FORM 15 Rev 6/99

State of Colorado
Oil and Gas Conservation Commission

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

RECEIVED
FOR OGCC USE ONLY
NOV 28 2011
COGCC

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

	Oper	OGCC
Detailed Site Plan	✓	
Topo Map w/ Pit Location	✓	
Water Analysis (Form 25)		
Source Wells (Form 26)	✓	
Pit Design/Plan & Cross Sect	✓	
Design Calculations	✓	
Sensitive Area Determ.	✓	
Mud Program		
Form 2A	✓	

FORM SUBMITTED FOR:

☐ Pit Report ☑ Pit Permit

OGCC Operator Number: 10071
Name of Operator: Bill Barrett Corporation
Address: 1099 18th Street, Suite 2300
City: Denver State: CO Zip: 80202

Contact Name and Telephone:
Doug Dennison
No: 970-876-1959
Fax: 970-876-0981

API Number (of associated well): _____ OGCC Facility ID (of other associated facility): 413830
Pit Location (QtrQtr, Sec, Twp, Rng, Meridian): NESW, Section 25, T6S, R92W, 6th PM
Latitude: 39.496986 Longitude: -107.619168 County: Garfield
Pit Use: ☐ Production ☐ Drilling (Attach mud program) ☑ Special Purpose (Describe Use): multi-well pit (Kaufman #1 pit)
Pit Type: ☑ Lined ☐ Unlined Surface Discharge Permit: ☐ Yes ☑ No
Offsite disposal of pit contents: ☑ Injection ☐ Commercial Pit/Facility Name: See attached supplement Pit/Facility No: See atttached supplement
Attach Form 26 to identify Source Wells and Form 25 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: 1,011 ground water: 70 water wells: 1,909

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 form USNRCS survey: Sheet No: _____ Soil Complex/Series No: _____
Soils Series Name: _____ Horizon thickness (in inches): A: ; B: ; C:
Soils Series Name: _____ Horizon thickness (in inches): A: ; B: ; C:
Attach detailed site plan and topo map with pit location.

Pit Design and Construction

Size of pit (feet): Length: 157 Width: 85 Depth: 16.6
Calculated pit volume (bbls): 19,900 Daily inflow rate (bbls/day): Varies - see attached supplement
Daily disposal rates (attach calculations): Evaporation: See attached supplement bbls/day Percolation: 0 bbls/day
Type of liner material: Synthetic Thickness: 2 - 30 mil liners
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): separator, filter
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: Doug Dennison Signed: Doug Dennison Digitally signed by Doug Dennison DN: cn=Doug Dennison, o=Bill Barrett Corporation, ou, e=ddennison@billbarrettcorp.com, c=US Date: 2011.11.28 11:41:27 -07'00'
Title: Environmental/Governmental Affairs Liaison Date: 11/28/11

OGCC Approved: David A. Kubat Title: Location Assessment Specialist Date: 12-15-11

CONDITIONS OF APPROVAL, IF ANY:

FACILITY NUMBER: 426889

COGCC FORM 15
EARTHEN PIT PERMIT
SUPPLEMENTAL INFORMATION

Pit Name – Kaufman #1
Location Number - 413830

BILL BARRETT CORPORATION (Operator Number 10071)

November 2011

This supplement to the COGCC Form 15 for Bill Barrett Corporation's (BBC) proposed multi-well pit provides additional information required by COGCC Rules 902, 903, and 904. This information is identified in the following sections by reference to the applicable section of these rules. The Kaufman #1 pit was originally constructed as a drilling pit to support completion operations only for wells on the Kaufman #1 well pad. This Form 15 is being filed to seek COGCC approval for converting the use of this pit to a multi-well pit that will be used to support completion operations for wells on nearby well pads. The design and operation of this pit is described in detail below.

This pit is a component of BBC's water management and reuse system. This pit is not used for the disposal of water. This pit will be used to store produced and flow-back water for the reuse in well completions throughout BBC's operations. Water is transported to the pit via pipelines from producing well sites and flow-back of completed wells. The water is stored in the pit and then transported to other well sites for completions via pipeline. The daily inflow and outflow of water varies depending upon water needs throughout the system. Any evaporation that occurs would be the result of natural evaporation – no active evaporation of water will be performed.

Ultimately, when the water managed with this pit is no longer needed for reuse, the water is piped to one of BBC's injection well facilities for disposal. Currently, BBC has four injection wells that could be used for the disposal of this water –

- GGU Rodreick (Facility 159176)
- Specialty 13A-28-692 SWD (Facility 159212)
- Circle B Land 33A-35-692 (Facility 159277)
- Scott 41D-36-692 SWD (Facility 159159)

A topographic map with the pit location is included in Figure 1.

902.a.

The pit has been designed with features to prevent spills or leaks from impacting the environment. The implementation of BBC's Stormwater Management Plan, Permit (COR-039752; Attachment A) and the operational policies and procedures described in this

supplement are designed to minimize risk to the environment and accommodate rapid response in the event of an accidental spill or release of fluids. All transfers of water into and out of the pit are monitored by personnel during the entire transfer operation to ensure that adequate freeboard (minimum of 2 feet) is maintained in the pit at all times. BBC has two fully-stocked spill response trailers staged at locations near all of our operations to facilitate response to any spills that may occur. The leak detection system in the pit is checked at least once per week and, in the event that a leak is detected, the pit will be drained as quickly as possible so that the source of the leak can be determined.

902.b.

BBCs pits have been designed to provide for a minimum of two (2) feet of freeboard at all times. Pit design and cross section details, calculation details, and a copy of the source wells (Form 26), are included in Attachment B. Monitoring and maintaining free board is addressed above under Rule 902.a. Spills and releases will be reported in accordance with Rule 906.

902.c.

The pit is checked by BBC staff at least twice each day and any accumulation of oil is removed immediately by skimming.

902.d.

The pit has been designed with a fence in accordance with recommendations of CDOW and COGCC to prevent wildlife from entering.

902.e.

BBC is permitting this pit as a special purpose, multi-well pit, which will be used for a period of no more than three years.

902.h.

All produced water that is stored in the pit is first treated by a 3-phase separator on the producing well and then cascaded through production tanks to give retention time for removal of additional sediment and hydrocarbons.

902.i.

The pit will be treated with biocide as necessary to control bacterial growth and related odors.

903.a.(4)

This supplemental information is being submitted with the COGCC Form 15 for a multi-well pit that will be used to recycle and reuse produced water or completion fluids.

903.d.

Instructions contained in the COGCC Appendix I were used as a guide in the Form 15.

904.a.(5)

The multi-well pit was lined in accordance with Rule 904 and the materials used are described in Rule 904.c below.

904.b.(1)

The materials used to line the pit are 2-6 oz. double sided Geo composites, a 30 mil anti-skid double E30WBS liner, and an additional 30 mil XR5 liner. The specifications of the material are included in Attachment C.

904.b.(2)

The pit liners will be constructed, installed, and maintained in accordance with the manufacturers' specification. The pits have also been designed with good engineering practices.

904.b.(3)

Field seams have been installed and tested in accordance with manufacturer specifications and good engineering practices. The manufacturer specifications are included in Attachment C. Test results will be maintained at BBC's Silt office and will be provided to the Director upon request.

