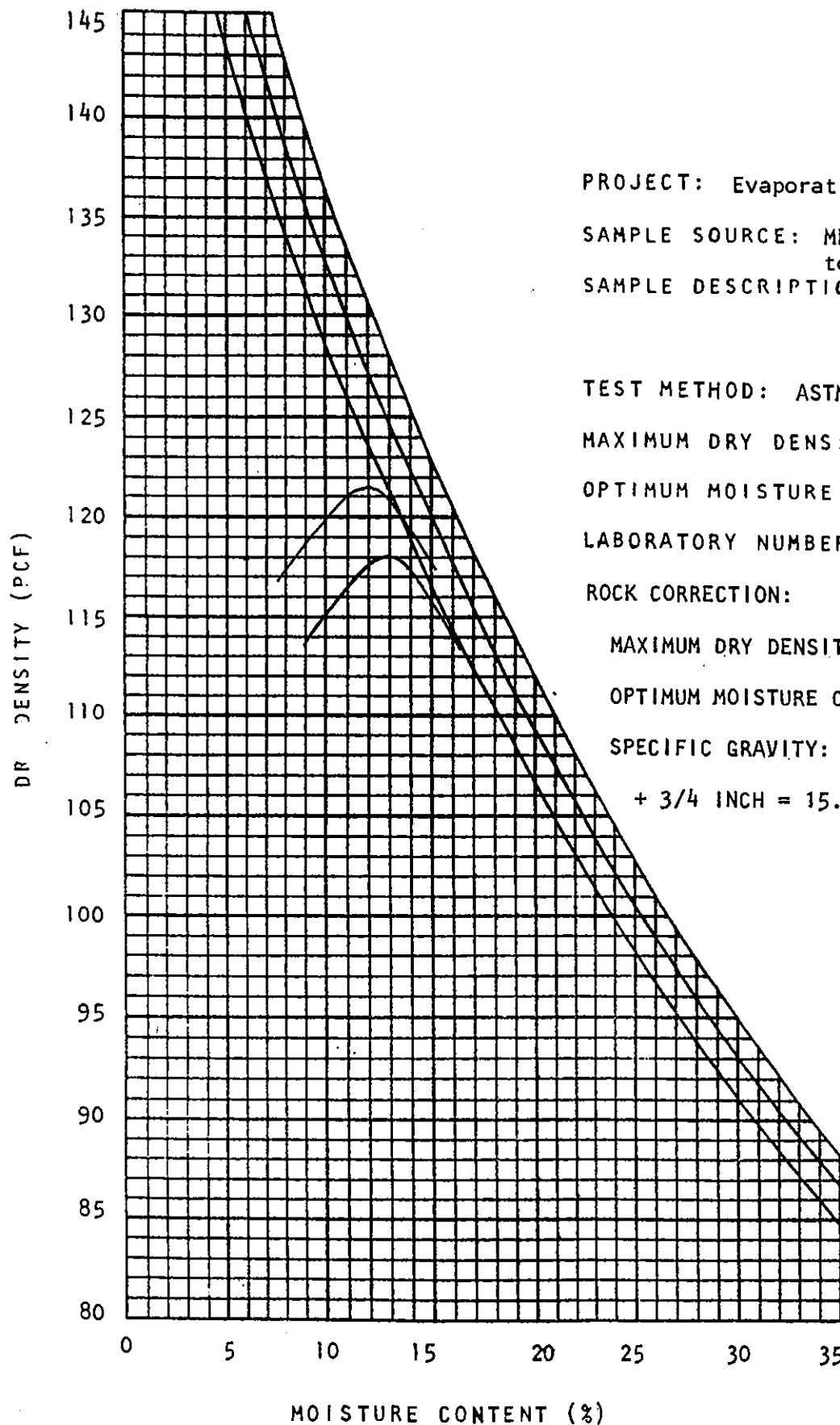
**Sample Description:** Clay, Sand, Gravelly, Brown

## CONSTANT HEAD PERMEABILITY TEST

Initial Moisture Content: 13.5%

Dry Unit Weight: 106.2 pcf

Permeability:  $4.2 \times 10^{-8}$  cm/sec



PROJECT: Evaporation Pond

SAMPLE SOURCE: MB Sample Number 4, Delivered  
to Grand Junction Office

SAMPLE DESCRIPTION: Clay, Sand, Gravelly,  
Brown

TEST METHOD: ASTM D1557C

MAXIMUM DRY DENSITY: 118.0 pcf

OPTIMUM MOISTURE CONTENT: 13.0%

LABORATORY NUMBER: 1466

ROCK CORRECTION:

MAXIMUM DRY DENSITY: 121.5 pcf

OPTIMUM MOISTURE CONTENT: 12.0%

SPECIFIC GRAVITY: 2.302

+ 3/4 INCH = 15.4% OF TOTAL WEIGHT

**Lambert and Associates**

Project No.: G09032MT

Date: May/8/2009

Flame:

**Lambert and Associates**  
CONSULTING GEOTECHNICAL ENGINEERS AND MATERIAL TESTING

**Client:** MB Construction

**Date Received:** May/8/09

**Project:** Evaporation Pond

**Date Tested:** May/14/09

**Project Number:** G09032MT

**Sample Number:** 1466

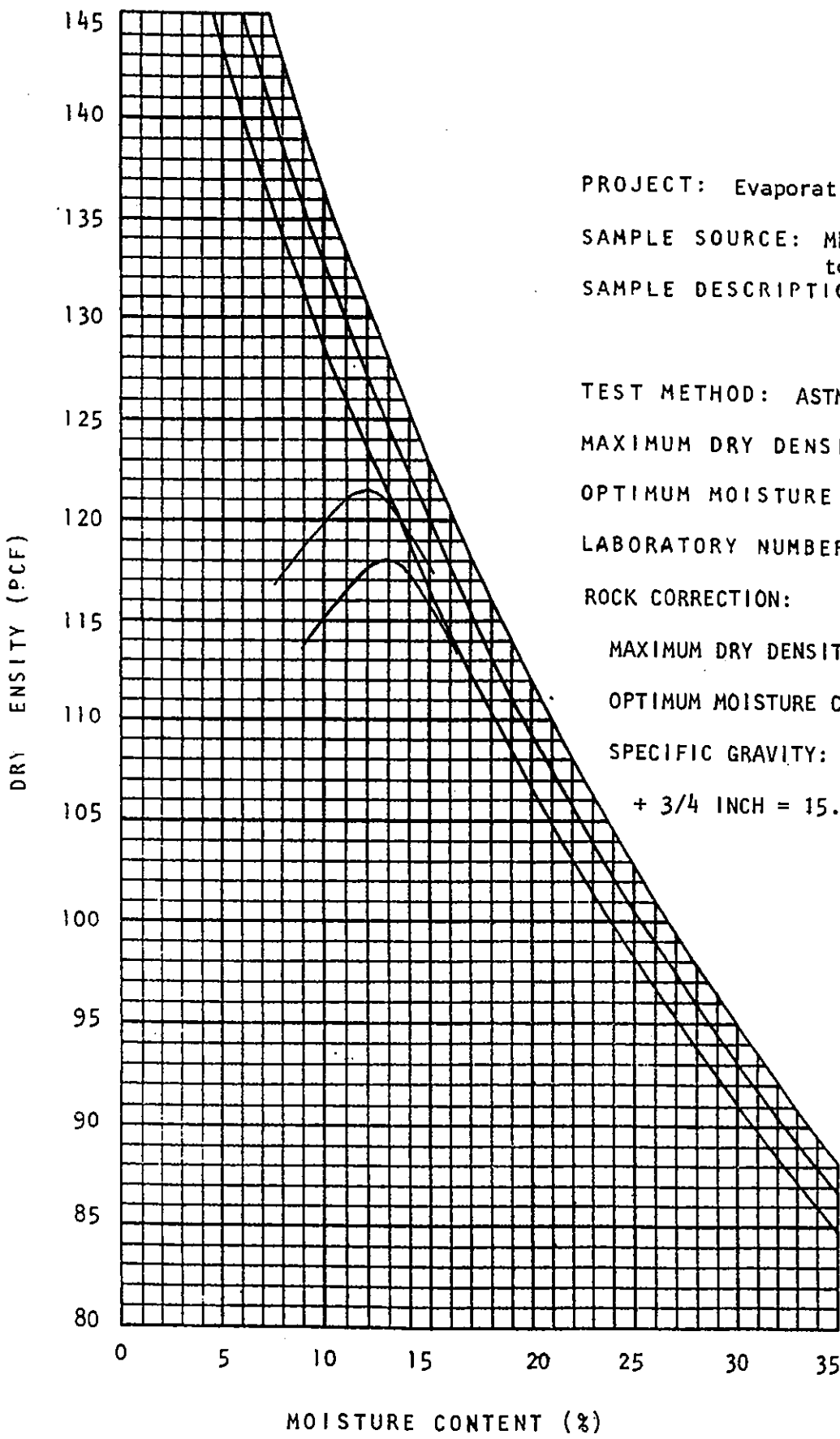
**Location:** Parachute, CO

**Sample Source:** MB Sample Number 4,  
Delivered to Grand Junction Office

**Sample Description:** Clay, Sand, Gravelly, Brown

**CONSTANT HEAD PERMEABILITY TEST**

Initial Moisture Content: 14.6%  
Dry Unit Weight: 106.2 pcf  
Permeability:  $1.8 \times 10^{-7}$  cm/sec



PROJECT: Evaporation Pond

SAMPLE SOURCE: MB Sample Number 4, Delivered  
to Grand Junction Office

SAMPLE DESCRIPTION: Clay, Sand, Gravelly,  
Brown

TEST METHOD: ASTM D1557C

MAXIMUM DRY DENSITY: 118.0 pcf

OPTIMUM MOISTURE CONTENT: 13.0%

LABORATORY NUMBER: 1466

ROCK CORRECTION:

MAXIMUM DRY DENSITY: 121.5 pcf

OPTIMUM MOISTURE CONTENT: 12.0%

SPECIFIC GRAVITY: 2.302

+ 3/4 INCH = 15.4% OF TOTAL WEIGHT

**Lambert and Associates**

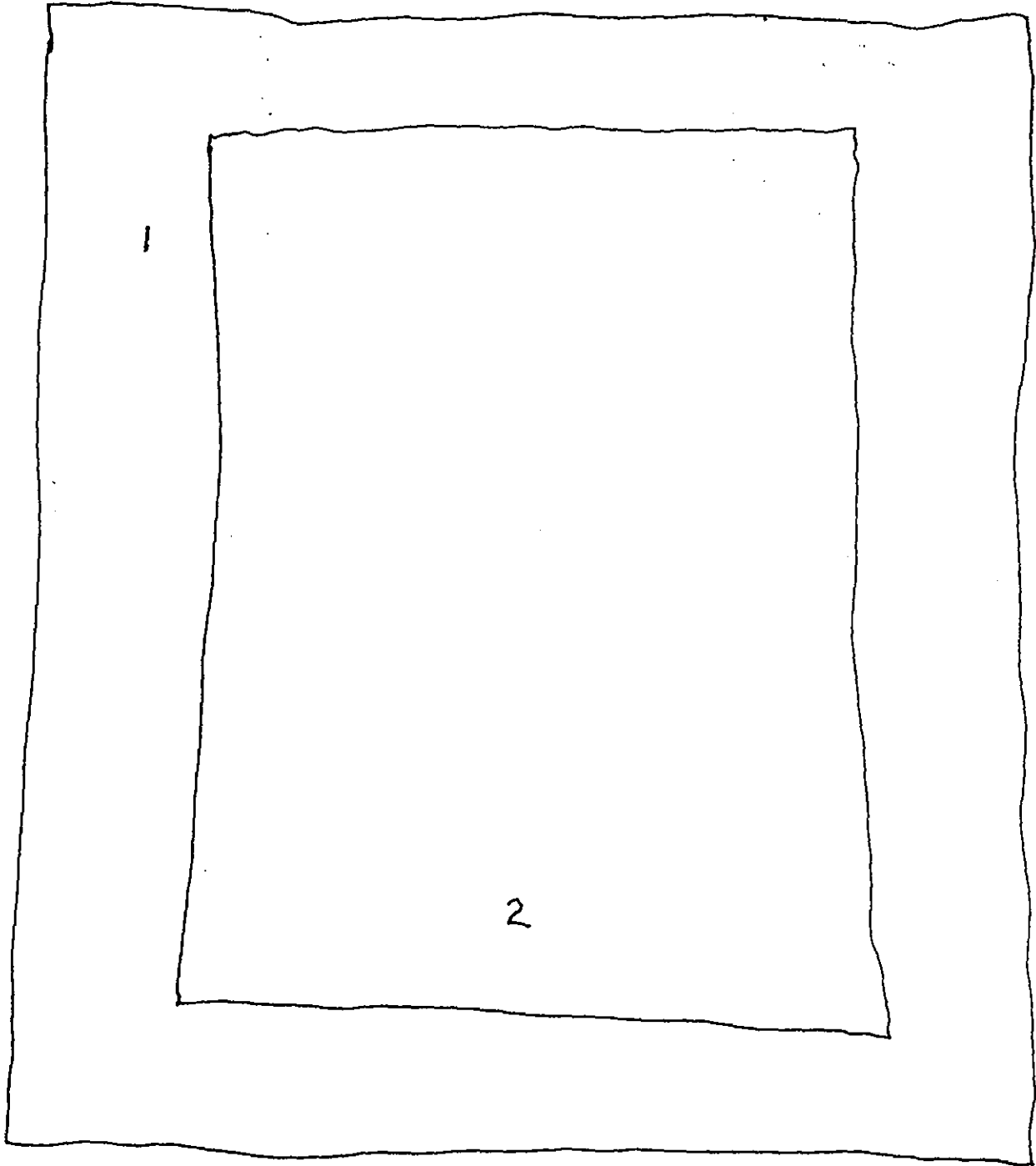
Project No.: G09032MT

Date: May/8/2009

Flare:



Parachute Evaporation Pond #3  
609032MT  
5-28-09  
Pond #3



No Scale



## Attachment C

Historical Use and Maintenance

## Grand Valley Pit # 3

### Historical Use and Maintenance:

- The pit was constructed in 2009 in accordance with the COGCC Rules applicable at that time.
- The pit bottom was compacted and lined with one 60 mil HDPE liner (See attachment B for the engineering evaluation of the liners installation and sub grade acceptance).
- Grand Valley Pit # 3 prior to the commissioning of the Grand Valley Pit #1 was used for storage and receiving of recycled produced water. With Grand Valley Pit #1 in service the Grand Valley Pit # 3 is only used for storage of recycled produced water.
- The historical maintenance consisted of regular inspections and general house cleaning.
- No repairs have been required on the Grand Valley Pit # 3
- This pit is managed under close supervision and has minimal daily exposure to operations other than normal water movements.

## Attachment D

Operation and Maintenance Plan



# **OPERATION AND MAINTENANCE PLAN**

**Parachute Centralized E&P Waste Management Facility  
Garfield County, Colorado**

WPX Energy Rocky Mountain, LLC  
February 29, 2012

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## **1.0 INTRODUCTION**

WPX Energy Rocky Mountain, LLC (WPX) owns and operates the Parachute Water Management Facility (Parachute WMF) located in Garfield County, Colorado. Parachute WMF was constructed as a centralized waste management facility to process and recycle fluids that are generated from natural gas exploration and production and other WPX operations in the Piceance Basin. The facility was constructed in response to WPX's increasing natural gas production and continued drilling in the area and the need to cost effectively treat these fluids for re-use as well as disposal.

The Parachute WMF operates 24 hours per day, 365 days a year and is designed to process approximately 25,000 bbls per day (average annual basis) of fluids using different recovery, treatment and disposal processes. Maximizing recovery and re-use of these fluids is important to WPX's operations and contributes to overall company efficiency. Due to the facility size and volumes processed, attention to proper operation and maintenance of the Parachute WMF and its associated equipment is important to maintain high operational performance, minimize maintenance costs and ensure safe operation.

## **2.0 OPERATION**

### **General Description**

The Parachute WMF receives produced water, flow back and other fluids from natural gas production, well completion and other WPX operations in the Piceance Basin. These fluids are received by truck and pipeline at this facility and consist of mostly water with small amounts of non-aqueous free phase hydrocarbons, dissolved hydrocarbons and solids. These fluids are processed at this facility to treat and prepare these fluids for re-use in well completion or for disposal.

Fluids enter the Front-End of the facility by truck and are received at a multi-bay unloading station. Fluid streams by truck combine with fluids received by pipeline and flow into Inlet Skim Tanks where initial phase separation is allowed to occur. Recovered oil in the upper fluid phase is routed to Condensate Sales Tanks, mixed phase emulsions are routed to Emulsion Tanks for additional treating and recovered water is routed to Surge Tanks. Solids that accumulate at the bottom of the Inlet Skim Tanks are separated by cyclone with liquids routing back to the Inlet Skim Tanks and solids diverted to a Sand Tank. Accumulated solids in the Sand Tank are removed and processed through a filter press. Residual fluids recovered by filter press are pumped back to the Inlet Skim Tanks and the final dry solids are treated at the on-site Landfarm or taken to a commercial facility.