904.c

The pit has, from compacted native soil up, a 6 oz. double sided Geo composite on 100% of the pit from anchor ditch to anchor ditch, a 30 mil anti-skid double E30WBS liner, a 6oz. double sided Geo composite on the bottom of the pit and runners to the top of the anchor ditch and an additional 30 mil XR5 liner. The liner extends 3-4 feet out from the edge of the pit in all directions and is anchored in an anchor ditch that is a minimum of 8 inches deep.

904.e.

Since the facility is within the 317B external buffer zone and in sensitive wildlife habitat for mule deer and elk it is considered to be in a sensitive area. All material used in the determination is included in Attachment D and includes copies of the previously approved Form 2A for this location.

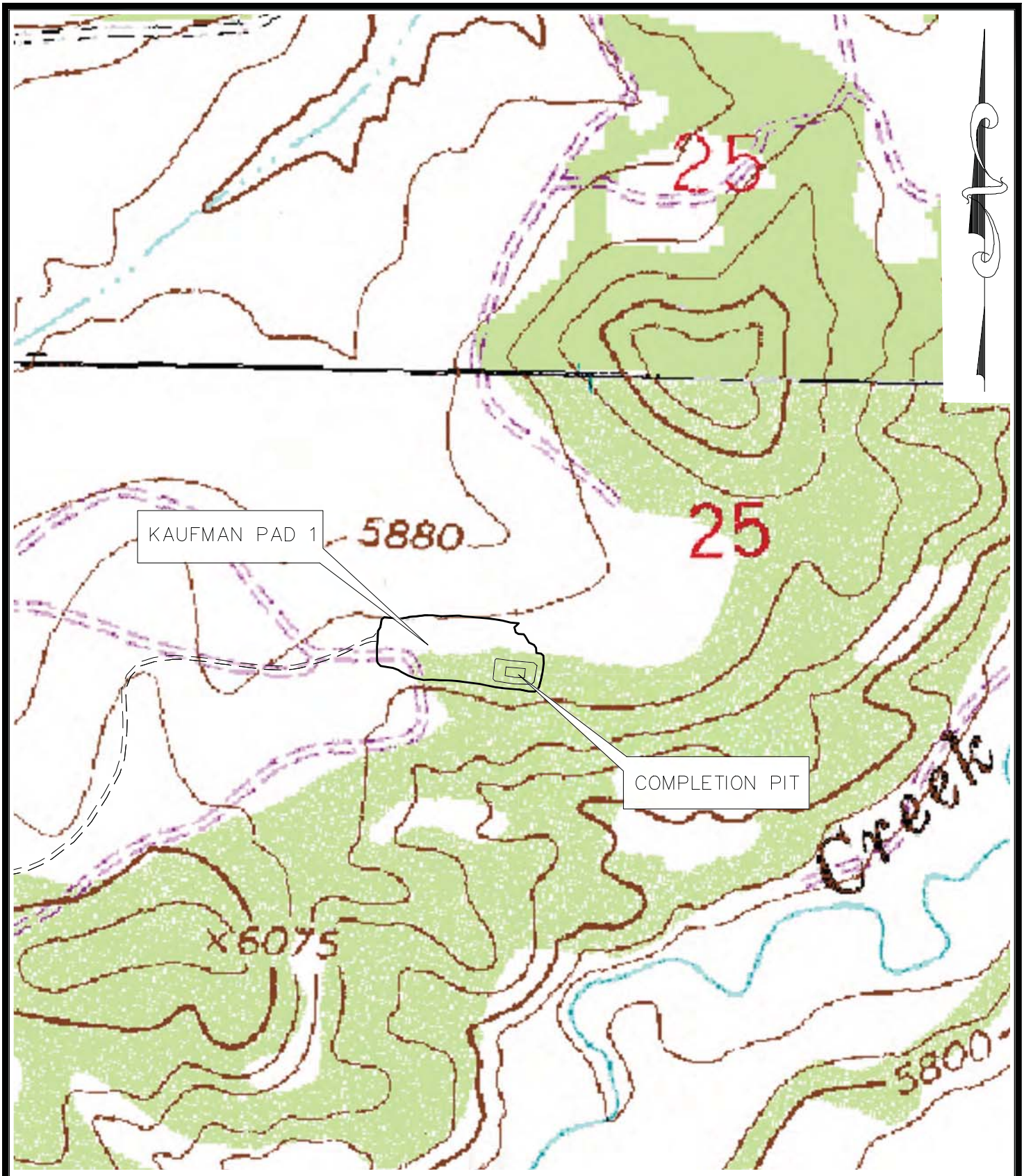
The pit has been designed with features that significantly reduce the potential for the facility to impact nearby surface and ground water. As described above and detailed in Attachment C, the pit will be double lined and include a leak detection system. The implementation of BBC's Stormwater Management Plan, Permit (COR-039752; Attachment A) and the operational policies and procedures described in this supplement are designed to minimize risk to the environment and accommodate rapid response in the event of an accidental spill or release of

fluids. All transfers of water into and out of the pit are monitored by personnel during the entire transfer operation to ensure that adequate freeboard (minimum of 2 feet) is maintained in the pit at all times. BBC has two fully-stocked spill response trailers staged at locations near all of our operations to facilitate response to any spills that may occur. The leak detection system in the pit is checked at least once per week and, in the event that a leak is detected, the pit will be drained as quickly as possible so that the source of the leak can be determined.

The pit has been fenced and netted in accordance with the recommendations of the Colorado Division of Parks and Wildlife, specifically –

1. Minimum of 7-foot perimeter fence constructed of wire mesh.
2. Installation of chicken wire around the lower portion of the fence to prevent small mammals from entering the pit with about 1 foot of the wire buried under ground.
3. Installation of netting to prevent a loss of waterfowl.

Figures



ECLIPSE surveying
111 E. THIRD ST., SUITE 208, RIFLE, CO 81650
(970) 625-3048

REV. DATE:	4/12/11
SCALE:	1"=500'
DATE:	03/15/10
SHEET:	7 of 7
PROJECT:	KAUF1
DFT:	JAK

Bill Barrett Corporation

KAUFMAN PAD I
FIGURE 1

Attachment A

Stormwater Permit (COR-039752)

STATE OF COLORADO

COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT
WATER QUALITY CONTROL DIVISION
TELEPHONE: (303) 692-3500

CERTIFICATION TO DISCHARGE
UNDER
CDPS GENERAL PERMIT COR-030000
STORMWATER DISCHARGES ASSOCIATED WITH CONSTRUCTION

Certification Number **COR039752**

This Certification to Discharge specifically authorizes:

Bill Barrett Corp.

LEGAL CONTACT:
Scot A. Donato,
Bill Barrett Corp.
1099 - 18th Street Ste. 2300
Denver, CO 80202
Phone # 303/312-8191
jmerry@billbarrettcorp.com

LOCAL CONTACT:
Jesse Merry, Field Supervisor,
Phone # 970/ 985-9061
sdonato@billbarrettcorp.com

During the Construction Activity: **Oil & Gas Production and/or Exploration Field**
to discharge stormwater from the facility identified as **Mamm Creek Field** which is located at:

2438 CR 333
Silt, Co

Latitude **39.496,** Longitude **107.621**
In **Garfield County**

to: -- Mamm Creek

Anticipated Activity begins **03/30/2006** continuing through **12/31/2007**
On **>5** acres **(>5** acres disturbed)

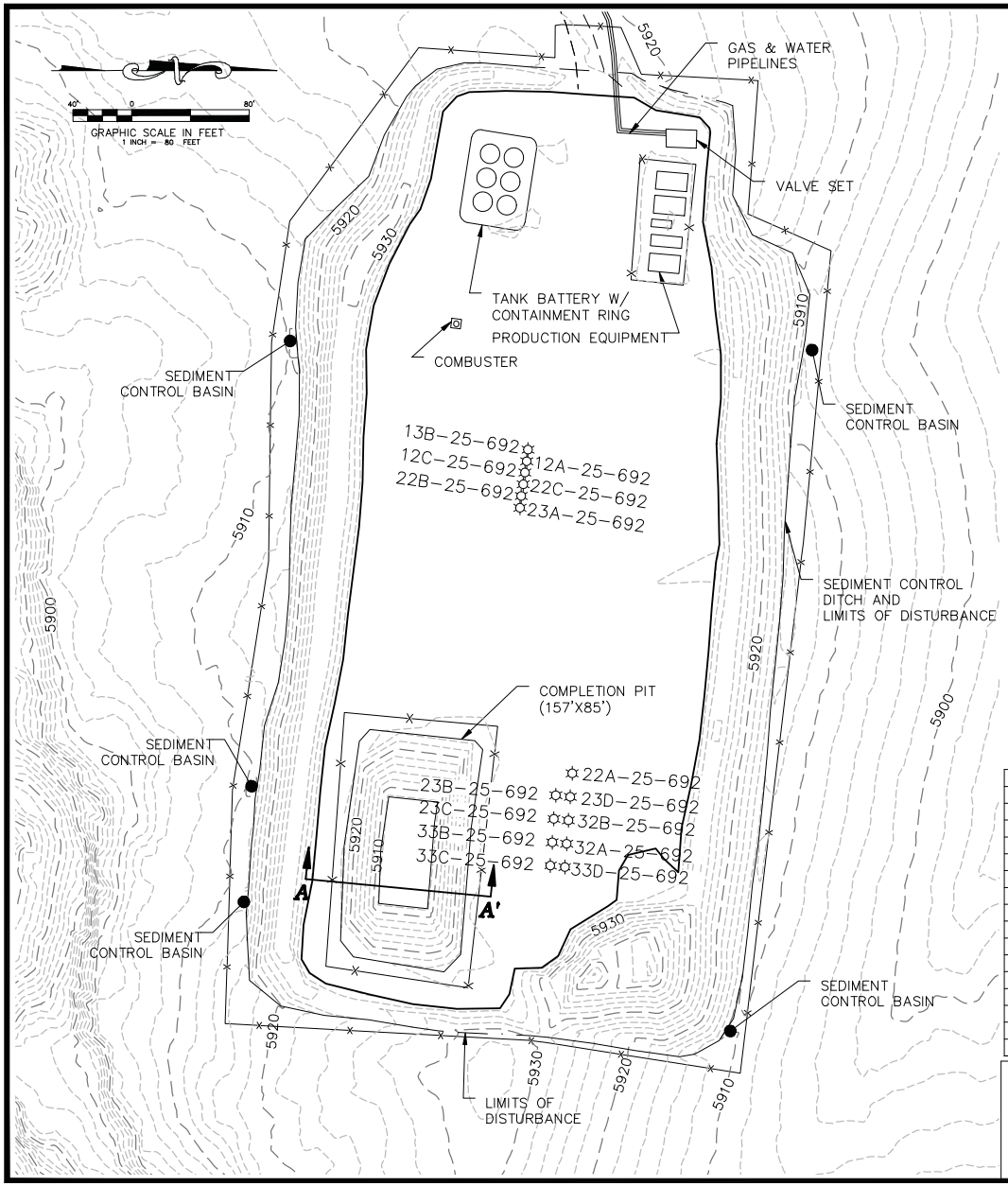
Certification is effective: **07/01/2007** Certification Expires: **06/30/2012**

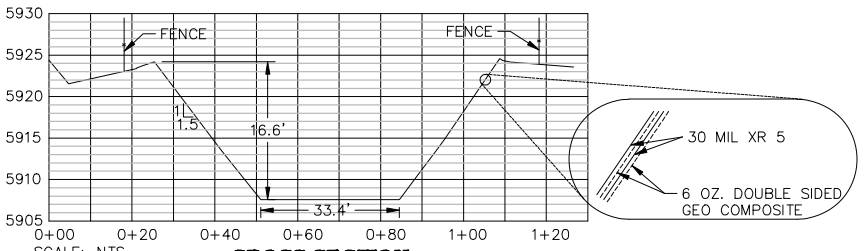
Annual Fee: $245.00 **(DO NOT PAY NOW** – A prorated bill will be sent shortly.)

Attachment B

Site Diagram
Pit Design and Cross Section
Volume Calculations
Form 26

KAUFMAN 1 PHASE II AS-BUILTS
SEC. 25, T. 6 S., R. 92 W., 6TH P.M.
GARFIELD COUNTY, COLORADO





CROSS SECTION
A - A'

PIT VOLUME CALC'S:

AREA OF TOP = 13,002 FT
AREA OF BOTTOM = 2,487 FT
AVERAGE AREA = 15,489/2 = 7,744.5 FT

AVERAGE TOP ELEV. = 5924.0
AVERAGE BOTTOM ELEV. = 5907.6
AVERAGE PIT DEPTH = 16.4 FT

AVERAGE TOTAL VOLUME = 7,745*16.4 = 127,018 CU FT OR 22,623 BBL
AVERAGE WORKING VOLUME = 7,745*14.4 = 111,528 CU FT OR 19,864 BBL

TOTAL DISTURBED AREA:

AREA INSIDE LIMITS OF DISTURBANCE LINE = 210,779 SQ FT OR 4.84 ACRES

SURFACE HOLE LOCATIONS

	WELL NAME	FNSL	FEWL	LATITUDE	LONGITUDE
1	Kaufman 22A-25-692	2218 FSL	1829 FWL	39.497207	-107.618228
2	Kaufman 23D-25-692	2217 FSL	1845 FWL	39.497204	-107.618171
3	Kaufman 32B-25-692	2216 FSL	1861 FWL	39.497202	-107.618115
4	Kaufman 32A-25-692	2215 FSL	1877 FWL	39.497200	-107.618058
5	Kaufman 33D-25-692	2214 FSL	1893 FWL	39.497197	-107.618002
6	Kaufman 33C-25-692	2204 FSL	1892 FWL	39.497170	-107.618005
7	Kaufman 33B-25-692	2205 FSL	1876 FWL	39.497173	-107.618061
8	Kaufman 23C-25-692	2206 FSL	1860 FWL	39.497175	-107.618118
9	Kaufman 23B-25-692	2207 FSL	1844 FWL	39.497177	-107.618174
10	Kaufman 23A-25-692	2180 FSL	1648 FWL	39.497098	-107.618866
11	Kaufman 22B-25-692	2181 FSL	1640 FWL	39.497100	-107.618895
12	Kaufman 22C-25-692	2182 FSL	1632 FWL	39.497103	-107.618923
13	Kaufman 12C-25-692	2183 FSL	1624 FWL	39.497105	-107.618951
14	Kaufman 12A-25-692	2184 FSL	1616 FWL	39.497108	-107.618979
15	Kaufman 13B-25-692	2185 FSL	1609 FWL	39.497110	-107.619007