The water stream entering the Surge Tanks is allowed to accumulate allowing additional phase separation of residual hydrocarbons. Any recovered oil accumulated in the Surge Tanks is transferred to the Condensate Sales Tanks. The remaining water is routed to a set of Dissolved Air Flotation (DAF) units which utilize water clarifying agents to break the remaining emulsion and facilitate removal of residual hydrocarbons and solids. The DAF units capture these hydrocarbons and solids with dissolved air to float a foam froth that is mechanically skimmed from the surface. This froth is routed to Emulsion Tanks for additional treatment while the treated water is routed to the Holding Pond System.

The Emulsion Tanks receive a variety of emulsion types from the Inlet Skim Tanks, Surge Tanks, DAF units, residual tank bottom solids from the Condensate Sales Tanks and emulsions fluids that are not suitable for direct offload into the Inlet Skim Tanks. These emulsions are treated by heat or additional chemicals to provide additional separation and recovery of oil and water. Any residual oil recovered from processing these emulsions is routed back to the Condensate Sales Tanks while recovered water is pumped to the Field Treat facility Field Skim Tank. Solids remaining in the Emulsion Tanks are processed through a filter press and residual liquids from the filter press are routed back to the Emulsion Tanks. The final dry solids are treated at the on-site Landfarm or taken to a commercial facility.

Recovered oil is stored in Condensate Sales Tanks until measured, loaded onto trucks and sold. When necessary, accumulated water, sediment and solids will be transferred from the Condensate Sales Tanks to the Emulsion Tanks for additional treating and oil recovery.

A separate Field Treat facility located within the Parachute WMF provides additional surge capacity during times of high water production in the field. This water can be received by pipeline or by direct truck offload and will flow directly into a Field Skim Tank and will function identically to the Inlet Skim Tanks in the Front-End portion of the facility. Any recovered oil will be routed to a separate set of Field Condensate Tanks and recovered water will be routed through a set of Field Polishing Tanks for additional phase separation. Oil recovered in the Field Polishing Tanks will also route to the Field Condensate Tanks. Water will continue to flow from the Field Polishing Tanks and route directly into Grand Valley Pit # 1 (Pond-1). Recovered water will be held in Pond-1 and will be pumped as necessary to the Inlet Skim Tanks and processed through the Front-End treatment system. All water routed to Pond-1 will be tracked by a flow meter located downstream of the Field Polishing Tanks.

Accumulated solids in the Field Skim Tank will also be routed through a cyclone to send recovered water back through the Field Skim Tank and remaining solids to a Field Sand Tank. Solids in the Field Sand Tank will be processed in the same manner as the Sand Tank in the Front-End treatment system.

Accumulated oil in the Field Condensate Tanks will be transferred to the Condensate Sales Tanks in the Front-End treatment system. Any emulsions or tank bottoms from the Field Polishing Tanks or Field Condensate Tanks will be transferred to the Emulsion Tanks in the Front-End treatment system for additional processing.

Pond-1 is a holding pond with a capacity of approximately 176,000 bbls and with a potential throughput of approximately 2,500,000 bbls per year. Pond-1 is intended to provide surge and holding capacity of partially treated water until it can be routed to the Front-End treatment system. It is equipped with a floating sealed cover to capture any vapors and route them to an enclosed combustor.

The Holding Pond System is a set of four holding ponds identified as North, South, Grand Valley Pit # 2 (Pond-2) and Grand Valley Pit # 3 (Pond-3) with a cumulative holding capacity of approximately 365,000 bbls and an operating throughput of up to 9,300,000 bbls per year. These ponds hold water that has been recovered and treated by the Front-End treatment system which includes the Inlet Skim Tanks, Surge Tanks and DAF units. Additionally, water in the Holding Pond System is augmented with nutrients and hydrocarbon consuming microbes to facilitate further reduction of any remaining dissolved hydrocarbon content. Although water in the Holding Pond System will be moved and recirculated between these four ponds as necessary, water generally routes from the DAF units to the North pond first and gravity feeds into the South pond while Pond-2 and Pond-3 generally recirculate independently. Aerators are utilized and water is recirculated to enhance biodegradation of dissolved hydrocarbons through increased oxygen content and nutrient distribution.

As necessary, excess water accumulated in the Holding Pond System will be transferred to Water Injection Tanks and disposed by pumping into deep well formations using a high pressure injection pump or water may be sent to a commercial disposal facility. If needed for

re-use in other field operations, water from the Holding Pond System can be pumped by pipeline or loaded and trucked off-site for re-use.

Enhanced water evaporation with a potential throughput of up to 500,000 bbls per year will also be utilized to dispose of excess water accumulated in the Holding Pond System. Evaporation will be conducted over Pond-2 and Pond-3. Circulation pumps will route the water from these ponds to a network of sprinklers which will spray the water into a fine mist to increase the surface area and in turn increase the evaporation rate. The sprinklers will be positioned such that the mist of water will project over these ponds and any water not evaporated will re-accumulate back into the ponds.

An on-site Landfarm consisting of five separate plots will be utilized to treat residual solid waste through biodegradation and volatilization of residual hydrocarbon content. The capacity of the Landfarm will be up to 3,000 tons per year.

## **Holding Ponds**

Managing the volumes of field water is critical to efficient operations of WPX assets. To ensure sufficient water is on-hand for well completions or other operational re-use, daily accounting of the pond levels at the Parachute WMF will be compiled. All recovered water entering the Holding Pond System is monitored through flow meters and pond levels are tracked using level pressure transducers and transmitted to the facility's automation system. These operational data sources are used to monitor change in pond levels for overall facility accounting as well as to monitor for potential leaks in the individual ponds. In the event an unexpected change in pond level that cannot be accounted for in overall facility operational data, further investigation will be conducted to mitigate potential leakage.

Water entering the Holding Pond System (North, South, Pond-2 and Pond-3) must be treated through the Front-End treatment system including the Inlet Skim Tanks, Surge Tanks and DAF units. No fluids may enter the Holding Pond System that has not been treated.

A containment boom will be placed where water exits the DAF units and discharges into the North pond as an additional measure to capture any residual skim that may enter the ponds. The ponds will be monitored daily and any observed oil skim captured in this boom will be reported. A standby skim pump will be available to remove any skim that is observed.

Accumulated sediment in the ponds will be monitored quarterly by direct measurement at distributed points throughout the ponds. Should sediment accumulation be reported, mitigation will be performed to prevent excessive sediment build-up.

Pond-1 will have a sealed floating cover to capture and collect any vapor emissions. Vapors will exit Pond-1 via a hose that will direct the vapors to an enclosed combustor. Periodic precipitation will accumulate on the floating cover and will be pumped out through a network of drainage troughs which lead to level activated sump pumps. These pumps will pump the surface water into Pond-1 via a sealed opening.

## **Evaporation System**

The enhanced evaporation system will be operated during favorable seasonal conditions to reduce the volume of accumulated water in the Holding Pond System. Evaporation will be conducted over Pond-2 and Pond-3. As necessary, measured volumes of water will be moved to these ponds in batches for disposal by evaporation. Circulation pumps will route the water from these ponds to a network of spray nozzles, sprinkler heads or other water dispersion devices to increase the overall water surface area and evaporation rate. These spray nozzles will be positioned over the ponds to capture the water spray that has settling velocity. Measurements will be recorded daily of the total amount of water evaporated. To prevent freeze damage, the evaporation system will not be operated during excessive cold conditions. The evaporation system will not be operated during times of high wind to prevent overspray to adjacent surfaces.

## **Landfarm**

The Landfarm will consist of five separate plots designated for receiving and treating solid waste from facility and other E&P operations. Incoming material will be received initially into a landfarm plot designated for incoming material where it will be quantified and sampled prior to being worked into an active landfarm plot. Each landfarm plot will be managed independently and may be segregated and managed as sub-cells depending upon the rate of biodegradation and nutrient requirements. Additional augmentation of cultured microbes, nutrients, moisture and other amendments will be utilized to achieve optimum soil properties for enhanced biodegradation. Periodic tilling or turning of the solid waste will be performed to provide mixing, aeration and control moisture. Treated solid waste which has passed regulatory requirements for disposal will be utilized for roads, berms and fill within WPX's operating locations.

## **Security**

The facility is authorized to receive only E&P waste from WPX operations. No unauthorized personnel are allowed at the Parachute WMF. A plant operator is on-site 24 hours per day to monitor the facility for any unauthorized activity. Signage is located at multiple points throughout the facility to direct contractors and truck drivers to proper unloading areas. The perimeter of the facility is fenced to prevent unauthorized access. This fence also serves as wildlife mitigation along with cattle guards across each ingress and egress point of the facility.



### 3.0 INSPECTION AND MAINTENANCE

Plant personnel will inspect the facility through the course of routine daily operations. Some specific checks will be performed more extensively according to the following schedule. A form for recording inspection data is included in Appendix A. Completed forms will be maintained within the facility's data management system which may include multiple databases, spreadsheets and log sheets. Except as otherwise noted, any issues identified in the inspections will be brought to the attention of WPX management and corrections or repairs will be scheduled promptly.

ITEM	FREQUENCY
Excessive Odors	Daily
Oil Accumulation on Storage Ponds	Daily
Pipe Leaks and Spills	Daily
Equipment Function	Daily
Liner and Pond Cover Condition	Daily
Liner integrity	Daily
Evaporation Operation	Daily
Fence Condition	Monthly
Safety Equipment Deployment	Monthly

- Stormwater inspections will be conducted in accordance with the Grand Valley Field Stormwater Plan. Permit #CR038544.
- SPCC inspections will be conducted in accordance with the Parachute Centralized E&P Waste Management FRP.
- Storage ponds will be inspected for oil skim accumulation. If a skim is observed within the containment boom, the installed skim pump will be operated to remove the skim. If a skim exists outside the boom, a vacuum truck will be used to remove any skim.
- Equipment function including automation controls and monitoring will be checked daily.
- The Evaporation system operation will be monitored for wind conditions that could cause potential overspray. The system will be shut down whenever wind conditions are not favorable or in the event overspray is observed.

## 4.0 RECORD KEEPING

The following facility operational data will be recorded and maintained within the facility's data management system which may include multiple databases, spreadsheets and log sheets. An example of such log sheets is included in Appendix A. This data will be used to monitor facility performance and to ensure proper operation.

DATA	FREQUENCY
Total Daily Volume In	Daily
Total Daily Volume Out	Daily
Total Daily Volume Injected By Well	Daily
Storage Pond Levels	Daily
Total Enhanced Evaporation	Daily

Critical to pond leak detection, evaporation monitoring and throughput calculations are the flow meters and level indicators throughout the facility. The following specific flow meters and level indicators track the facility daily operating parameters and are utilized in the facility's data management system to track the pond system.

DEVICE ID	PURPOSE
FIT-300	Meter tracking total throughput through DAF 300, DAF 310 and flows into North pond.
FIT-310	
FIT-160	Flows from pipeline into Inlet Skim Tanks
FIT-106	Flows from North or South ponds for recycle or truck loadout for reuse
FIT-900	Flows into Field-Treat system into Field Skim Tank
FIT-905	Flows into Pond-1 from the Field-Treat system or pipeline into Pond-1
FIT-691	Flows from Pond-1 recirculate, diversion back to Field-Treat system, flows out of Pond-1 to Front-End
FIT-691A	
FIT-691B	
FIT-692	Flows from Pond-2 recirculate, diversion to Pond-2 or Pond-3, bypass from Pond-3 to other ponds
FIT-692A	
LIT-122	Level indicator monitoring North pond
LIT-121	Level indicator monitoring South pond
LIT-691	Level indicator monitoring Pond-1
LIT-692	Level indicator monitoring Pond-2
LIT-693	Level indicator monitoring Pond-3

## **5.0 SAFETY PROCEDURES**

### **Emergency Response Plan**

In the event of an immediate threat to human health, the environment, and/or property please refer to the *WPX Energy Emergency Response One Plan, Effective 02-15-12*. The Emergency Response Plan is maintained at the Parachute office.

### **Hazard Description**

Special precautions must be taken when working near the storage ponds. The sloping linear material is challenging to walk on when dry and difficult to walk on when wet, frosted or covered with snow. Walking on the sloped area is certain to result in immersion in the ponds under these conditions. If snow is present at the pond perimeter, it is impossible to determine if the area to be traversed is underlain by soil or linear material.

### **Facility Safety Practices**

The following special safety precautions must be followed for the facility:

- All personnel who have access to the facility, including contract water haulers, must be briefed on the safety hazards
- A sign providing a description of hazards must be maintained at the first point of access to the upper storage pond
- Signs shall be posted at 150' intervals, "Danger Keep Out- Drowning Hazard"
- Ring buoys with an adequate length of rope shall be stationed at two easily accessible points on the perimeter of each pond
- Buddy system when on plastic

### **Storage Pond Access Requirements**

Points requiring regular access, such as the suction line area or skimming points shall be equipped with the following additional safety measures:

- An anchored rope ladder that extends at least three feet below the liquid surface
- A ring buoy with an adequate length of rope to rescue an immersed party without entering the sloped area of the pond
- An anchored support pole to help maintain balance and footing while walking the pond slope and
- An approved personal floatation device (PFD)
- A sign stating "Danger – Authorized Personnel Only – Keep Out"

Only access points so equipped may be used to access the ponds for normal maintenance activities. Only authorized personnel, trained in the hazards and proper work practices shall be allowed to access the ponds.

The ponds may not be accessed if the liner is wet or in the winter season without employing the buddy system. One person must remain on the pond perimeter, in direct view of the individual working in the pond. A PFD must be worn by both individuals accessing the pond. If possible, pond maintenance activities should be avoided if the liner is wet, or snow and frost covered.

## **Personal Protective Equipment**

Protective equipment and procedures described by WPX Hazard Communication program and Personal Protective Equipment program shall be followed when contact with produced water or condensate is possible.



### Parachute Water Management Facility

#### Pond Inspection Report

Date: \_\_\_\_\_

Time: \_\_\_\_\_

Operator: \_\_\_\_\_

Average WS Elevation: \_\_\_\_\_

Mark all that apply ☒

#### Daily - Adverse Weather Conditions

Extreme heat	<input type="checkbox"/>	High	_____	F°
Extreme cold	<input type="checkbox"/>	Low	_____	F°
High winds	<input type="checkbox"/>	Direction	_____	
		Speed	_____	MPH
Rain	<input type="checkbox"/>	Rainfall	_____	Inches
Other	<input type="checkbox"/>	_____		

#### Montly -Inspection

	YES	NO
Damaged Fence	<input type="checkbox"/>	<input type="checkbox"/>
Damaged safety equipment	<input type="checkbox"/>	<input type="checkbox"/>
(Other)	<input type="checkbox"/>	<input type="checkbox"/>
(Other)	<input type="checkbox"/>	<input type="checkbox"/>
(Other)	<input type="checkbox"/>	<input type="checkbox"/>
(Other)	<input type="checkbox"/>	<input type="checkbox"/>

#### Daily - Reservoir Perimeter Check

	YES	NO
Damage to perimeter fencing or gates	<input type="checkbox"/>	<input type="checkbox"/>
Debris on pond cover	<input type="checkbox"/>	<input type="checkbox"/>
Visible damage to pond cover	<input type="checkbox"/>	<input type="checkbox"/>
Rainwater removal system malfunction	<input type="checkbox"/>	<input type="checkbox"/>
Ponded water	<input type="checkbox"/>	<input type="checkbox"/>
Visible damage at structures	<input type="checkbox"/>	<input type="checkbox"/>
Excessive odors	<input type="checkbox"/>	<input type="checkbox"/>
Evap. mister overspray observed	<input type="checkbox"/>	<input type="checkbox"/>
(Other)	<input type="checkbox"/>	<input type="checkbox"/>
(Other)	<input type="checkbox"/>	<input type="checkbox"/>
(Other)	<input type="checkbox"/>	<input type="checkbox"/>
(Other)	<input type="checkbox"/>	<input type="checkbox"/>

#### Daily - Detailed Inspection

	YES	NO
Unsecure suction lines	<input type="checkbox"/>	<input type="checkbox"/>
Debris on cover or in troughs	<input type="checkbox"/>	<input type="checkbox"/>
Damage to rainwater removal system	<input type="checkbox"/>	<input type="checkbox"/>
Areas of ponded surface water	<input type="checkbox"/>	<input type="checkbox"/>
Standing water in troughs	<input type="checkbox"/>	<input type="checkbox"/>
Leakage at previous repairs	<input type="checkbox"/>	<input type="checkbox"/>
Membrane damage/pinholes/abrasions	<input type="checkbox"/>	<input type="checkbox"/>
Seam failure	<input type="checkbox"/>	<input type="checkbox"/>
Excessive air pockets under cover	<input type="checkbox"/>	<input type="checkbox"/>
Damage or wear at structures	<input type="checkbox"/>	<input type="checkbox"/>
Damage to vents or hatches	<input type="checkbox"/>	<input type="checkbox"/>
Oil accumulation	<input type="checkbox"/>	<input type="checkbox"/>

**Provide details for those items maked "yes" above**

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#### Complete the table for each required repair

Required Repair	Date Reported to O&M	Repair Assigned To:	Date Assigned	Completed Date



Pond Flow Tracking	
--------------------	--

[illegible]