NOTES:

1) CONTOUR INTERVAL IS 2 FOOT
2) SURVEY DATE: 11/7/11
3) INSTRUMENT OPERATOR: J. ODOR
4) PDOP MASK SET TO 6, ELEV MASK SET TO 15°
4) LATS AND LONGS ARE IN DECIMAL DEGREE FORMAT
5) DATUM IS COLORADO STATE PLANE, CENTRAL ZONE, NAD 83

ECLIPSE surveying
111 E. THIRD ST., SUITE 208, RIFLE, CO 81650
(970) 625-3048

REV. DATE:	
SCALE:	1" = 80'
DATE:	11/07/11
SHEET:	1 OF 1
PROJECT:	KAUF1
DFT:	JAK

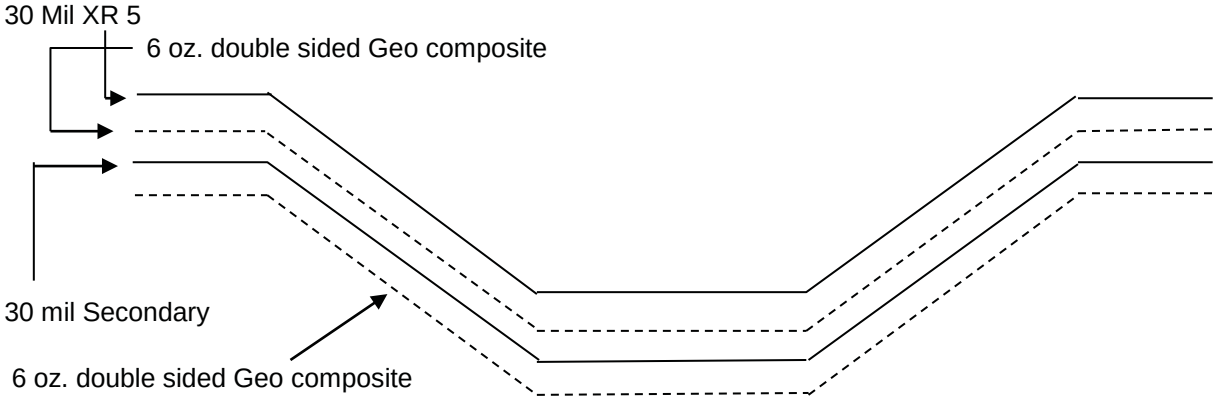
Bill Barrett Corporation

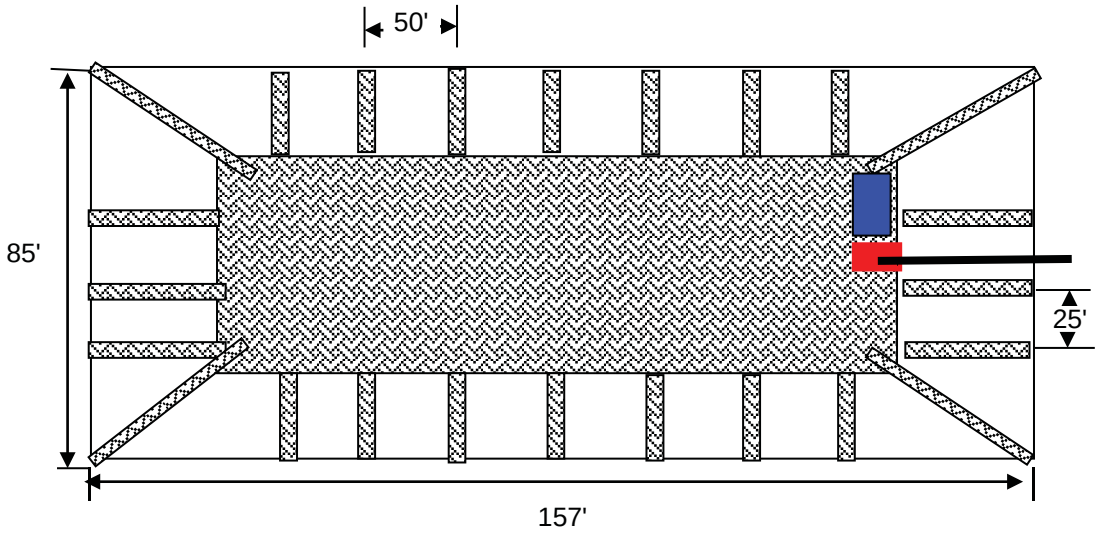
KAUFMAN 1 PHASE II
SEC 25, T.6S., R.92W., 6TH P.M.

PIT DESIGN PLAN AND CROSS SECTION
Pit Location - Kaufman #1 (Location ID 413830)

From native soil up

1. 6 oz. double sided Geo composite on 100% of pit from anchor ditch to anchor ditch
2. 30 mil anti skid double E30WBS liner for seconadry liner
3. 6 oz. double sided Geo composite on bottom of pit and runners to top of anchor ditch
 (50' span between on sides25' span on ends)
4. 30 mil XR 5 liner for primary liner
5. Vent pockets at top of every vent grid.





Note:

Leak Detection Sump Placement
Suction Line Sump

*Construct suction line sump approximately 6 feet long and leave 2 feet of native soil between leak detection sump to separate.

FORM
26
Rev 6/99

State of Colorado
Oil and Gas Conservation Commission

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

FOR OGCC USE ONLY

SOURCE OF PRODUCED WATER FOR DISPOSAL

This form must be completed for any new disposal site and for any change in sources of produced water for an existing disposal site.

Complete the Attachment Checklist

	Oper	OGCC
Chemical Analysis of fluid	X	

If more space is required, attach additional sheet.

OGCC Operator Number: _____
Name of Operator: _____
Address: 10071
City: Bill Barrett Corporation State: 1099 18 Zip: Denver

Contact Name and Telephone:
CO
No: 80202
Fax: Doug Dennison

OGCC Disposal Facility Number: 970-876-1959
Operator's Disposal Facility Name: 970-876-0981 Operator's Disposal Facility Number: _____
Location (QtrQtr, Sec, Twp, Rng, Meridian): 413830
Address: NESW, Section 25, T6S, R92W, 6th PM
City: 39.496986 State: -107.6191 Zip: Garfield County: _____

Add Source: ☑ **Delete Source:** ☑
OGCC Lease No: _____ API No: _____ Well Name & No: multi-well pit (Kaufman #1 pit)
Operator Name: _____ Operator No: _____
Location: QtrQtr: _____ Section: _____ Township: _____ Range: _____ Producing Formation: See attached supplement
Analysis Attached? Yes ☑ No Transported to disposal site via: ☐ Pipeline Truck TDS: 70

Add Source: ☑ **Delete Source:** ☐
OGCC Lease No: 1,909 API No: _____ Well Name & No: _____
Operator Name: _____ Operator No: _____
Location: QtrQtr: _____ Section: _____ Township: _____ Range: _____ Producing Formation: _____
Analysis Attached? Yes ☐ No Transported to disposal site via: ☐ Pipeline ☐ Truck TDS: _____

Add Source: ☑ **Delete Source:** ☐
OGCC Lease No: _____ API No: _____ Well Name & No: _____
Operator Name: _____ Operator No: _____
Location: QtrQtr: _____ Section: _____ Township: _____ Range: _____ Producing Formation: 157
Analysis Attached? Yes No Transported to disposal site via: Pipeline Truck TDS: See attached supplement