## Attachment E

### Hydrostatic Test Results

# Hydrostatic Pit Testing

## Data Collection & Computation Form

Fox Engineering Solutions



**Pit Owner:** WPX Energy Rocky Mountain, LLC  
**Pit Name:** Grand Valley Pond #3  
**COGCC Facility No.** 426956  
**Pit Location:** NW 1/4 NW 1/4 S1, T7S, R96W, 6th P.M.; Garfield County, CO  
Latitude: N 39.4696° Longitude: W108.0653° NAD83  
**Reported Liner:** 60 mil Polypropylene  
**Approximate Elevation:** 5520 ft. MSL  
**Test Conducted By:** David Fox, Fox Engineering Solutions

### Test Initiation:

Date: January 13, 2011  
Time: 12:01 PM  
Total Duration: 72 hours

### Test Termination:

Date: January 16, 2012  
Time: 12:01 PM

	<u>Length</u>	<u>Width</u>	<u>Area</u>	<u>Comments</u>
Tributary Pit Liner Surface Area (ft <sup>2</sup> ):	-	-	36,768 ft. <sup>2</sup>	Surveyed by Bookcliff Survey
Initial Pit Water Surface Area:	-	-	21,694 ft. <sup>2</sup>	Surveyed by Bookcliff Survey
Final Pit Water Surface Area:	-	-	21,694 ft. <sup>2</sup>	Surveyed by Bookcliff Survey
Average Pit Surface Area:			21694 ft. <sup>2</sup>	
Initial Pit Fluid Level:				5513.78 ft.
Final Pit Fluid Level:				5513.78 ft
Difference				0.00 ft or
Est. Fluid Depth:	5.2 ft.			0 inches

Evaporation Pan Installed: No	Location:	Measured Pan Evaporation:	0.00 inches
Ice, frozen conditions		during Test Duration	
		Evaporation w/ Pan Coeff. 0.72	0.00 inches

Rain Gauge Installed: Yes	Location: East side of pit	Recorded Precipitation:	0.05 inches
		Equiv. 72-Hour Precip. Inflow:	0.09 inches

Other Inflow/Outflow:	Inflow (gal)	0	Equivalent Inflow:	0.00 inches
	Outflow (gal)	0	Equivalent Outflow:	0.00 inches

**Calculated Fluid Level Change in Inches:** (+ indicates fluid level increased)

(Precipitation - Pan Evaporation + Inflows - Outflows)	0.09 inches
(Precipitation - 72% Pan Evaporation + Inflows - Outflows)	0.09 inches

**Measure Change in Inches:** (+ indicates fluid level increased) 0.00 inches

Difference between Calculated and Measured Pit Fluid Level:	(With Pan Evaporation)	0.09 inches
	(With 72% Pan Evaporation)	0.09 inches

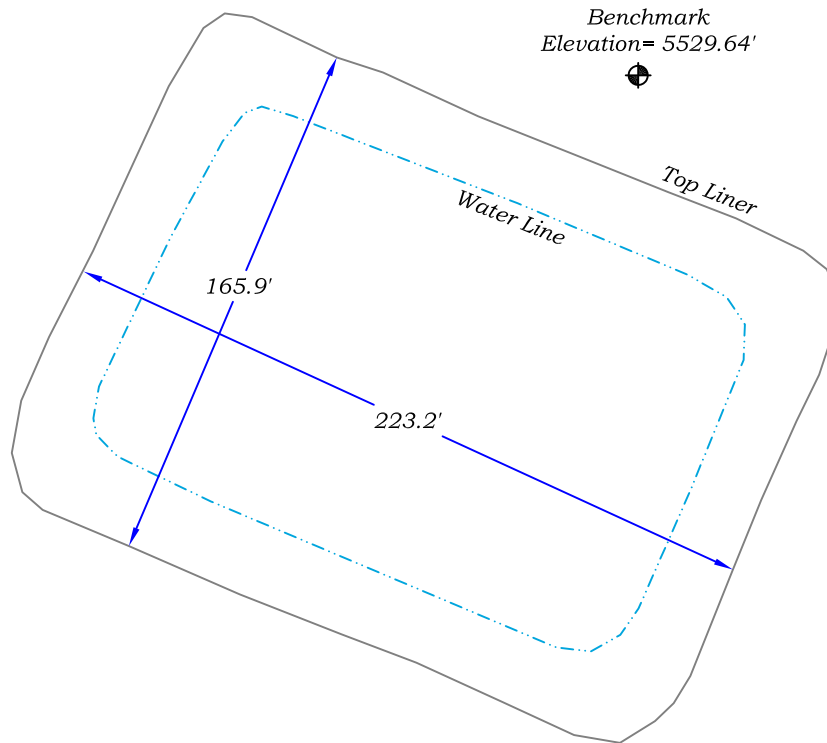
**Summary:** No observed loss of liner integrity. Fluid level remained unchanged. Precipitation inflow was imperceptible.  
Weather: Sunny and cold 5° - 35° with light snow/rain the morning of January 16th.

**Liner and Pit Condition:** Liner was installed in 2009.

Visible portion of liner, approximately the top 30 ft., had no apparent tears, delamination or seam failures.

**Comments:** Bookcliff Survey utilized a Trimble Total Station for required area and elevation measurements.  
Williams staff indicated that no fluids were transferred from or to the pit during the duration of the test.  
Produced water fluid level at 5.2 ft depth based on pressure transducers. Ice was 1"- 2" thick.

# GRAND VALLEY WATER TREATMENT FACILITY HYDRO-TEST EXHIBIT POND 3



SCALE: 1"= 60'

## POND 3 DETAILS

### TEST @ 12:00P.M.

TOP WATER ELEV. (JANUARY 13, 2012)= 5513.78'

TOP WATER ELEV. (JANUARY 16, 2012)= 5513.78'

TOP WATER SURFACE AREA (JANUARY 13, 2012)= 21,694 sq. ft.

TOP OF LINER SURFACE AREA = 36,768 sq. ft.

## POND 3 LOCATION

NW1/4 SECTION 1,  
TOWNSHIP 7 SOUTH,  
RANGE 96 WEST OF THE SIXTH P.M.

### COSP NAD83 CENTRAL ZONE

LATITUDE: 39.469653°

LONGITUDE: -108.065369°

136 East Third Street  
Rifle, Colorado 81650  
Ph. (970) 625-1330  
Fax (970) 625-2773



**BOOKCLIFF**  
Survey Services, Inc.

Fox Engineering Solutions  
670 Canyon Creek Dr.  
Grand Junction, CO 81503

Grand Valley Water  
Treatment Facility Pond 3

DATE: 1/16/12  
SHEET: 1 OF 1  
PROJECT: HYDROTEST  
DFT: SRB

# Hydrostatic Testing Procedures for COGCC Earthen Pits

Vers. 6.0 12-15-11 ©



The purpose for hydrostatic testing earthen pits is to comply with COGCC approval conditions for verifying the fluid holding integrity of the pit lining system. These procedures are specific to existing or active earthen pits holding oil and gas related fluids including, but not limited to, produced water. During testing, the pit shall have fluid level as high as practical, without encroaching into the 2 ft. freeboard, and the test shall be conducted for a minimum of 72 hours, if practical. Visible portions of the liner, including the anchor trench and seams, shall be inspected for defects. The test shall be scheduled and coordinated with personnel to ensure that oil and gas activities do not interfere with the test. Testing procedures may be subject to changes as dictated by field and climatic factors. All personnel involved with testing, while onsite, shall comply with their respective EH&S requirements.

- If practical, a sign shall be placed in a conspicuous location during the test stating "Hydrostatic testing in Progress, Pit Closed to All Water Hauling Activities". Contact information shall also be placed on the sign.
- A semi-permanent datum elevation point shall be established at the pit location. The surface area of the water surface and the surface area of the liner area, tributary to the pit shall be measured. The date and time of each measurement shall be documented.
- The pit fluid level; fluid surface area; and the lined surface area, tributary to the pit, shall be measured and recorded at the beginning of the test. The pit fluid level shall be measured again at the end of the test. A survey grade total station shall be utilized for accuracy to capture this information. The date and time of measurements shall be documented.
- A 4" diameter official rain gauge with funnel inlet shall be installed at the pit site. Precipitation shall be recorded for the duration of the hydrostatic test.
- During ice-free periods, pan evaporation shall be measured during the duration of the test following the procedures established by the National Weather Service – NOAA in the document entitled "National Weather Service - Observing Handbook No. 2, dated July 1989. A Class A evaporation pan shall be placed at the site, or as near as practical, with evaporation measured per established procedures. During ice-over periods at the pit, evaporation is assumed negligible and evaporation measurements will not be taken.
- For the duration of the test, all inflows and outflows, such as truck and piped transfers, shall cease. If the cessation of inflows and outflows is not practical, all pit inflows and outflows shall be accurately metered and documented during the test. 24-hour surveillance monitoring may be warranted.
- If no precipitation has occurred during the test, compare the change in the pit fluid level with the recorded pan evaporation. During ice-over periods, compare the pit levels taken at the start and end of the tests.
- If precipitation has occurred during the test, precipitation falling onto tributary portions of the liner, outside of the fluid surface area, may be added as an inflow to the pit and converted into inches of depth over the fluid surface area. During ice-over and snow conditions, precipitation inflow from tributary portions of the liner may be estimated from snow depth and corresponding water equivalent comparisons at the start and termination of the test. Other factors may also be utilized.
- The calculated change in pit level during the test is:  $\Delta L = P + I - O - E$  (all measurements converted to inches)  
  
Where:  $\Delta L$  = Change in pit fluid level       $P$  = Precipitation Inflow       $E$  = Evaporation  
           $I$  = Measured Inflows                       $O$  = Measured Outflows
- The measured change in the pit fluid level shall be compared to the calculated change, utilizing precipitation and evaporation data, in the pit fluid level during the test duration. The test procedures and results will be reviewed and analyzed for discrepancies. If the test results indicate integrity issues with the lining system, the test will be repeated.

## Attachment F

### Hydrologic Evaluation





# WATER RESOURCE CONSULTANTS, LLC

April 24, 2010

Phil Vaughan  
Phil Vaughan Construction Management, Inc.  
1038 CR 323  
Rifle, CO 81650

RE: Williams RMT  
Parachute Water Handling Facility, Garfield County, Colorado  
Effect on Groundwater and Aquifer Recharge Areas

Phil,

This letter report addresses the impacts of three new water storage and evaporation ponds constructed in 2009 at the Parachute Water Handling Facility (Fig. 1) on groundwater quantity and quality.

## REGULATORY BACKGROUND

This review has been prepared as a portion of a Limited Impact Review per Article 4-502 of the Garfield County, Colorado 2008 Unified Land Use Resolution. Specifically, the impact analysis required by Article 4-502(E)7 requires:

*7. Effect on Groundwater and Aquifer Recharge Areas. Evaluation of the relationship of the subject parcel to floodplains, the nature of soils and subsoils and their ability to adequately support waste disposal, the slope of the land, the effect of sewage effluents, and the pollution of surface runoff, stream flow and groundwater.*

The subject of this report is only the effect on groundwater and aquifer recharge areas. Other subjects required above are contained elsewhere in this Limited Impact Review.

## SITE SETTING

### Topographic Setting

The Parachute water handling facility is located 1.5 miles northwest of Parachute, Colorado (Fig. 1). It is located on a dry outcrop of the Wasatch formation approximately 250 feet above and ½ mile from Parachute Creek, and 400 feet above and 1-¾ miles from Colorado River. Two intermittent streams skirt the Wasatch outcrop and the facility, but are over 120 feet lower than site and have no hydrologic impact on the site. Figure 2 shows the location of the three ponds in relation to nearby intermittent creeks.

### Aquifers

The site geology and geologic hazards of the site are summarized in a report included elsewhere in this Limited Impact Review<sup>1</sup>.

From a groundwater and aquifer perspective, the site is underlain by 15 to 30 feet of clayey colluvium soils below which is thick Wasatch bedrock composed of low permeability interbedded shales, mudstones, siltstones and clays. The colluvium has a high clay content which greatly impedes movement of water. The Wasatch formation is typically several thousand feet thick and is known for being a poor source of water for domestic and irrigation water. Wells that have been completed in the formation are often brackish and are usually low volume and of little domestic or commercial use. The Wasatch formation is effectively an aquitard that inhibits the travel of water from higher to lower phreatic elevations. Underlying the Wasatch formation is the extensive Mesa Verde formation, from which most oil and gas extraction in the Piceance Basin takes place.

It should be noted that the Colorado Division of Water Resources<sup>2</sup> shows a "Piceance Basin" bedrock aquifer exists. This aquifer actually has three members, none of which involve the very thick Wasatch formation. The hydrologic system in Tertiary rocks of the Piceance Basin consists of the upper and lower Piceance Basin aquifers separated from each other and from underlying aquifers in Mesozoic rocks by confining units. Confining units are the Mahogany (oil shale bearing) confining unit, which separates the upper and lower Piceance Basin aquifers, and a basal confining unit, the Wasatch formation, which separates the lower Piceance Basin aquifer from the underlying Mesaverde aquifer. The upper aquifers are truncated laterally by topography, and are bounded in general by the Colorado River on the South and the White River on the North.<sup>3</sup> The lower Mesa Verde aquifer basin stretches from Gunnison in the southeast to near Craig on the northwest. This Mesa Verde aquifer is seldom used for water production for domestic and irrigation purposes. However, low quality water from this formation is often produced in conjunction with natural gas development.

Water well records in the area<sup>2</sup> indicate that local water wells produce from pediments and alluviums associated with the Parachute Creek and Colorado River floodplains. Most wells are fairly shallow (less than 100 feet) and are low producing wells used for domestic purposes (CDSS et al).

### Geotechnical Boreholes

Five boreholes were drilled on the site surrounding the ponds in February of 2010 to depths of 25 to 50 feet. All holes were dry at the time of drilling and have remained dry. Soils were moist at the time of drilling, but not saturated. Test holes TH-1, TH-2 and TH-3 were completed in the underlying Wasatch bedrock. No evidence of a groundwater table was encountered underneath or adjacent to the ponds.

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<sup>1</sup> *Geologic Evaluation and Geotechnical Investigation*, CTL | Thompson, Inc., March, 17 2010, Project No. GS05448-115.

<sup>2</sup> *Colorado's Decision Support Systems*, <http://cdss.state.co.us>

<sup>3</sup> *Geohydrology of Tertiary Rocks in the Upper Colorado River Basin in Colorado, Utah, and Wyoming, Excluding the San Juan Basin – Regional Aquifer-System Analysis*; Glover, Kent C., Naftz, David L., and Martin, Lawrence J., USGS Water Resources Investigation Report 96-4105, 1998. See aquifer maps, pgs. 9 and 55 in particular.

### Water Quality

The water placed in the holding and evaporation ponds is drill production water that is stripped of virtually all hydrocarbons. Thus the water is primarily water that is too high in total dissolved solids to be of domestic or irrigation value, but still has value as drilling water. Appendix A contains a description of the facilities and the operating manual for the water handling facility. The Operating Manual describes how hydrocarbons are stripped from the water.

### **POND CONSTRUCTION**

The ponds were designed and constructed with the intention of being leak proof, per COGCC rules. All three ponds are lined with a clay subgrade and a 60 mil HDPE liner. Review of QA/QC records for the ponds<sup>4</sup> show that industry standards were followed for the layout, welding, and testing of the HDPE liner.

The subgrade is a compacted clay liner, constructed with onsite clayey materials. Constant head permeability tests on laboratory samples indicate a permeability range of  $4.2 \times 10^{-8}$  cm/sec to  $1.8 \times 10^{-7}$  cm/sec<sup>5</sup>. This represents a reasonable permeability range for clayey subgrade materials. Because of variances between laboratory tests and field conditions, clay liners in the field often have a permeability that is at least an order of magnitude higher than under optimal conditions in the laboratory. Thus, it is probable that the underlying liner has an effective permeability in the range of  $1 \times 10^{-6}$  cm/sec to  $1 \times 10^{-7}$  cm/sec. Expressed in laymen's terms, this provides a virtually watertight seal against potential leakage from the ponds. However, the clay liner is a *secondary* defense against leakage from the ponds, and effectively serves as a backup, or redundant liner. The primary defense to leakage is the HDPE liner itself.

HDPE liners are an effective means of providing a water tight liner. HDPE is UV protected and is extremely chemically resistant, and has been proven for nearly 30 years to be the liner of choice due to its durability and chemical resistance. The seams are heat welded together at high temperatures. Historically, the lining industry has discovered that excellent installations require daily QA/QC testing to confirm the adequacy of welding. A review of the daily inspection reports shows a minimum of two test coupons were pulled per work day. All coupon tests passed. Also, every seam was air tested. Air testing is a non-destructive technique used to verify the continuity of welded seams. It is very effective at finding spot locations where a seam may not have adequately bonded together. All seams passed inspection. Additionally, 60 mil HDPE is, from a welding perspective, much easier to work with than 30 or 40 mil liner. The additional thickness lends itself to better welding, with fewer burn-throughs which in turn requires less patching, and more even welding temperatures. Also, thicker membranes have fewer issues with brittle welds due to over heating of the material during welding.

The combination of the primary HDPE liner and the secondary clay liner provides a virtually water tight system. While HDPE can leak through undetected pinholes, the potential for such is virtually nil. If pinholes were undetected, pinhole leakage at shallow water depths ( $< 20 \pm$  feet) is a matter

<sup>4</sup> *Daily Installation Reports, May 29 – June 16, 2009*, Clearwater Construction (aka Colorado Lining). Documents provided by Williams RMT.

<sup>5</sup> *Lambert and Associates, Project No. G09032MT*, May 13, 2009. See "Soils" section of Appendix A.

of no more than a few gallons per day, which would easily be constrained by the clay subgrade liner.

## CONCLUSIONS

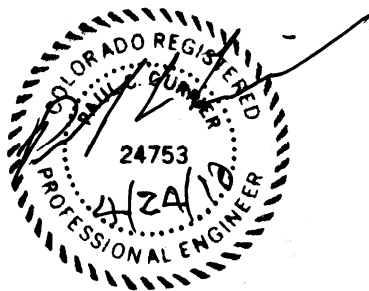
The potential for aquifer contamination from pond leakage is virtually non-existent. This is for a host of reasons:

- Physiographic setting – clayey, low permeability subsoils, with low permeability bedrock thousands of feet thick underneath, and no shallow aquifers underneath the ponds.
- Remote location – over one-half mile from the alluvial aquifer of Parachute Creek, and 1-3/4 miles from the alluvial aquifer of the Colorado River.
- Clayey soils between the ponds and Parachute Creek – it would take a significant amount of seepage, let alone time, for any seepage to make its way to Parachute Creek.
- Lined ponds – all three ponds are lined with 60 mil HDPE liners, with a clay subgrade that acts as a secondary, redundant liner

Thus I conclude that the ponds, as constructed and operated, will have no material impact on aquifers in the region.

Respectfully submitted,

## WATER RESOURCE CONSULTANTS, LLC



Paul C. Currier, P.E.  
PCC/pcc  
/ 431-1.0 Aquifer Evaluation.doc

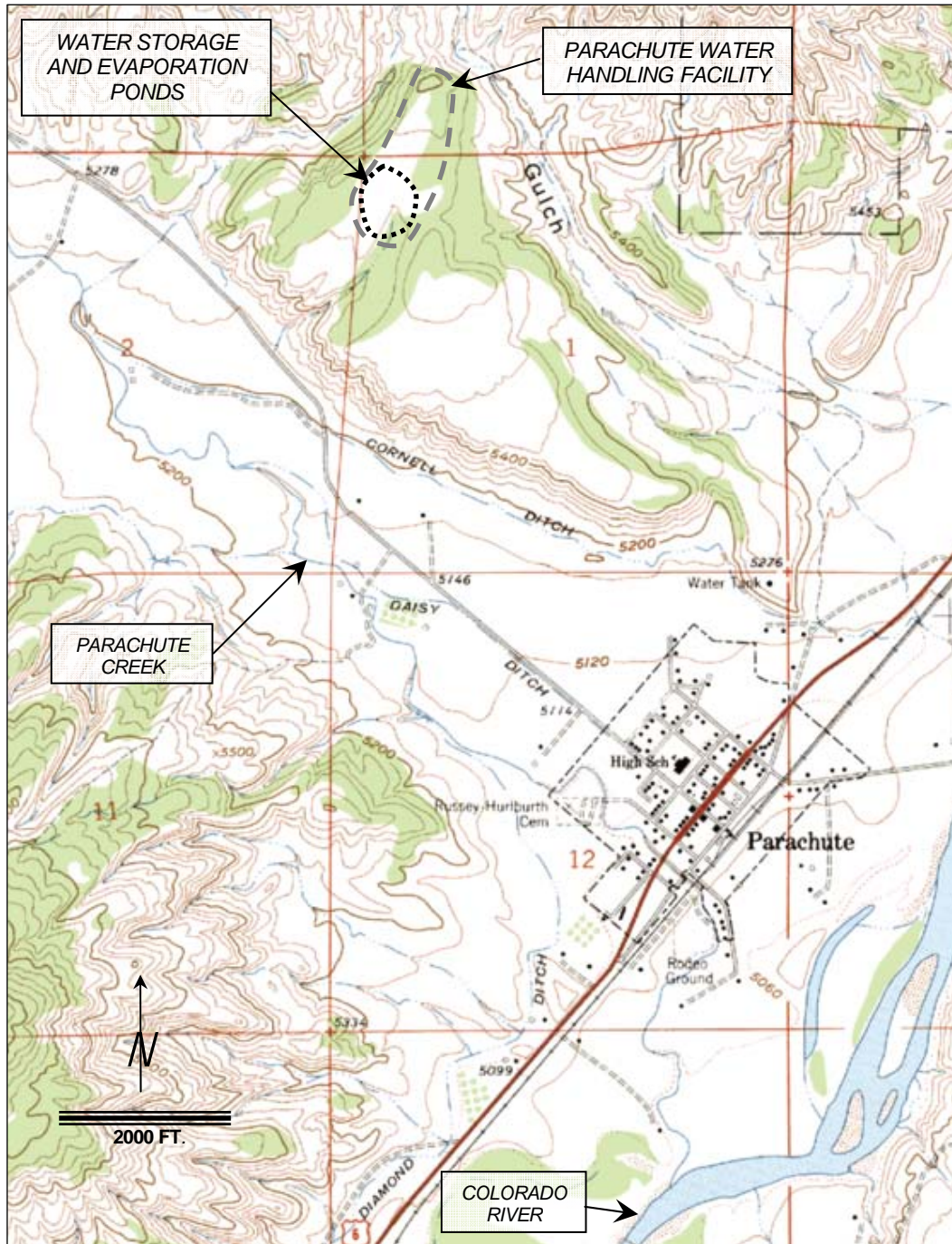
## Enclosures:

- Figure 1 - Parachute Water Handling Facility, General Location Map
- Figure 2 - Parachute Water Handling Facility, Site Plan
- Appendix A - Facility Design & Operating Manual (2009)
- Appendix B - QA/QC Records, 2009 Pond Construction

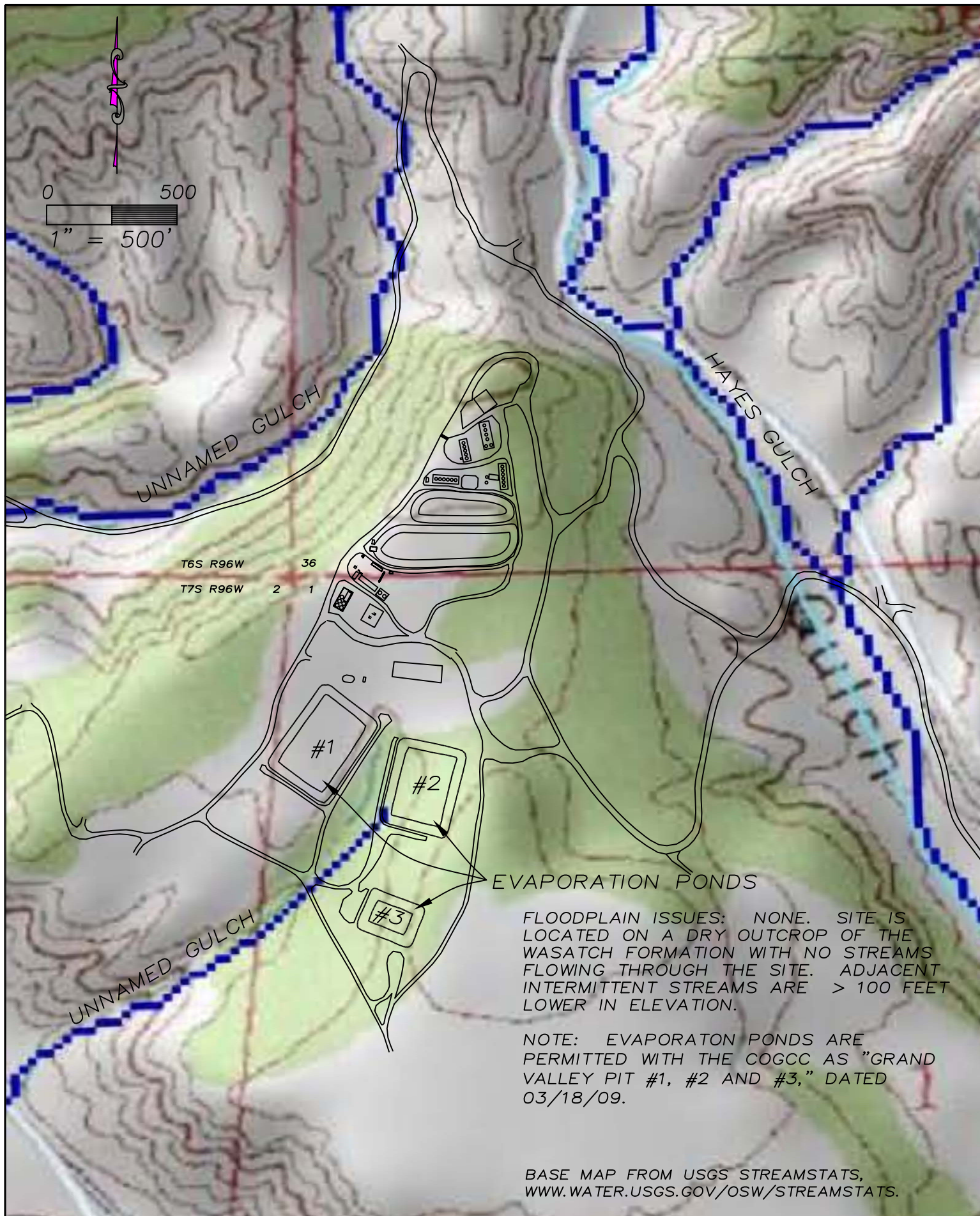


FIGURE 1  
GENERAL LOCATION MAP

Williams Production R.M.T.  
Parachute Colorado Water Handling Facility







WATER RESOURCE CONSULTANTS, LLC

244 Hutton Ave., Rifle, CO 81650  
(970) 625-5433 WWW.WRC-LLC.COM

WILLIAMS PRODUCTION R.M.T.  
PARACHUTE, COLORADO  
WATER HANDLING FACILITY

SITE PLAN

DATE : 21-APR-10

FILE : 431-1.0

DWG : 431 - Site Plan

BY : PCC

CHKD : PCC

FIG

2

REV: 0





# WATER RESOURCE CONSULTANTS, LLC

April 24, 2010

Phil Vaughan  
Phil Vaughan Construction Management, Inc.  
1038 CR 323  
Rifle, CO 81650

RE: Williams RMT  
Parachute Water Handling Facility, Garfield County  
Floodplain Evaluation

Phil,

This letter serves as an evaluation of floodplain issues regarding the Parachute Water Handling Facility. In summary, the facility is not located in a floodplain, and thus meets Garfield County's Zoning Resolution of 2008 sections 4-503 and 7-701 regarding standards within a Floodplain Overlay District.

Figure 1 shows the location of the facility, as plotted on FEMA's index map for floodplain maps. The asterisk in front of the panel number indicates that these areas have not been mapped for floodplain hazards by FEMA.

FIGURE 1  
FEMA Floodplain Map for  
Parachute Water Handling Facility

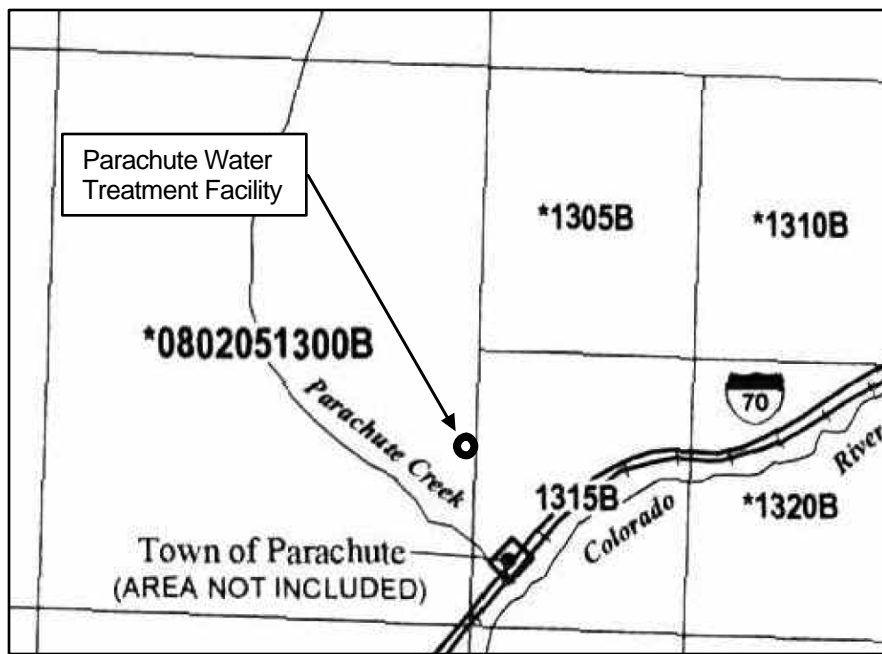
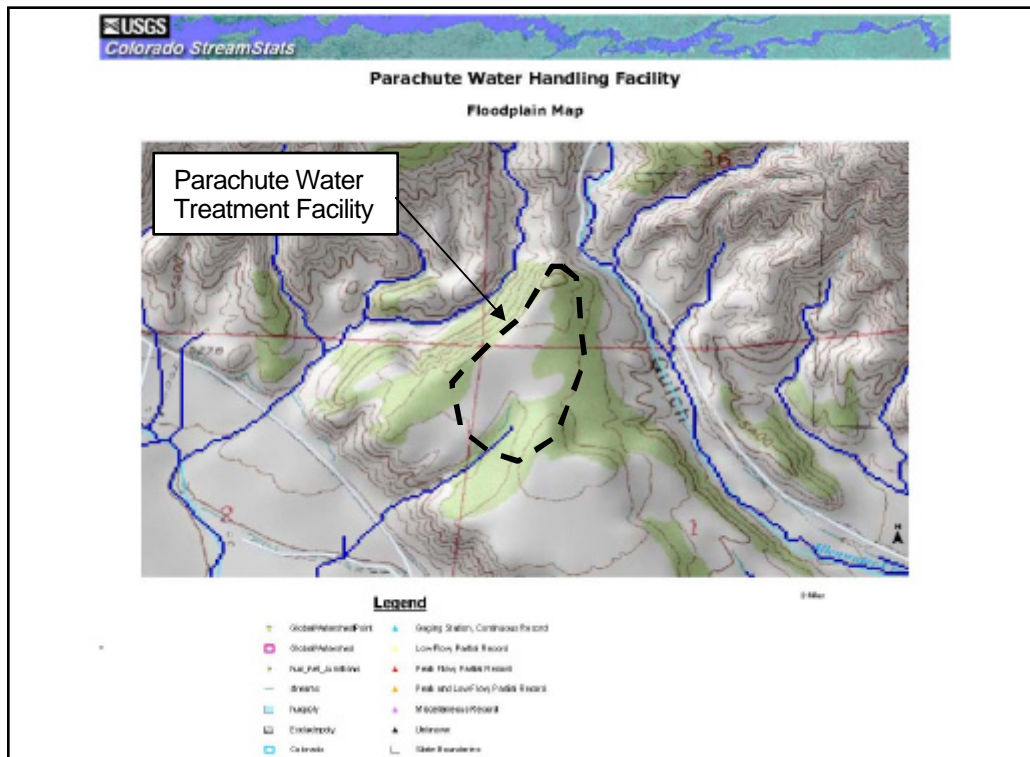


Figure 2 shows the location of the facility in relation to nearby intermittent streams. Hayes Gulch and an unnamed gulch flow around the site, but are more than 100 feet lower than the facility. Neither stream impacts the site, as the site is located on the top of a dry outcrop of the Wasatch Formation.

FIGURE 2  
Parachute Water Handling Facility  
Facility Location in Relation to Adjacent Streams



Respectfully submitted,

**WATER RESOURCE CONSULTANTS, LLC**



Paul C. Currier, P.E.  
PCC/pcc  
/ 431-1.7 Floodplain Evaluation.doc

## Attachment G

Geologic Evaluation

March 17, 2010

Phil Vaughan Construction Management, Inc.  
1038 County Road 323  
Rifle, CO 81650

Attention: Mr. Phil Vaughan

Subject: Geologic Evaluation and Geotechnical Investigation  
Williams-Parachute  
Water Handling Facility  
Garfield County, Colorado  
Project No. GS05448-115

This report provides the results of our geologic evaluations and geotechnical investigation at the Williams-Parachute Water Handling Facility in Garfield County, Colorado. The following sections discuss the site geology, geologic hazards and characterizes the subsurface conditions. We provide our opinion of the affects of the geologic and geotechnical conditions on the facility. A vicinity map is shown on Figure 1.

#### Site Geology and Geologic Hazards

Site geology and geologic hazards on this parcel were evaluated by David A. Glater, P.E., C.P.G., using field reconnaissance on February 24, 2010 and a review of available literature. The ground surface at the time of our visit was covered with snow, with the exception of south-facing slopes. Literature references are cited at the end of this section.

Mapping by the USGS indicates bedrock materials beneath the Williams – Parachute Water Handling Facility is the Wasatch Formation of Eocene and Paleocene (early Tertiary) time. The continental sedimentary deposit is comprised of bedded claystone shale, siltstone and sandstone. Outcrops of Wasatch Formation shale and sandstone are present on the steep slopes along County Road 215 below the site. The slightly younger Green River Formation caps the mesas and ridges north of the site. The Green River Formation contains bedded shale, sandstone and marlstone.