Add Source: ☐ **Delete Source:** ☐
OGCC Lease No: 0 API No: Synthetic Well Name & No: 2 - 30 mil liners
Operator Name: separator, filter Operator No: _____
Location: QtrQtr: _____ Section: _____ Township: _____ Range: Doug Dennison Producing Formation: Environmental/Governmental Affairs Liai
Analysis Attached? Yes ☑ No Transported to disposal site via: ☑ Pipeline ☐ Truck TDS: _____

Add Source: ☐ **Delete Source:** ☐
OGCC Lease No: See attached API No: _____ Well Name & No: _____
Operator Name: _____ Operator No: _____
Location: QtrQtr: _____ Section: _____ Township: _____ Range: _____ Producing Formation: _____
Analysis Attached? ☐ Yes ☐ No Transported to disposal site via: ☐ Pipeline ☐ Truck TDS: _____

Add Source: ☐ **Delete Source:** ☐
OGCC Lease No: See attached API No: _____ Well Name & No: _____
Operator Name: _____ Operator No: _____
Location: QtrQtr: _____ Section: _____ Township: _____ Range: _____ Producing Formation: _____
Analysis Attached? ☐ Yes ☐ No Transported to disposal site via: ☐ Pipeline ☐ Truck TDS: _____

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

Print Name: Doug Dennison Signed: _____
Title: Environmental/Governmental Affairs Liaison Date: 11/28/11

OGCC Approved: _____ Title: _____ Date: _____

CONDITIONS OF APPROVAL, IF ANY:

BILL BARRETT CORPORATION
FORM 26 ATTACHMENT – APPLICABLE FACILITIES
STATUS DATE – 11/14/11

The following are the multi-well pits that will handle the water produced by the wells identified in this Form 26 –

Pit Name	Location Number/API Number	Location
Daley 1-30	05-045-07151	NENE 30 6S 91W 6th PM
MDP #4	05-045-18986	SWNW 33 6S 91W 6th PM
Specialty 41A-28-692	05-045-11841	NENE 28 6S 92W 6th PM
Kaufman #1	413830	NESW 25 6S 92W 6th PM
Werner SWSE-23-692	416197	SWSE 23 6S 92W 6th PM

BILL BARRETT CORPORATION
FORM 26 ATTACHMENT - WELLS TO ADD AS SOURCES OF WATER
STATUS DATE - 11/14/11

Facility Name/Number	API Number	Qtr/Qtr	Section	Township	Range	TDS (mg/l)**
Federal 32A-20-691	05-045-19676	NWSE	20	6S	91W	9,500-10,900
Federal 32B-20-691	05-045-19678	SWNE	20	6S	91W	9,500-10,900
Federal 32C-20-691	05-045-19677	SWNE	20	6S	91W	9,500-10,900
Federal 32D-20-691	05-045-19680	SWNE	20	6S	91W	9,500-10,900
Jolley 42A-20-691	05-045-19682	NWSE	20	6S	91W	9,500-10,900
Jolley 42B-20-691	05-045-19679	NWSE	20	6S	91W	9,500-10,900
Jolley 42C-20-691	05-045-19681	SWNE	20	6S	91W	9,500-10,900
Jolley 42D-20-691	05-045-19675	SWNE	20	6S	91W	9,500-10,900
Kaufman 23C-24-692	05-045-19649	SWNE	24	6S	92W	9,500-10,900
Kaufman 23D-24-692	05-045-19648	SWNE	24	6S	92W	9,500-10,900
Kaufman 23B-24-692	05-045-19646	SWNE	24	6S	92W	9,500-10,900
Kaufman 23A-24-692	05-045-19651	SWNE	24	6S	92W	9,500-10,900
Kaufman 24D-24-692	05-045-19647	SWNE	24	6S	92W	9,500-10,900
Kaufman 24C-24-692	05-045-19650	SWNE	24	6S	92W	9,500-10,900
Kaufman 24A-24-692	05-045-19645	SWNE	24	6S	92W	9,500-10,900
Kaufman 24B-24-692	05-045-19652	SWNE	24	6S	92W	9,500-10,900

** The operation of Bill Barrett Corporation's water management system results in water from these wells being mixed together and transported throughout BBC's operations via pipeline. As a result, the water that is managed in pits is reflected by this mixture. The TDS values indicated are a range of typical concentrations found by analyses of water from various pits throughout this system. Laboratory reports reflecting these values are attached.

ORIGINS LABORATORY, INC

5/18/2010

Olsson Associates
Ken Kreie
826 21 1/2 Road
Grand Junction CO 81505

Project Name- BBC - Pad Seep Project Number- 010-0974

Attached are your analytical results for BBC - Pad Seep received by Origins Laboratory, Inc. May 14, 2010 2:20 pm. This project is associated with Origins project number X005074-01 .

The analytical results in the following report were analyzed under the guidelines of EPA Methods specified in SW-846. The analytical results apply specifically to the samples and analyses specified per the attached Chain of Custody.

Thank you for selecting Origins for your analyical needs. Please contact us with any questions concerning this report, or if we can help with anything at all,

Origins Laboratory, Inc.
303.433.1322
o-squad@oelabinc.com

ORIGINS LABORATORY, INC

Olsson Associates
826 21 1/2 Road
Grand Junction CO 81505

Ken Kreie
Project Number: 010-0974
Project: BBC - Pad Seep

CROSS REFERENCE REPORT

Sample ID	Laboratory ID	Matrix	Sampled	Date Received
SP-1	X005074-01	Water	5/13/2010 2:00:00PM	05/14/2010 14:20
SE-1	X005074-02	Water	5/13/2010 3:10:00PM	05/14/2010 14:20

Origins Laboratory, Inc.