The topography of the site was formed by Hayes Gulch, Parachute Creek and the Colorado River that have downcut through the shales over the past





million years or so. The project area lies on a pediment planed by ancient erosive flows from Hayes Gulch. Many thousands of years ago, Hayes Gulch deposited debris and mudflows that have accumulated as a thick colluvial soil consisting of shale and sandstone fragments in a plastic clay matrix. At some point, modern flows in Hayes Gulch were captured in defined drainages that formed east and west of the site. After the area was cut off from further deposition, the current topography formed as drainages and ridge divides on the broad, southwest-trending mesa. We understand significant cut and fill grading occurred over the past several years at the Water Handling Facility, particularly below the abandoned original ponds. Cuts and fills of up to about 25 feet occurred.

No bedrock outcrops were observed on the east side of the tributary drainage that bisects the project. The cuts above Produced Water Ponds 2 and 3 had been dressed with soil or were covered with snow, preventing determination of whether shallow bedrock exists on the east hillside. Our borings encountered man-made fill and colluvium soils in all borings. The natural soils and fill constructed with these soils were difficult to discern between. We found sandstone and claystone bedrock below the fill/natural soils in three borings (TH-1, TH-2 and TH-3) at depths of 18, 32 and 25 feet, respectively. Sandstone beds outcrop at the top and sides of the ridge that is south of Produced Water Pond 1. Regional dips appear to be less than 5 degrees.

We prepared a Geologic Map, Figure 2. Contacts between units are estimated due to snow cover. Mapped units include, in order of increasing age:

- Af – Man-placed fill and areas disturbed by grading.
- Qc – Colluvium, shale and sandstone fragments in a clay matrix with scattered cobbles and boulders. Overlies Wasatch Formation.
- Two – Wasatch Formation shale, siltstone and sandstone with little soil cover.

Geologic hazards typical in Colorado are described in Reference 3. Brief reconnaissance found no evidence of avalanches, landslides, rockfalls, unstable slopes or ground subsidence on the Water Handling Facility site. Steep slopes are present in cuts made for Ponds 2 and 3, at an overall inclination of about 2H:1V. These slopes should be globally stable if dry. Our borings imply ground water is deep. Natural slopes near the ponds are less steep and no evidence of instability was noted. In general, we recommend avoidance of slopes in excess of 3H:1V (33%) for development or construction, although careful engineering design may allow construction on steeper slopes, particularly in bedrock areas. Site soils should be considered to be somewhat susceptible to erosion, but not unusually so. The cut slopes above the ponds and natural steep slopes will have higher erosion rates. Revegetation, drainage capture or erosion control methods can reduce potential for soil loss. Potential for flooding and drainage analysis should be determined by the Civil Engineer. We saw no evidence of geologically recent



flooding. Regional issues of expansive soils and bedrock, seismicity and radioactivity are discussed below.

Expansive soils and bedrock are present at this site. The presence of expansive soils and bedrock, collectively referred to as expansive or swelling soils, constitutes a geologic hazard. There is risk that ground heave could damage slabs-on-grade and foundations. The risks associated with swelling soils can be mitigated but not eliminated by careful design, construction and maintenance procedures. The type of building construction associated with the water production facility is generally not adversely affected by the amount of movement related to swelling soils. Expansive soils as a geologic hazard are judged as a low risk at this site.

The soil and bedrock units are not expected to respond unusually to seismic activity. Liquifaction potential is considered nil. Where bedrock is within about 15 feet of the surface, sites can be considered to be Site Class C. Sites with thicker deposits of clay soil will likely be Site Class D. Horizontal Peak Ground Acceleration (PGA) for this site is 0.08g, with about a 1,000 year return period. Horizontal response spectral acceleration for 0.2 sec. period (Ss) can be taken as 0.17g and for 1 sec. period (Sl), 0.04g. Only minor damage to relatively new, properly designed and built structures would be expected.

Due to the fact that the property was covered with snow, we could not perform a background radiation screening at the time of this writing. However, we have performed several background radiation screenings in the vicinity of the Williams-Parachute Water Handling Facility. Based upon the historic use of the property, we anticipate radiation readings on the order of 0 to 10 microroentgens per hour (normal background radiation). When the snow has melted, likely in April, we will perform a background radiation screening of the property using a Ludlum Instruments, Inc. Model 19 Micro-R-Meter.

### Investigation

We drilled five exploratory borings at the approximate locations shown on Figure 3. The borings were advanced to depths of 25 to 53 feet using 4-inch diameter, continuous-flight solid-stem auger and a track-mounted drill rig. Our laboratory/field manager observed drilling, logged the soils and bedrock encountered in the borings, and obtained samples. Graphical logs of the borings, including results of field penetration resistance tests are presented on the Summary Logs of Exploratory Borings on Figures 4 and 5. The borings were constructed as open piezometers to allow future measurements to water. A detail of the piezometer installation is shown on Figure 6.

Soils at the site consisted of man-placed fill from grading operations and natural colluvium. Fills were constructed with the natural soils. The fill and the natural soils were sandy to silty clay and clayey sand with a significant percentage of sandstone, claystone and siltstone bedrock fragments. The soils were deposited by gravity from the weathering of bedrock exposures on slopes





above the site. The thickness of fill could not be determined at boring locations because of similar appearances of the fill and natural soils.

The soils were stiff to very stiff based on the results of field penetration resistance tests. Selected samples of the soils were at moisture contents of 4.5 to 16.8 percent and dry densities of 98 to 122 pounds per cubic foot (pcf). Atterberg limits were liquid limits of 22 to 39 percent and plasticity indices of 8 to 24 percent. The samples had 18 to 81 percent silt and clay size particles (passing the No. 200 sieve). Hydrometer testing on 5 samples determined 45 to 66 percent silt and 4 to 23 percent clay in the fine grained portion of samples. Five samples of the soils were tested for volume change potential using a one-dimensional consolidometer. The samples exhibited 0.5 percent compression to 1.3 percent swell when wetted under a vertical pressure of 1,000 psf. Laboratory test results are presented in Appendix A.

### Conclusions

Based on the results of our geologic and geologic hazard evaluations, the site is not subject to natural or geologic hazards. Natural or geologic hazards should not adversely affect the facility. Based on information from our exploratory borings and laboratory testing, the soils and bedrock should not have a significant adverse influence on the facility.

### Limitations

Our exploratory borings were located to obtain a reasonably accurate picture of subsurface conditions below the site. Variations in the subsurface conditions not indicated by our borings will occur.

This investigation was conducted in a manner consistent with that level of care and skill ordinarily exercised by geotechnical engineers currently practicing under similar conditions in the locality of this project. No warranty, express or implied, is made. If we can be of further service in discussing the contents of this letter, please call.

Very truly yours,

CTL | THOMPSON, INC.

John Mechling, P.E.  
Branch Manager

JM:cd

cc: Via email to [phil@pvcmi.com](mailto:phil@pvcmi.com)

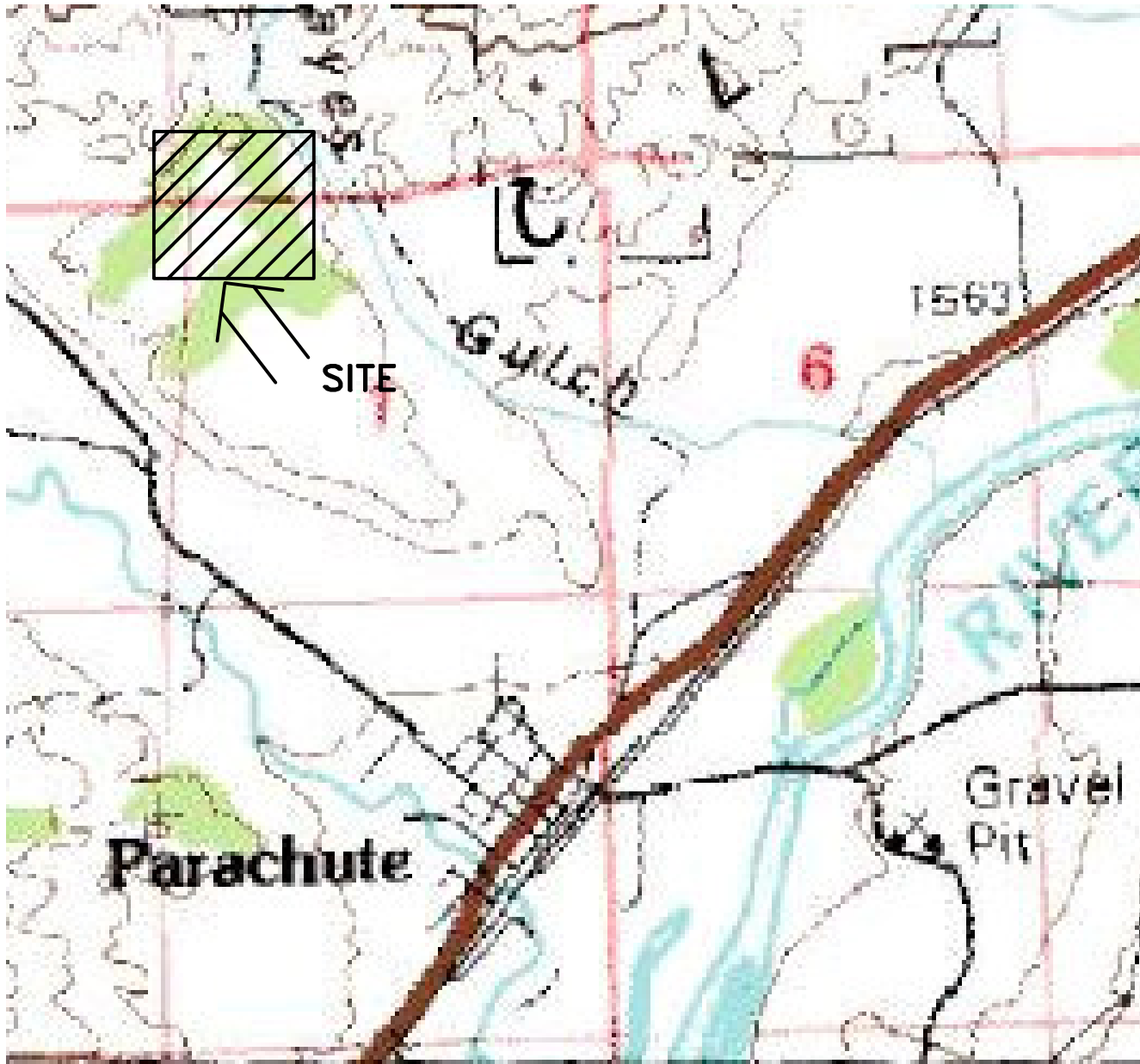


### Geology Section References

1. "Surficial Geology, Geomorphology, and General Engineering Geology of Parts of the Colorado River Valley, Roaring Fork River Valley, and Adjacent Areas, Garfield County, Colorado" by J. M. Soule and B. K. Stover, Colorado Geologic Survey Open File Report 85-1, Plate 1A - Surficial Geologic Map, Plate 2A - Geomorphic Features Map, Plate 3A - Geologic Hazards Map, and Plate 4A - Construction - Materials Map, 1985
2. "Geologic Map of the Leadville 1 degree by 2 degree Quadrangle, Northwestern Colorado" compiled by Ogden Tweto, Robert Moench and John C. Reed, Jr., US Geological Survey Map I-99, 1978
3. "Guidelines and Criteria for Identification and Land-Use Controls of Geologic Hazard and Mineral Resource Areas" by W.P. Rogers, et. al, Special Publication 6, Colorado Geologic Survey, 1974
4. Aerial Photography by Google Earth. Date believed to be several years ago, prior to construction of facilities south of the earth-filled ponds.
5. AASHTO LRFD Bridge Design Specifications, by American Association of Highway and Transportation Engineers, Chapter 3.10 - Earthquake Effects, Interim 2008



SCALE: 1" = 2,000'

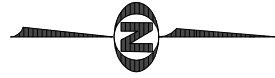


## Vicinity Map

Phil Vaughn Construction Management, Inc.  
Williams - Parachute Water Handling Facility  
Project No. GS05448-115




Fig. 1

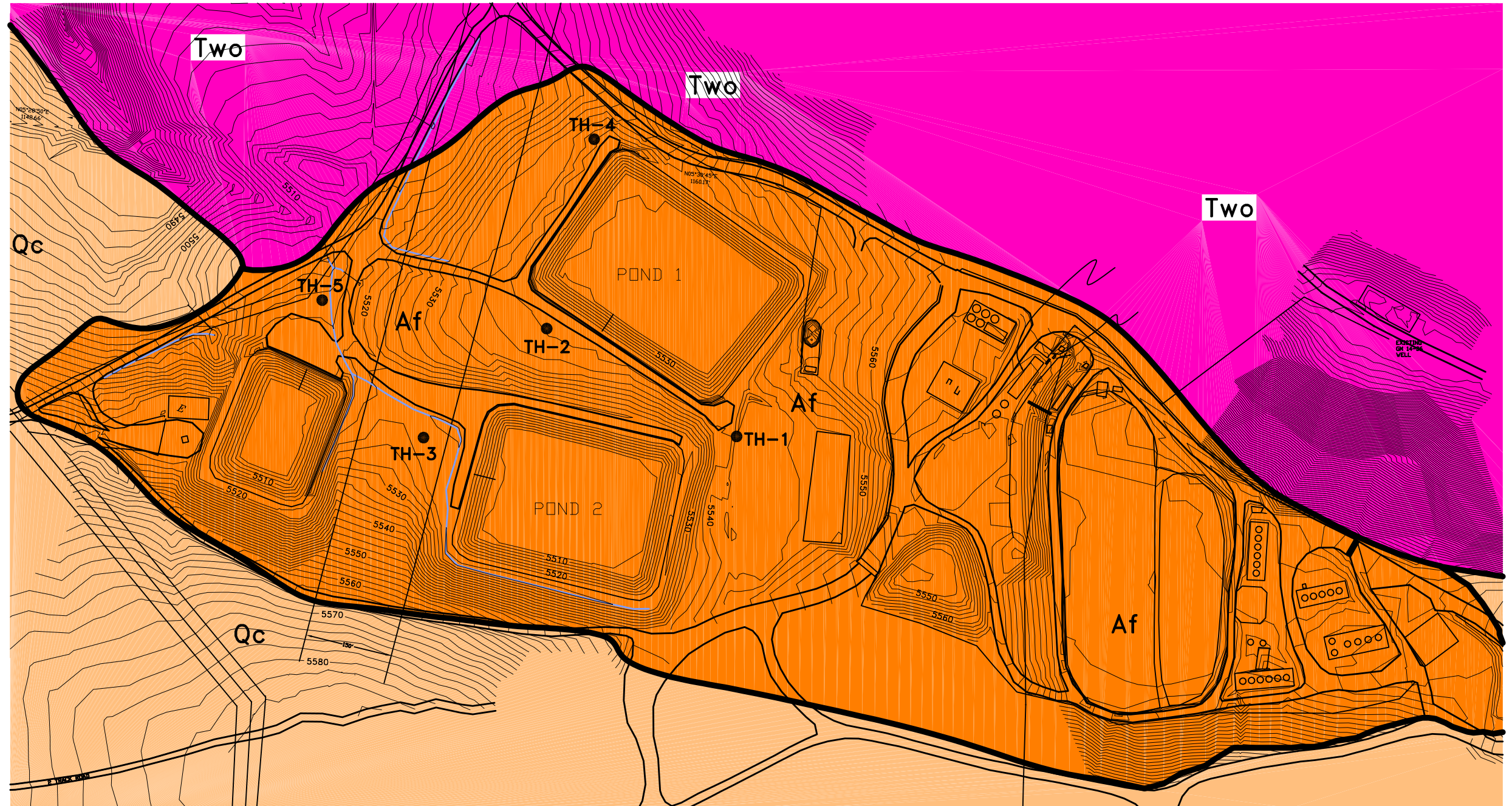




Scale: 1"=200'

LEGEND:

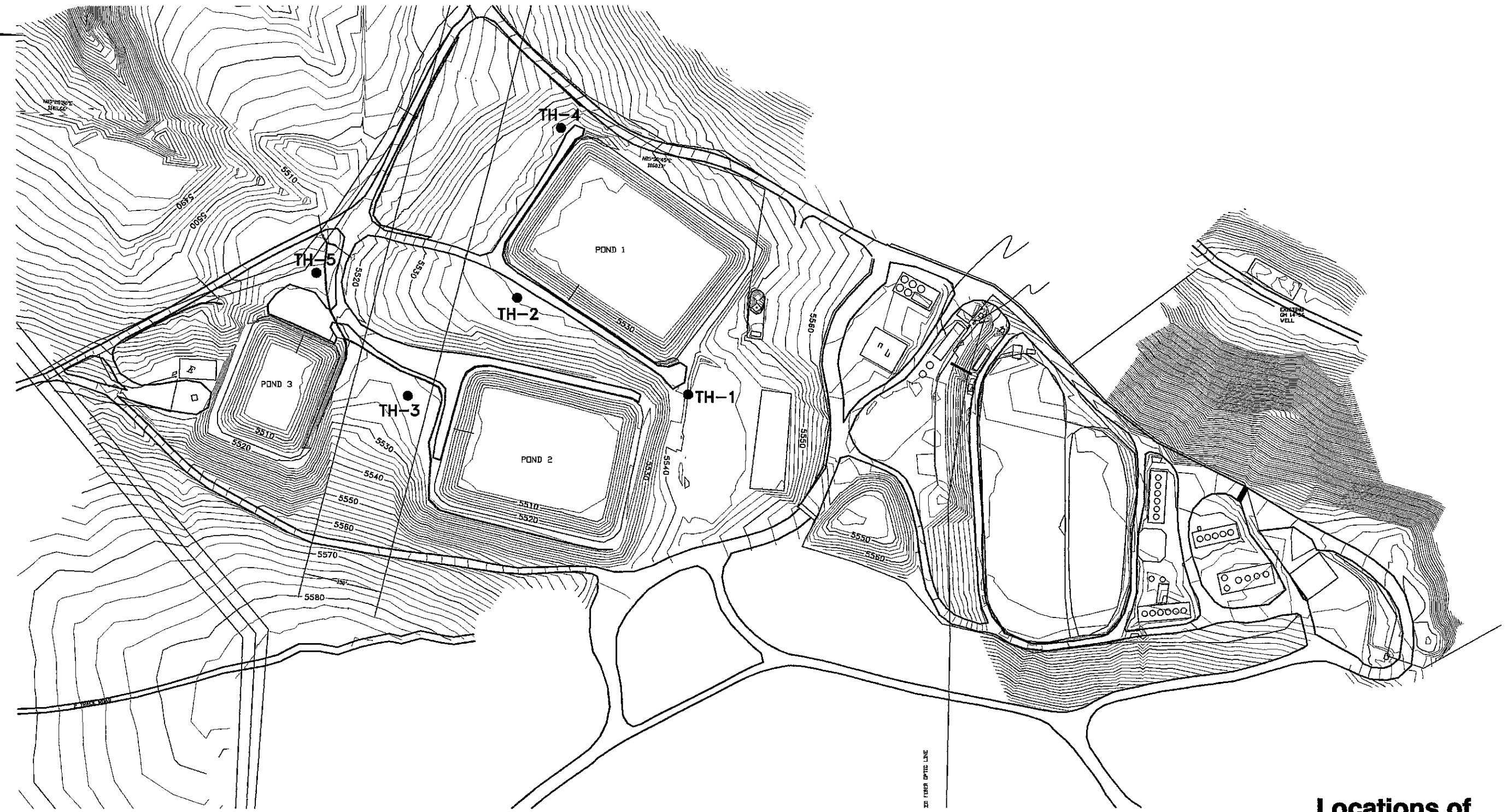
-  Af – Man-placed fill and areas disturbed by grading.
-  Qc – Colluvium, shale and sandstone fragments in a clay matrix with scattered cobbles and boulders.
-  Two – Wasatch Formation shale, siltstone and sandstone.



Geologic  
Map



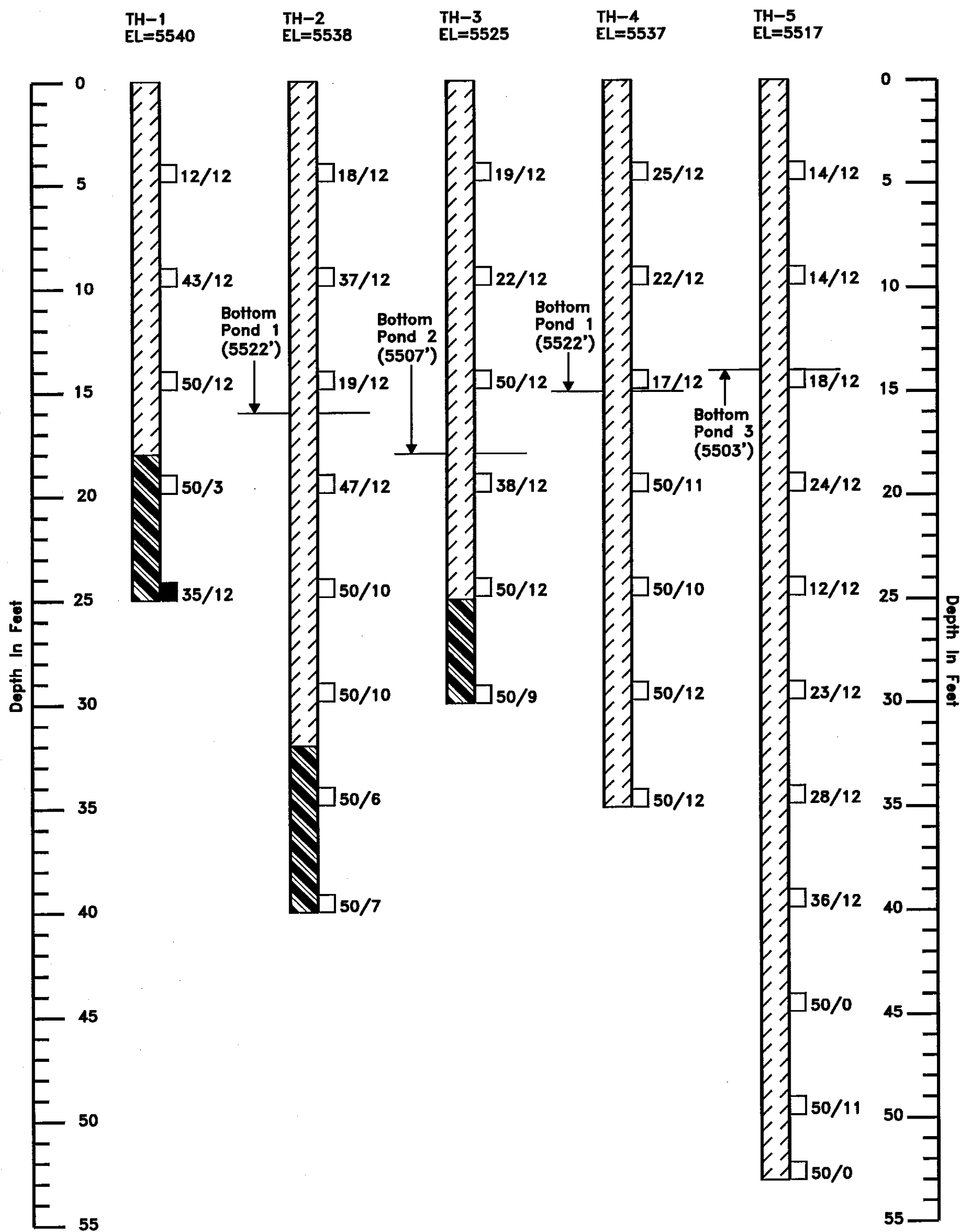
Scale: 1"=200'



NOTE:  
Locations of exploratory borings are approximate.

**Locations of  
Exploratory  
Borings**





SUMMARY LOGS OF EXPLORATORY BORINGS





#### LEGEND:



Fill or colluvial soil consisting of sandy clay and clayey sand with significant percentages of sandstone, siltstone and claystone fragments and scattered cobbles and boulders, stiff to very stiff, slightly moist to moist, brown (CL, CL-ML, SC)



Sandstone, claystone and siltstone bedrock, medium hard to very hard, slightly moist to moist, brown.



Drive sample. The symbol 12/12 indicates that 12 blows of a 140 pound hammer falling 30 inches were required to drive a 2.5 inch O.D. California sampler 12 inches.

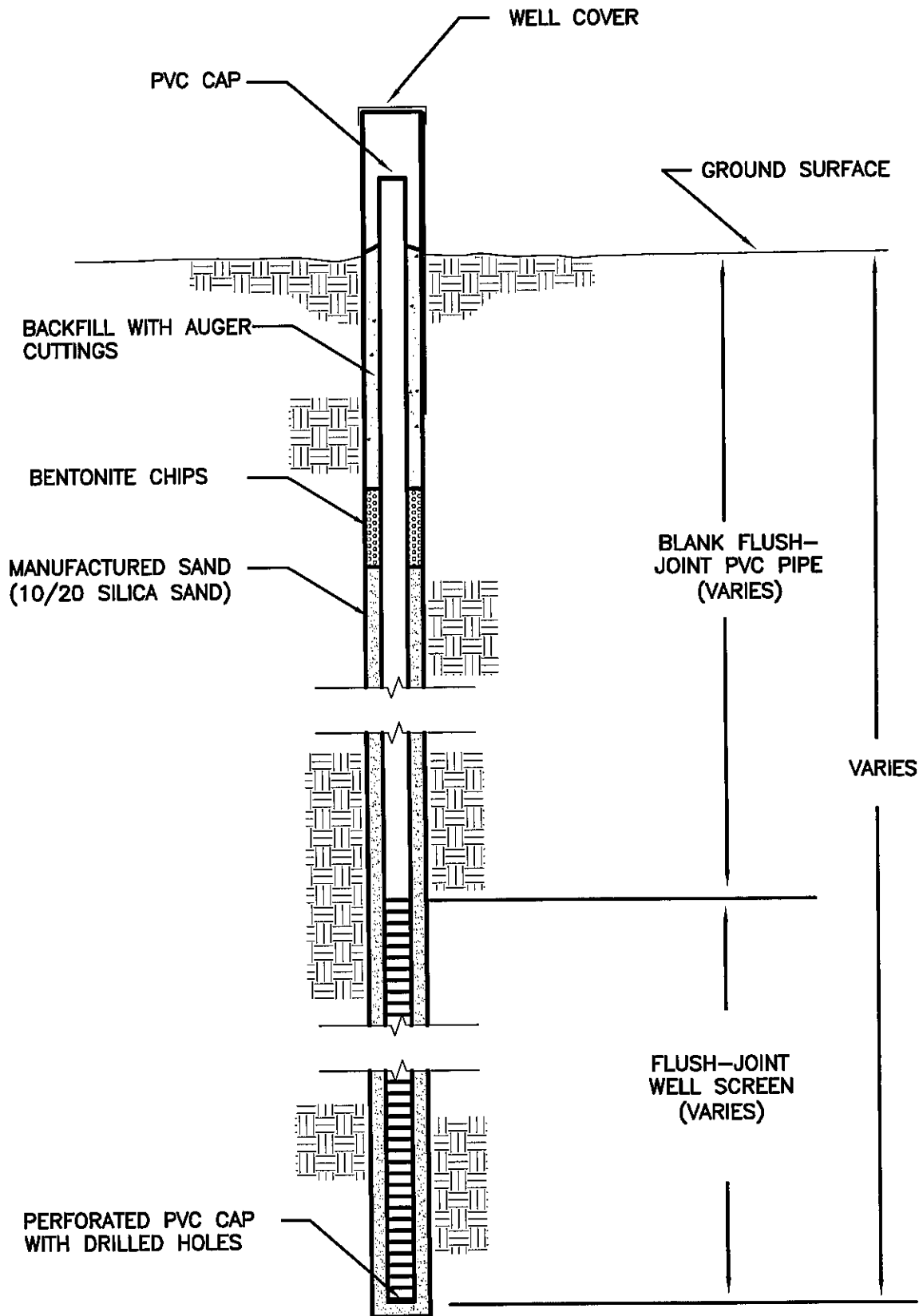


Drive sample. The symbol 35/12 indicates that 35 blows of a 140 pound hammer falling 30 inches were required to drive a 2.0 inch O.D. standard sampler 12 inches.

#### NOTES:

1. Exploratory borings were drilled on February 23 and 24, 2010 with 4-inch diameter, continuous-flight solid-stem auger and an track-mounted drill rig.
2. Locations and elevations of exploratory borings are approximate.
3. No free ground water was found in our exploratory borings at the time of drilling.
4. These exploratory borings are subject to the explanations, limitations and conclusions as contained in this report.