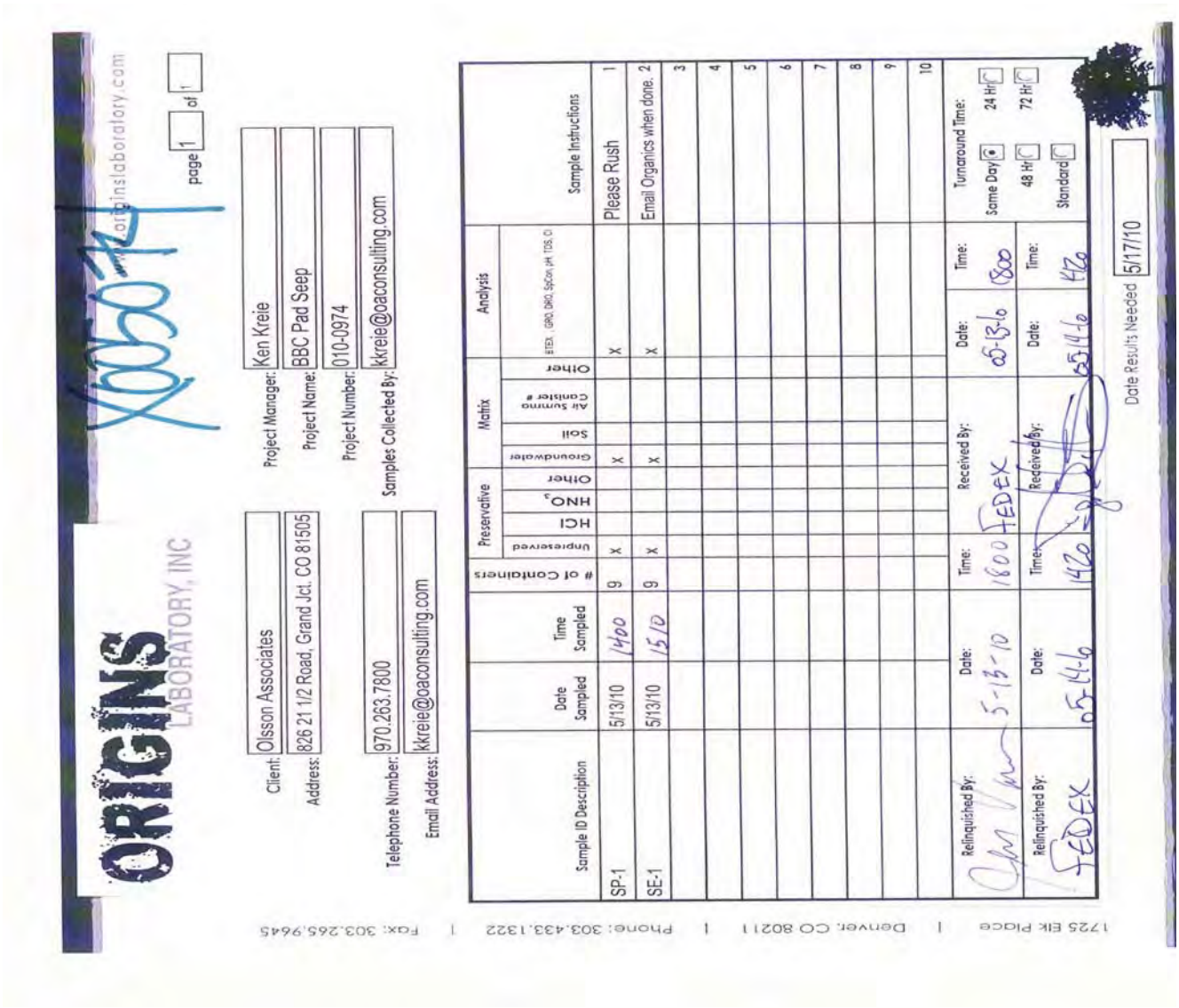
The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Noelle E Doyle, Laboratory Manager

ORIGINS LABORATORY, INC

Olsson Associates
826 21 1/2 Road
Grand Junction CO 81505

Ken Kreie
Project Number: 010-0974
Project: BBC - Pad Seep



Origins Laboratory, Inc.

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Noelle E Doyle, Laboratory Manager

Olsson Associates
826 21 1/2 Road
Grand Junction CO 81505

Ken Kreie
Project Number: 010-0974
Project: BBC - Pad Seep

SP-1

5/13/2010 2:00:00PM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Notes
Origins Laboratory, Inc.								
X005074-01 (Water)								
BTEX by EPA 8260B								
Benzene	**1.61**	0.0200	mg/L	20	0E14001	05/14/2010	05/14/2010	
Toluene	**3.17**	0.0200	"	"	"	"	"	
Ethylbenzene	**0.205**	0.0200	"	"	"	"	"	
Xylenes, total	**3.10**	0.0200	"	"	"	"	"	
Surrogate: 1,2-Dichloroethane-d4	*98.2 %*	*73.5-130*			"	"	"	
Surrogate: Toluene-d8	*98.8 %*	*79.3-113*			"	"	"	
Surrogate: 4-Bromofluorobenzene	*103 %*	*81.5-117*			"	"	"	
Chloride by E300								
Chloride	**3880**	25	mg/L	50	806837	05/15/2010	05/15/2010	
Conductivity by E120.1								
Conductivity	**16900**	50	US/CM	1	806871	05/17/2010	05/17/2010	
GRO (TVPH)/DRO (TEPH)by EPA 8015M								
Gasoline (C6-C10)	**18.7**	5.00	mg/L	1	0E14002	05/14/2010	05/15/2010	
Diesel (C10-C28)	**11.6**	5.00	"	"	"	"	"	

Origins Laboratory, Inc.

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Noelle E Doyle, Laboratory Manager

ORIGINS LABORATORY, INC

Olsson Associates
826 21 1/2 Road
Grand Junction CO 81505

Ken Kreie
Project Number: 010-0974
Project: BBC - Pad Seep

SP-1

5/13/2010 2:00:00PM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Notes
Origins Laboratory, Inc.								
X005074-01 (Water)								
GRO (TVPH)/DRO (TEPH)by EPA 8015M								
Surrogate: o-Terphenyl	*107 %*	*60-130*			*0E14002*	*05/14/2010*	*05/15/2010*	
pH by SM4500-H								
pH	**7.76**		SU	1	806873	05/17/2010	05/17/2010	
Total Dissolved Solids (TDS) by SM2540C								
Total dissolved solids	**10900**	5	MG/L	1	806961	05/17/2010	05/17/2010	

Origins Laboratory, Inc.

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Noelle E Doyle, Laboratory Manager

Olsson Associates
826 21 1/2 Road
Grand Junction CO 81505

Ken Kreie
Project Number: 010-0974
Project: BBC - Pad Seep

Extractable Petroleum Hydrocarbons by 8015M - Quality Control
Origins Laboratory, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0E14002 - Default Prep GC-Semi										
Blank (0E14002-BLK1)						Prepared: 05/14/2010 Analyzed: 05/14/2010				
Gasoline (C6-C10)	ND	5.00	mg/L							
Diesel (C10-C28)	ND	5.00	"							
Surrogate: o-Terphenyl	*49.7*		*mL*	*50.0*		*99.4*	*60-130*			
LCS (0E14002-BS1)						Prepared: 05/14/2010 Analyzed: 05/14/2010				
Gasoline (C6-C10)	11.1	5.00	mg/L				65-140			
Diesel (C10-C28)	39.8	5.00	"	50.0		79.6	60-140			
Surrogate: o-Terphenyl	*53.2*		*mL*	*50.0*		*106*	*60-130*			
Matrix Spike (0E14002-MS1)		Source: X005046-01				Prepared: 05/14/2010 Analyzed: 05/15/2010				
Gasoline (C6-C10)	10.8	5.00	mg/L		ND		65-130			
Diesel (C10-C28)	41.1	5.00	"	50.0	3.16	75.9	60-140			
Surrogate: o-Terphenyl	*55.8*		*mL*	*50.0*		*112*	*60-130*			
Matrix Spike Dup (0E14002-MSD1)		Source: X005046-01				Prepared: 05/14/2010 Analyzed: 05/15/2010				
Gasoline (C6-C10)	11.0	5.00	mg/L		ND		65-130	1.90	20	
Diesel (C10-C28)	42.0	5.00	"	50.0	3.16	77.7	60-140	2.22	25	
Surrogate: o-Terphenyl	*56.6*		*mL*	*50.0*		*113*	*60-130*			

Origins Laboratory, Inc.