## SUMMARY LOGS OF EXPLORATORY BORINGS

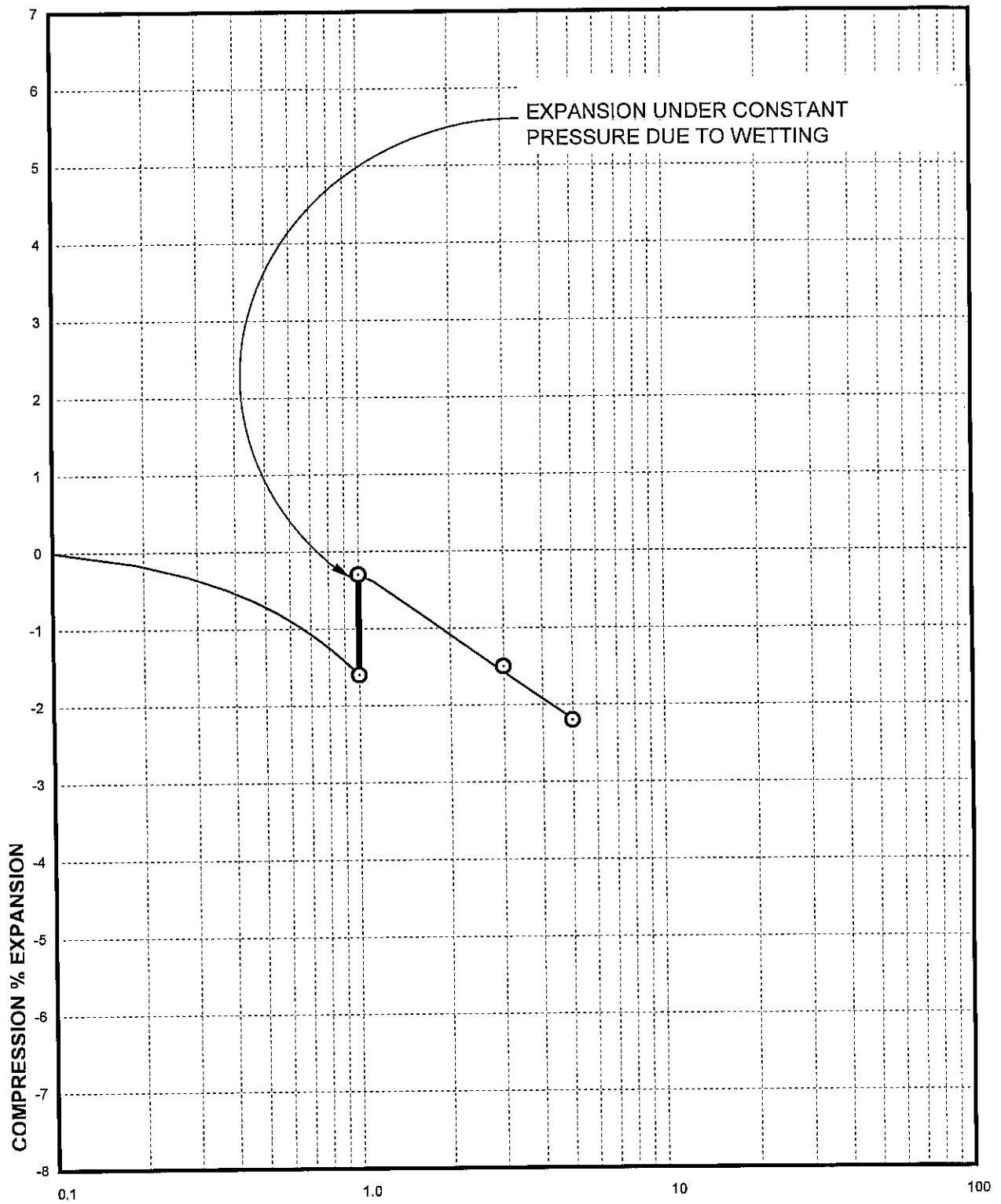


**Typical  
Piezometer  
Installation  
Detail**



## **APPENDIX A**

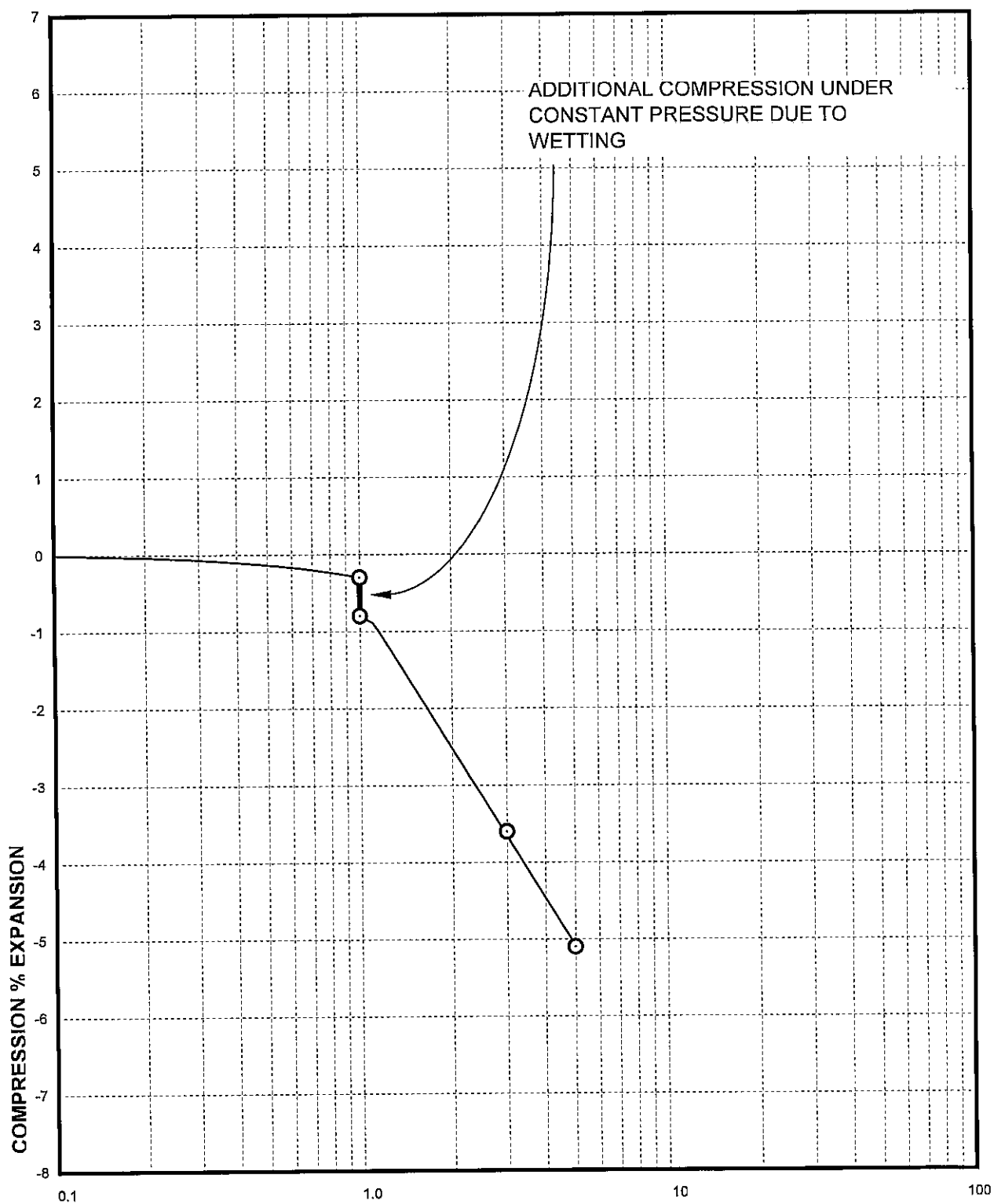
### **LABORATORY TEST RESULTS**



**APPLIED PRESSURE - KSF**  
Sample of CLAY, SLIGHTLY GRAVELLY (CL)  
From TH-1 AT 14 FEET

DRY UNIT WEIGHT= 122 PCF  
MOISTURE CONTENT= 7.2 %

## Swell Consolidation Test Results

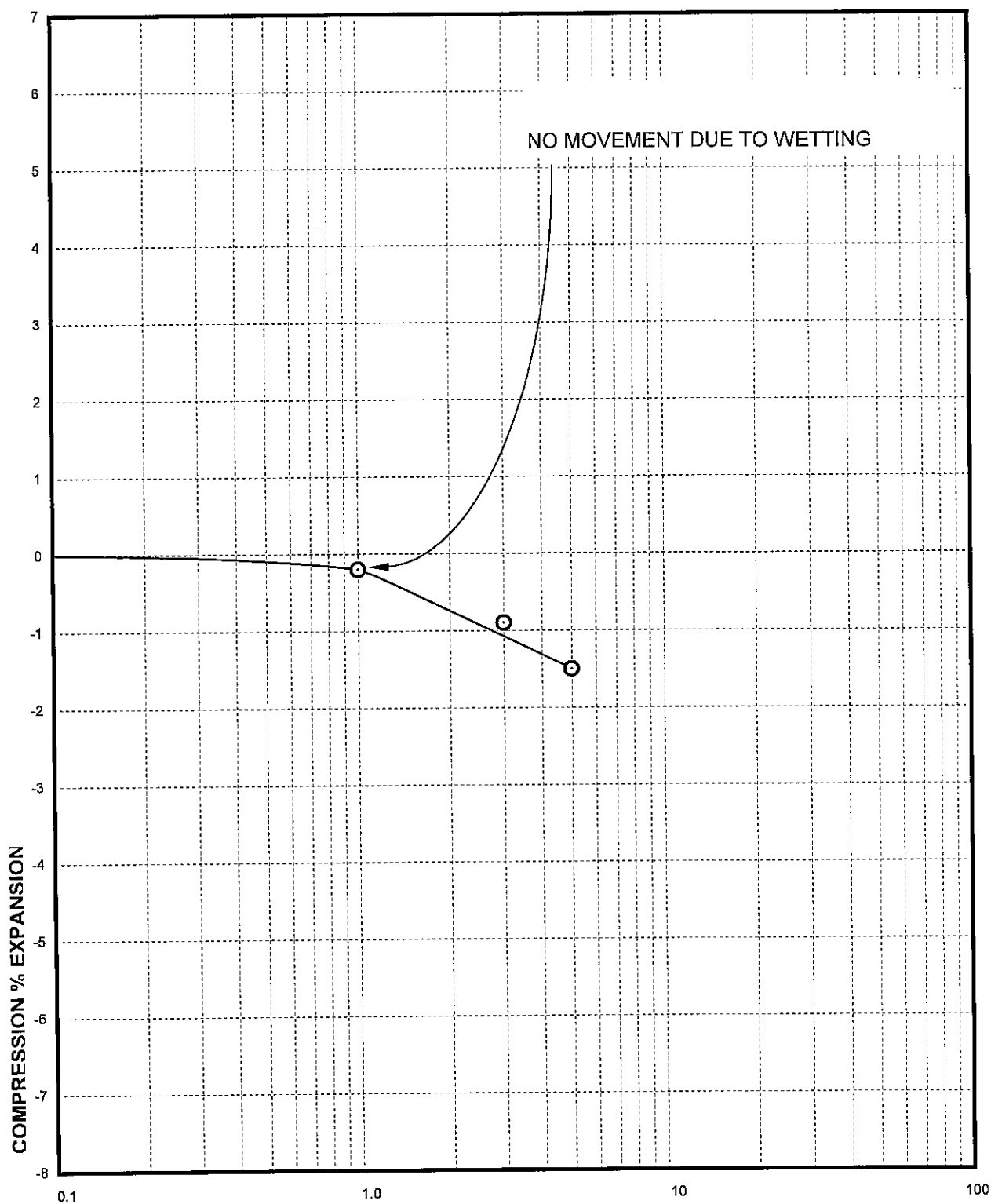
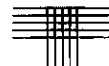


Sample of SAND, CLAYEY (SC)  
From TH-2 AT 9 FEET

DRY UNIT WEIGHT= 113 PCF  
MOISTURE CONTENT= 5.8 %

## Swell Consolidation Test Results



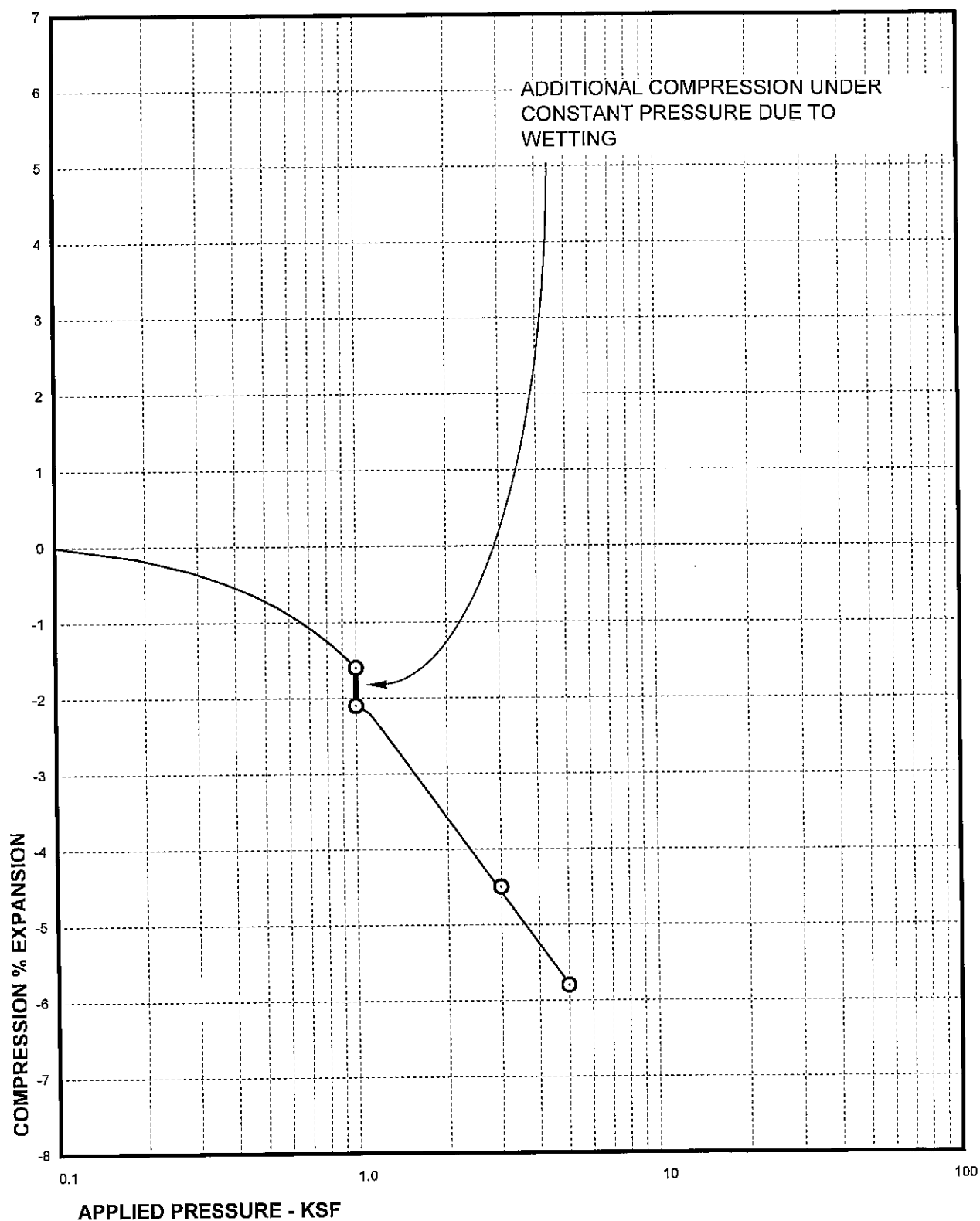
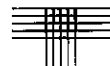


**APPLIED PRESSURE - KSF**

Sample of SAND, CLAYEY (SC)  
From TH-3 AT 4 FEET

DRY UNIT WEIGHT= 120 PCF  
MOISTURE CONTENT= 8.8 %

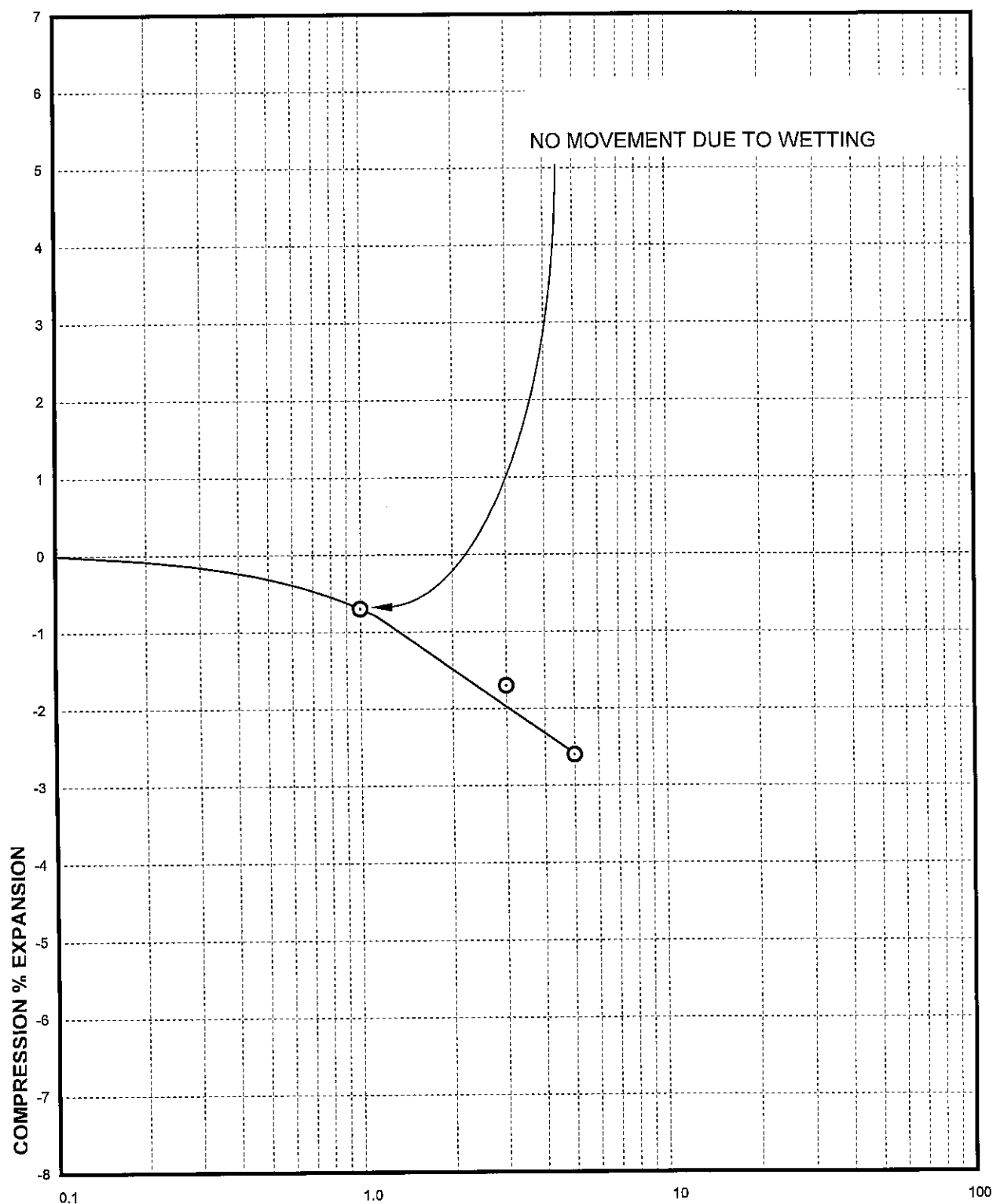
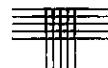
**Swell Consolidation  
Test Results**



Sample of SAND, CLAYEY (SC)  
From TH-5 AT 4 FEET

DRY UNIT WEIGHT= 109 PCF  
MOISTURE CONTENT= 7.4 %

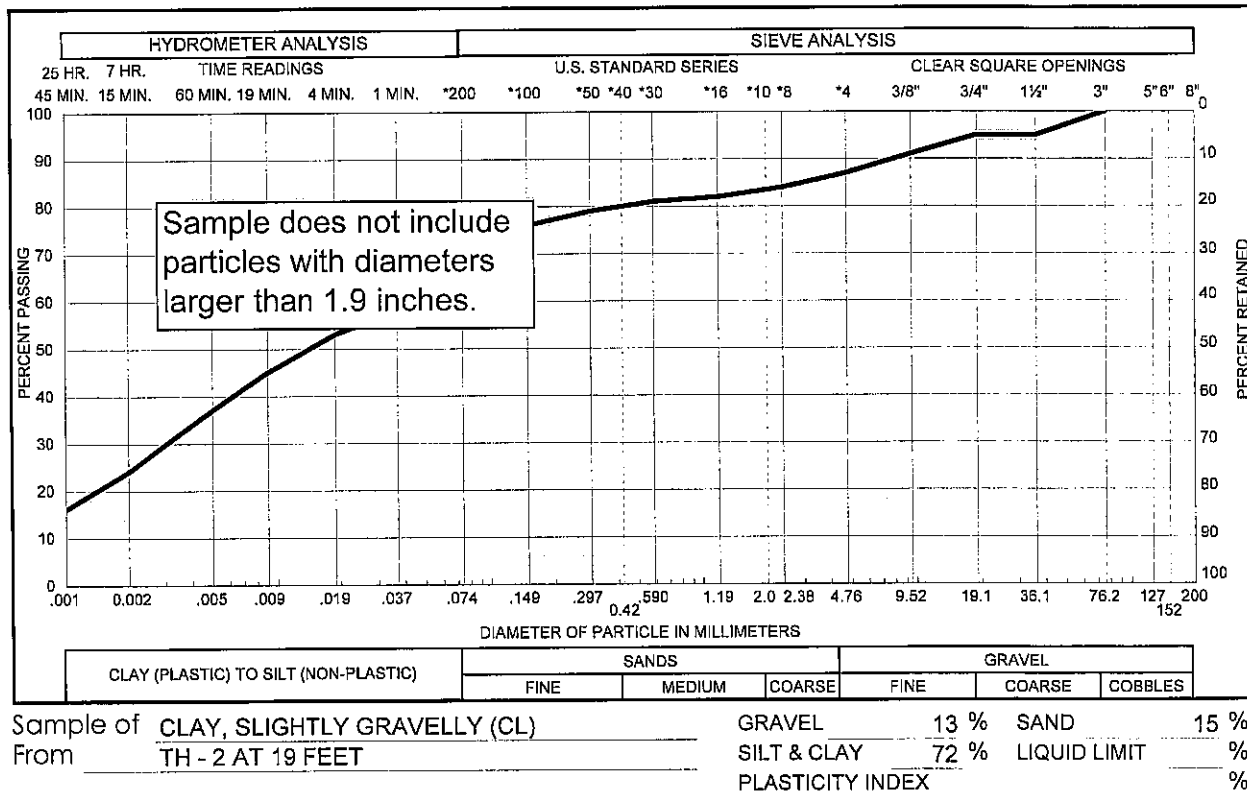
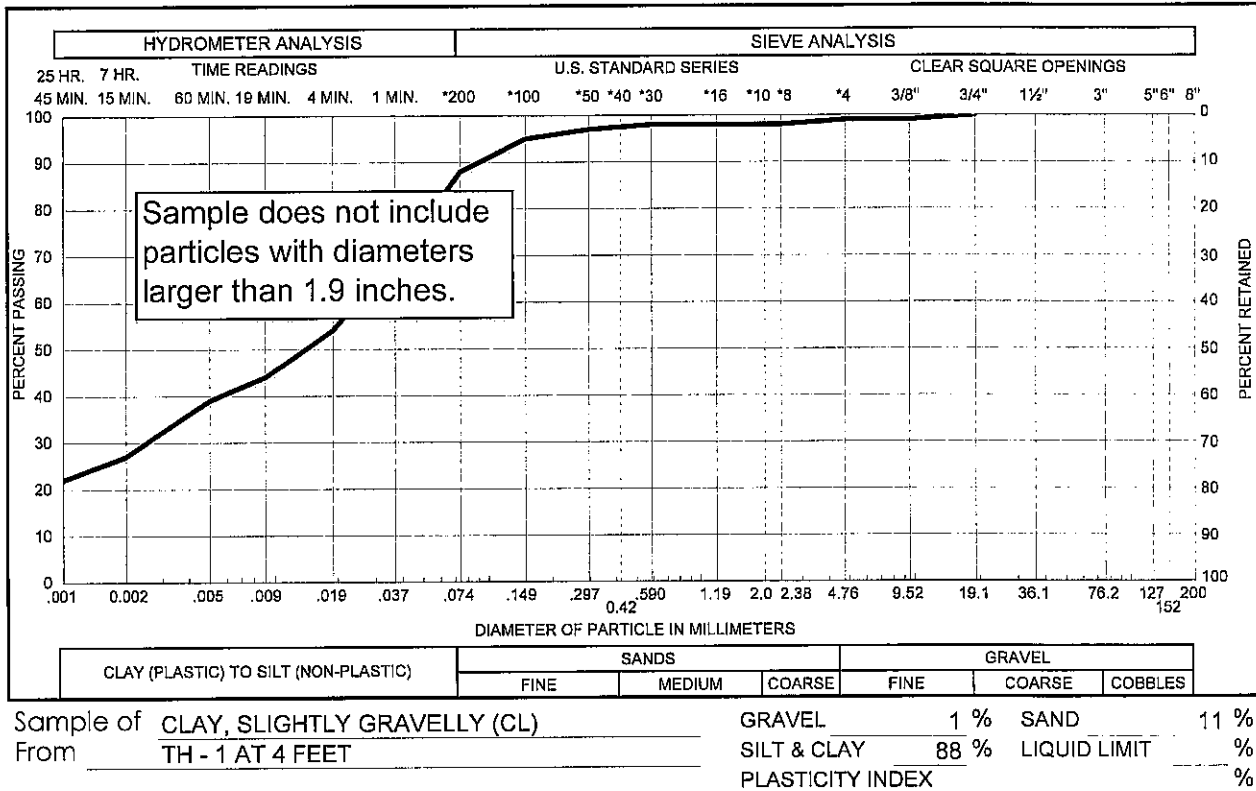
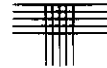
## Swell Consolidation Test Results



Sample of CLAY, SLIGHTLY GRAVELLY (CL)  
From TH-5 AT 14 FEET

DRY UNIT WEIGHT= 114 PCF  
MOISTURE CONTENT= 11.2 %

## Swell Consolidation Test Results

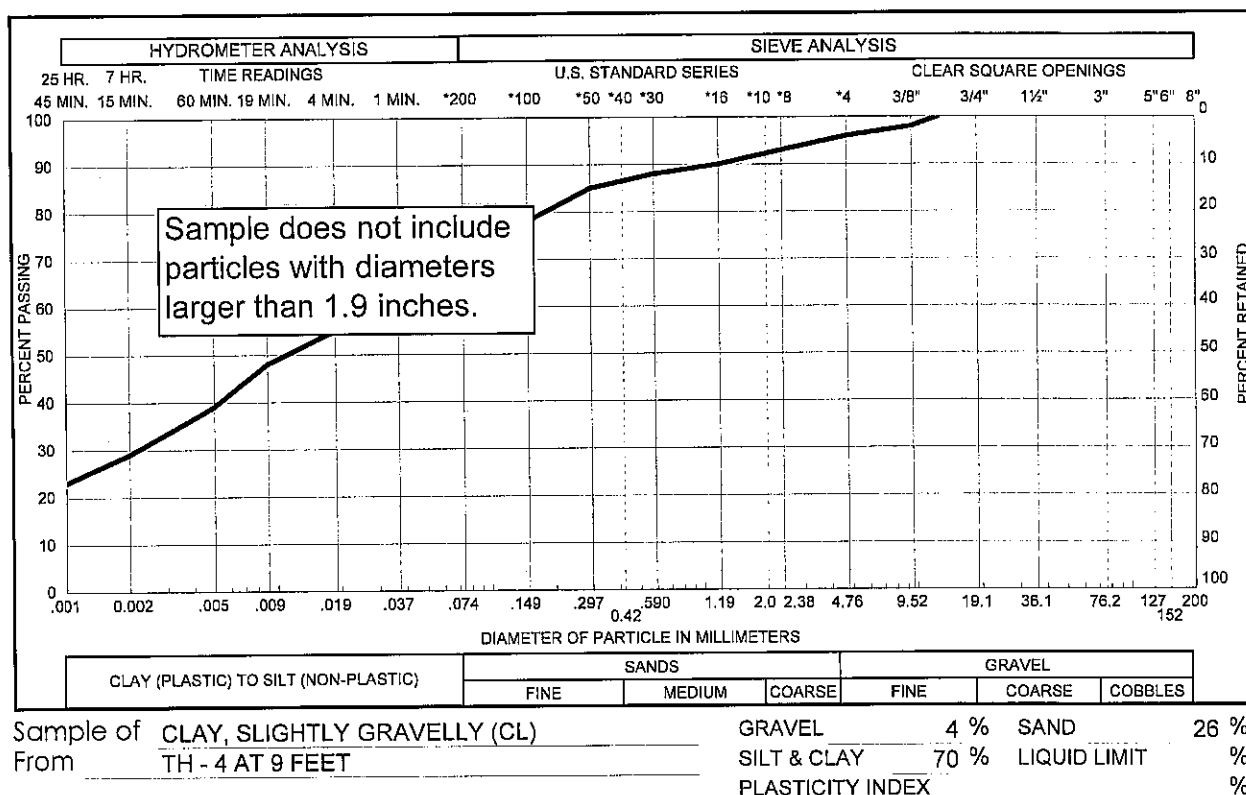
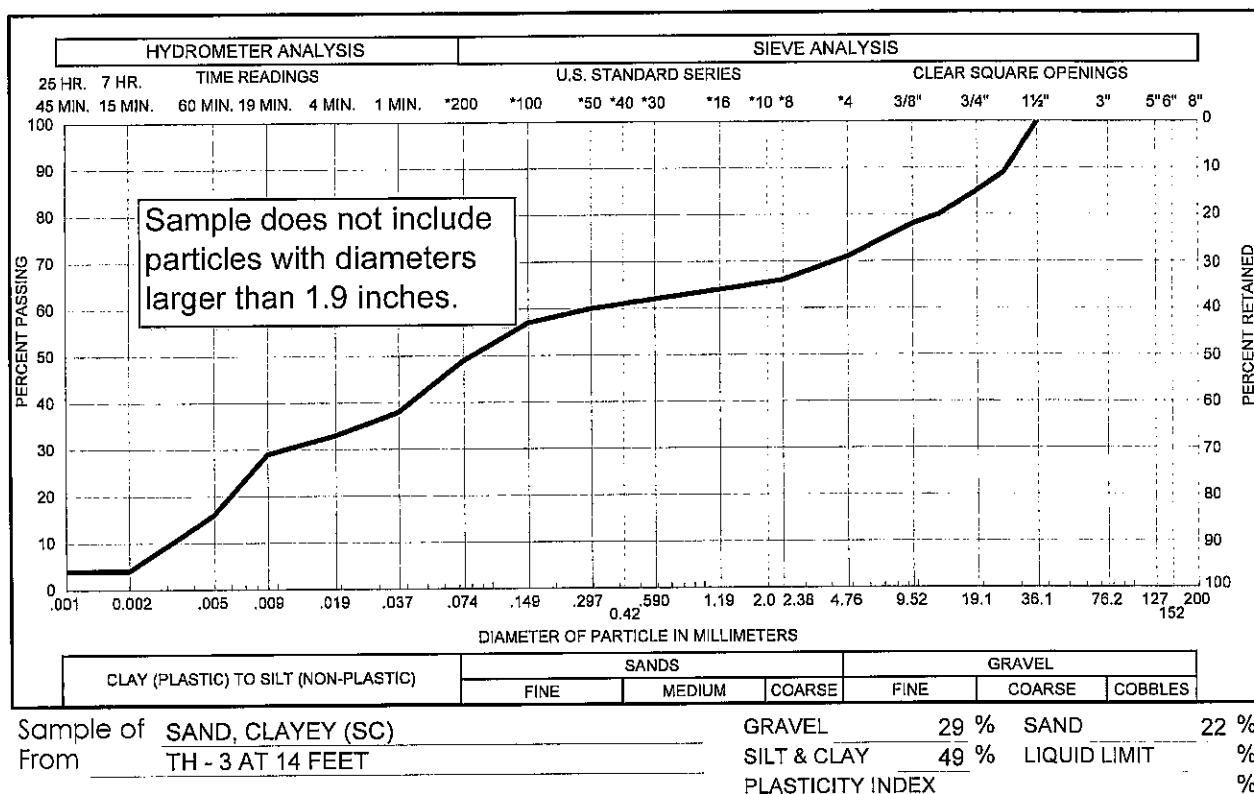


PHIL VAUGHAN CM  
WILLIAMS WATER HANDLING FACILITY  
PROJECT NO. GS05448-115

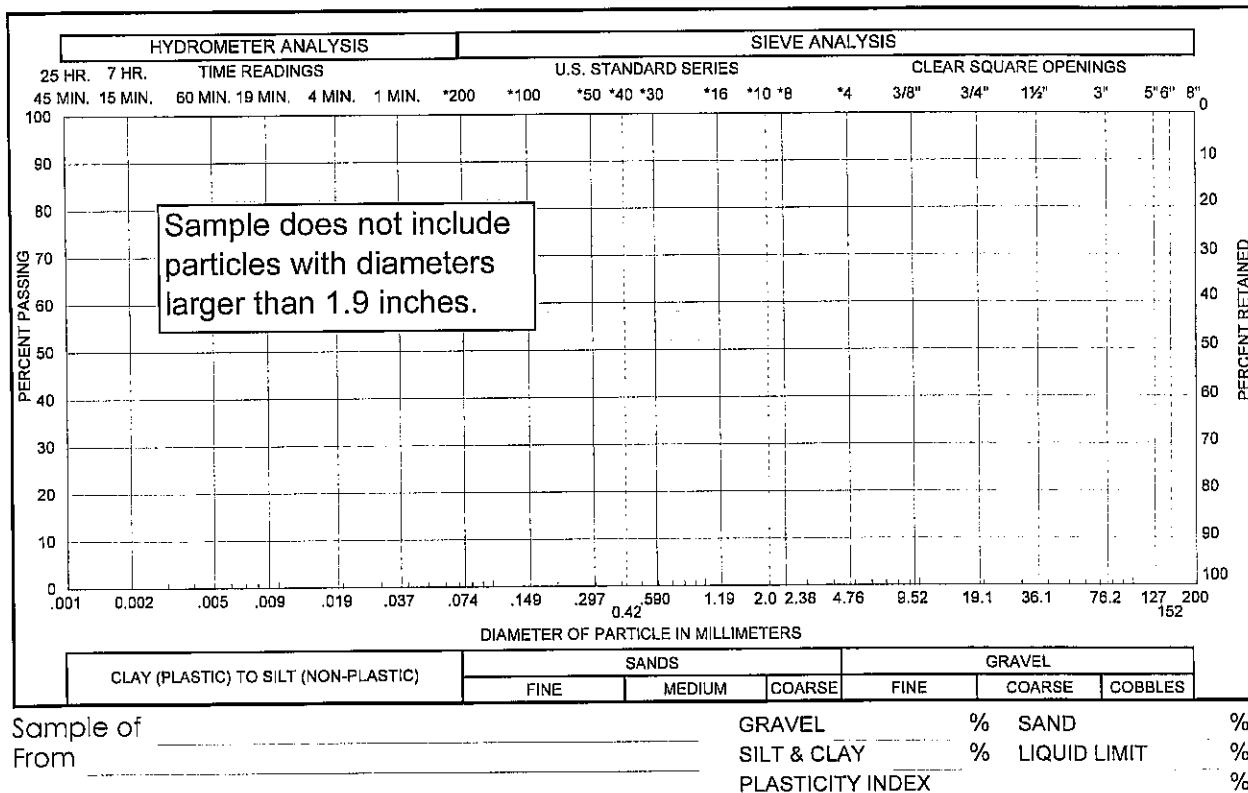
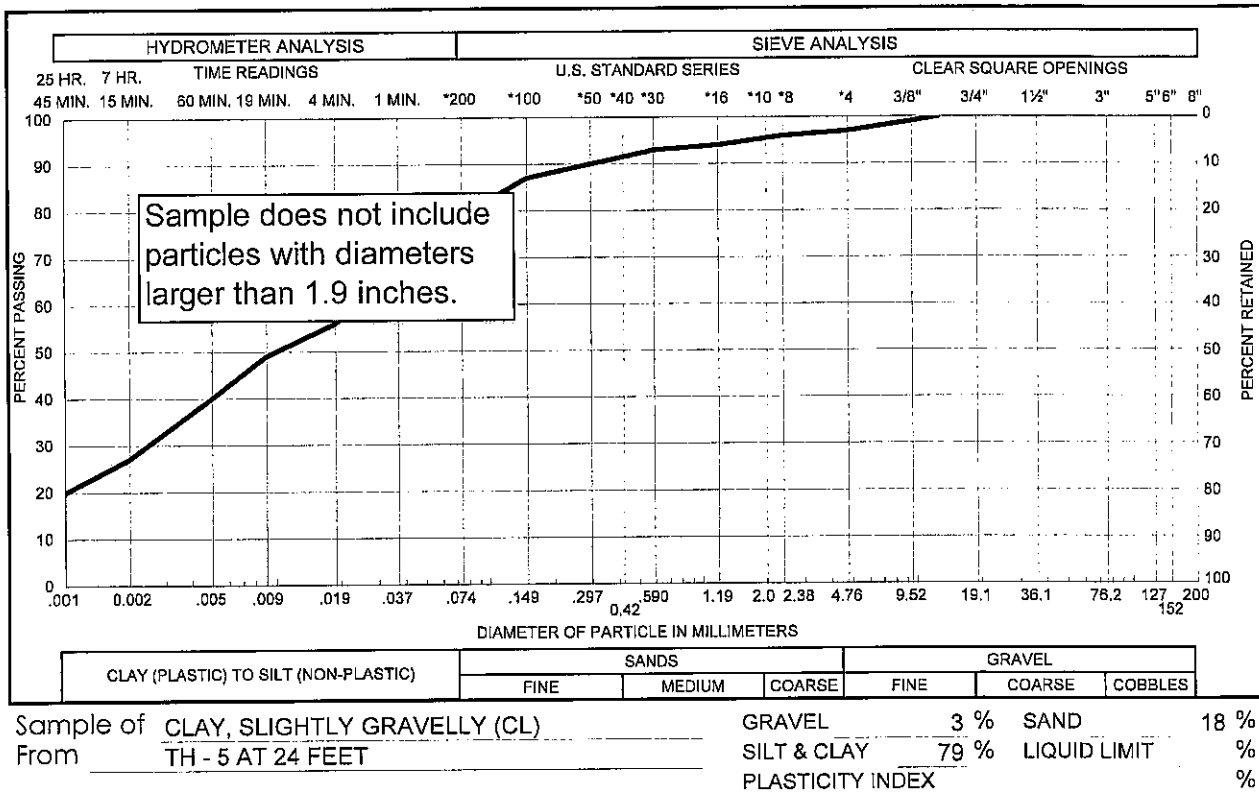
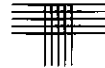
S:\GS05448.000\115\6. Calcs\Gradation GS05448 115 R1.xls

## Gradation Test Results

FIG. A-6









**SUMMARY OF LABORATORY TESTING  
PROJECT NO. GS05448-115**

[illegible]

\* SWELL MEASURED WITH 1000 PSF APPLIED PRESSURE, OR ESTIMATED IN-SITU OVERBURDEN PRESSURE. NEGATIVE VALUE INDICATES COMPRESSION.