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Noelle E Doyle, Laboratory Manager

Olsson Associates
826 21 1/2 Road
Grand Junction CO 81505

Ken Kreie
Project Number: 010-0974
Project: BBC - Pad Seep

Volatile Organic Compounds by EPA Method 8260B - Quality Control
Origins Laboratory, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0E14001 - EPA 5030B										
Blank (0E14001-BLK1)						Prepared: 05/14/2010 Analyzed: 05/14/2010				
Benzene	ND	0.001	mg/L							
Toluene	ND	0.001	"							
Ethylbenzene	ND	0.001	"							
o-Xylene	ND	0.001	"							
m,p-Xylene	ND	0.002	"							
Surrogate: 1,2-Dichloroethane-d4	*62.2*		*ug/L*	*62.5*		*99.5*	*73.5-130*			
Surrogate: Toluene-d8	*61.1*		*"*	*62.5*		*97.8*	*79.3-113*			
Surrogate: 4-Bromofluorobenzene	*62.9*		*"*	*62.5*		*101*	*81.5-117*			
Blank (0E14001-BLK2)						Prepared: 05/14/2010 Analyzed: 05/14/2010				
Benzene	ND	0.001	mg/L							
Toluene	ND	0.001	"							
Ethylbenzene	ND	0.001	"							
o-Xylene	ND	0.001	"							
m,p-Xylene	ND	0.002	"							
Surrogate: 1,2-Dichloroethane-d4	*61.9*		*ug/L*	*62.5*		*99.0*	*73.5-130*			
Surrogate: Toluene-d8	*60.9*		*"*	*62.5*		*97.4*	*79.3-113*			
Surrogate: 4-Bromofluorobenzene	*62.9*		*"*	*62.5*		*101*	*81.5-117*			
LCS (0E14001-BS1)						Prepared: 05/14/2010 Analyzed: 05/14/2010				
Benzene	0.05	0.001	mg/L	0.0500		102	77.3-128			
Toluene	0.04	0.001	"	0.0500		88.4	81.7-118			
Surrogate: 1,2-Dichloroethane-d4	*63.1*		*ug/L*	*62.5*		*101*	*73.5-130*			
Surrogate: Toluene-d8	*62.0*		*"*	*62.5*		*99.3*	*79.3-113*			
Surrogate: 4-Bromofluorobenzene	*64.0*		*"*	*62.5*		*102*	*81.5-117*			
LCS (0E14001-BS2)						Prepared: 05/14/2010 Analyzed: 05/14/2010				
Benzene	0.05	0.001	mg/L	0.0500		104	77.3-128			
Toluene	0.04	0.001	"	0.0500		88.3	81.7-118			

Origins Laboratory, Inc.

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Noelle E Doyle, Laboratory Manager

Olsson Associates
826 21 1/2 Road
Grand Junction CO 81505

Ken Kreie
Project Number: 010-0974
Project: BBC - Pad Seep

Volatile Organic Compounds by EPA Method 8260B - Quality Control
Origins Laboratory, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0E14001 - EPA 5030B										
LCS (0E14001-BS2)					Prepared: 05/14/2010 Analyzed: 05/14/2010					
Surrogate: 1,2-Dichloroethane-d4	*63.4*		*ug/L*	*62.5*		*101*	*73.5-130*			
Surrogate: Toluene-d8	*60.4*		*"*	*62.5*		*96.7*	*79.3-113*			
Surrogate: 4-Bromofluorobenzene	*63.1*		*"*	*62.5*		*101*	*81.5-117*			
Matrix Spike (0E14001-MS1)		Source: X005065-01			Prepared: 05/14/2010 Analyzed: 05/14/2010					
Benzene	0.04	0.001	mg/L	0.0500	ND	87.7	74.5-132			
Toluene	0.04	0.001	"	0.0500	0.0004	70.1	74.2-116			QM-07
Surrogate: 1,2-Dichloroethane-d4	*61.7*		*ug/L*	*62.5*		*98.8*	*73.5-130*			
Surrogate: Toluene-d8	*59.0*		*"*	*62.5*		*94.4*	*79.3-113*			
Surrogate: 4-Bromofluorobenzene	*61.8*		*"*	*62.5*		*98.8*	*81.5-117*			
Matrix Spike (0E14001-MS2)		Source: X005065-02			Prepared: 05/14/2010 Analyzed: 05/14/2010					
Benzene	0.05	0.001	mg/L	0.0500	ND	103	74.5-132			
Toluene	0.04	0.001	"	0.0500	ND	83.9	74.2-116			
Surrogate: 1,2-Dichloroethane-d4	*62.4*		*ug/L*	*62.5*		*99.9*	*73.5-130*			
Surrogate: Toluene-d8	*59.4*		*"*	*62.5*		*95.0*	*79.3-113*			
Surrogate: 4-Bromofluorobenzene	*61.6*		*"*	*62.5*		*98.6*	*81.5-117*			
Matrix Spike Dup (0E14001-MSD1)		Source: X005065-01			Prepared: 05/14/2010 Analyzed: 05/14/2010					
Benzene	0.05	0.001	mg/L	0.0500	ND	101	74.5-132	14.2	13.1	QM-07
Toluene	0.04	0.001	"	0.0500	0.0004	80.7	74.2-116	13.9	21.2	
Surrogate: 1,2-Dichloroethane-d4	*61.5*		*ug/L*	*62.5*		*98.4*	*73.5-130*			
Surrogate: Toluene-d8	*58.8*		*"*	*62.5*		*94.2*	*79.3-113*			
Surrogate: 4-Bromofluorobenzene	*62.3*		*"*	*62.5*		*99.7*	*81.5-117*			
Matrix Spike Dup (0E14001-MSD2)		Source: X005065-02			Prepared: 05/14/2010 Analyzed: 05/14/2010					
Benzene	0.05	0.001	mg/L	0.0500	ND	104	74.5-132	1.58	13.1	
Toluene	0.04	0.001	"	0.0500	ND	87.2	74.2-116	3.76	21.2	
Surrogate: 1,2-Dichloroethane-d4	*61.1*		*ug/L*	*62.5*		*97.7*	*73.5-130*			
Surrogate: Toluene-d8	*59.4*		*"*	*62.5*		*95.0*	*79.3-113*			
Surrogate: 4-Bromofluorobenzene	*62.1*		*"*	*62.5*		*99.4*	*81.5-117*			

Origins Laboratory, Inc.

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Noelle E Doyle, Laboratory Manager

Olsson Associates
826 21 1/2 Road
Grand Junction CO 81505

Ken Kreie
Project Number: 010-0974
Project: BBC - Pad Seep

Volatile Organic Compounds by EPA Method 8260B - Quality Control
Origins Laboratory, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0E14001 - EPA 5030B										

Origins Laboratory, Inc.

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Noelle E Doyle, Laboratory Manager

Olsson Associates
826 21 1/2 Road
Grand Junction CO 81505

Ken Kreie
Project Number: 010-0974
Project: BBC - Pad Seep

Chloride by E300 - Quality Control
XENCO

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 806837 - E300P										
MS (373068-001 S)		Source: 373068-001 S			Prepared: 05/15/2010 Analyzed: 05/15/2010					
Chloride	135	5	mg/L	50.0	95.2	80	90-110	0	20	
MSD (373068-001 SD)		Source: 373068-001 SD			Prepared: 05/15/2010 Analyzed: 05/15/2010					
Chloride	134	5	mg/L	50.0	95.2	78	90-110	1	20	
LCS (563421-1-BKS)		Source: 563421-1-BKS			Prepared: 05/15/2010 Analyzed: 05/15/2010					
Chloride	5.03	0.5	mg/L	5.00	←0.066	101	90-110	0	20	
BLANK (563421-1-BLK)		Source: 563421-1-BLK			Prepared: 05/15/2010 Analyzed: 05/15/2010					
Chloride	ND	0.5	mg/L	0.00			-	0	20	

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Noelle E Doyle, Laboratory Manager

Olsson Associates
826 21 1/2 Road
Grand Junction CO 81505

Ken Kreie
Project Number: 010-0974
Project: BBC - Pad Seep

Conductivity by E120.1 - Quality Control
XENCO

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 806871 - NONE										
LCS (806871-1-BKS)		Source: 806871-1-BKS			Prepared: 05/17/2010 Analyzed: 05/17/2010					
Conductivity	1450	50	US/CM	1410	←10.0	103	80-120	0	20	
BLANK (806871-1-BLK)		Source: 806871-1-BLK			Prepared: 05/17/2010 Analyzed: 05/17/2010					
Conductivity	ND	50	US/CM	0.00			-	0	20	

Origins Laboratory, Inc.

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Noelle E Doyle, Laboratory Manager

Olsson Associates
826 21 1/2 Road
Grand Junction CO 81505

Ken Kreie
Project Number: 010-0974
Project: BBC - Pad Seep

Total Dissolved Solids (TDS) by SM2540C - Quality Control
XENCO

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 806961 - NONE										
MS (373068-001 S)		**Source: 806961-1-BKS**			Prepared: 05/15/2010 Analyzed: 05/15/2010					
Total dissolved solids	960	5	MG/L	1000	←5.00	96	80-120	0	30	
BLANK (563421-1-BLK)		**Source: 806961-1-BLK**			Prepared: 05/15/2010 Analyzed: 05/15/2010					
Total dissolved solids	ND	5	MG/L	1000			-	0	30	

Origins Laboratory, Inc.

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Noelle E Doyle, Laboratory Manager

ORIGINS LABORATORY, INC

Olsson Associates
826 21 1/2 Road
Grand Junction CO 81505

Ken Kreie
Project Number: 010-0974
Project: BBC - Pad Seep

Notes and Definitions

QM-07	The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on acceptable LCS recovery.
ND	Analyte NOT DETECTED at or above the reporting limit
RPD	Relative Percent Difference

Origins Laboratory, Inc.

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Noelle E Doyle, Laboratory Manager

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Est. 1970

Ken Kreie
Olsson Associates - GJ, CO
826 21 1/2 Road
Grand Junction, CO 81505

Report Summary

Friday April 23, 2010

Report Number: L455308
Samples Received: 04/22/10
Client Project: 010-0692

Description: Miller Pit Leak

The analytical results in this report are based upon information supplied by you, the client, and are for your exclusive use. If you have any questions regarding this data package, please do not hesitate to call.

Entire Report Reviewed By:

John D. Blackman , ESC Representative

Laboratory Certification Numbers

A2LA - 1461-01, AIHA - 100789, AL - 40660, CA - I-2327, CT - PH-0197, FL - E87487
GA - 923, IN - C-TN-01, KY - 90010, KYUST - 0016, NC - ENV375/DW21704, ND - R-140
NJ - TN002,NJ NELAP - TN002, SC - 84004, TN - 2006, VA - 00109, WV - 233
AZ - 0612, MN - 047-999-395, NY - 11742, WI - 998093910, NV - TN000032008A

Accreditation is only applicable to the test methods specified on each scope of accreditation held by ESC Lab Sciences.
Note: The use of the preparatory EPA Method 3511 is not approved or endorsed by the CA ELAP.

Where applicable, sampling conducted by ESC is performed per guidance provided in laboratory standard operating procedures: 060302, 060303, and 060304.

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REPORT OF ANALYSIS

Ken Kreie
Olsson Associates - GJ, CO
826 21 1/2 Road
Grand Junction, CO 81505

April 23, 2010

ESC Sample # : L455308-01

Date Received : April 22, 2010
Description : Miller Pit Leak

Site ID :

Sample ID : MILLER-11-SUMP

Project # : 010-0692

Collected By : Jess Vann
Collection Date : 04/21/10 11:05

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Chloride	3200	50.	mg/l	9056	04/22/10	50
Sulfate	BDL	5.0	mg/l	9056	04/22/10	1
pH	7.4		su	9040C	04/22/10	1
Specific Conductance	14000		umhos/cm	9050A	04/23/10	1
Dissolved Solids	9200	10.	mg/l	2540C	04/23/10	1
Benzene	0.79	0.025	mg/l	8260B	04/22/10	25
Toluene	1.7	0.12	mg/l	8260B	04/22/10	25
Ethylbenzene	0.060	0.025	mg/l	8260B	04/22/10	25
Total Xylenes	2.5	0.075	mg/l	8260B	04/22/10	25
Methyl tert-butyl ether	BDL	0.025	mg/l	8260B	04/22/10	25
Surrogate Recovery						
Toluene-d8	103.		% Rec.	8260B	04/22/10	25
Dibromofluoromethane	98.9		% Rec.	8260B	04/22/10	25
4-Bromofluorobenzene	107.		% Rec.	8260B	04/22/10	25

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Note:
The reported analytical results relate only to the sample submitted.

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Reported: 04/23/10 16:12 Printed: 04/23/10 16:12
L455308-01 (PH) - 7.4@18.9c

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Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Ken Kreie
Olsson Associates - GJ, CO
826 21 1/2 Road
Grand Junction, CO 81505

April 23, 2010

ESC Sample # : L455308-02

Date Received : April 22, 2010
Description : Miller Pit Leak

Site ID :

Sample ID : MILLER-11-PIT

Project # : 010-0692

Collected By : Jess Vann
Collection Date : 04/21/10 11:20

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Chloride	3200	50.	mg/l	9056	04/22/10	50
Sulfate	BDL	5.0	mg/l	9056	04/22/10	1
pH	8.0		su	9040C	04/22/10	1
Specific Conductance	14000		umhos/cm	9050A	04/23/10	1
Dissolved Solids	9500	10.	mg/l	2540C	04/23/10	1
Benzene	2.7	0.050	mg/l	8260B	04/22/10	50
Toluene	6.8	0.50	mg/l	8260B	04/23/10	100
Ethylbenzene	0.40	0.050	mg/l	8260B	04/22/10	50
Total Xylenes	5.6	0.15	mg/l	8260B	04/22/10	50
Methyl tert-butyl ether	BDL	0.050	mg/l	8260B	04/22/10	50
Surrogate Recovery						
Toluene-d8	99.7		% Rec.	8260B	04/22/10	50
Dibromofluoromethane	95.3		% Rec.	8260B	04/22/10	50
4-Bromofluorobenzene	107.		% Rec.	8260B	04/22/10	50

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Note:
The reported analytical results relate only to the sample submitted.

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Reported: 04/23/10 16:12 Printed: 04/23/10 16:12
L455308-02 (PH) - 8.0@18.0c

Attachment A
List of Analytes with QC Qualifiers

Sample Number	Work Group	Sample Type	Analyte	Run ID	Qualifier
L455308-01	WG474537	SAMP	pH	R1192368	T8
L455308-02	WG474537	SAMP	pH	R1192368	T8
L455308-03	WG474537	SAMP	pH	R1192368	T8

Attachment B
Explanation of QC Qualifier Codes

Qualifier	Meaning
T8	(ESC) - Additional method/sample information: Sample(s) received past/too close to holding time expiration.

Qualifier Report Information

ESC utilizes sample and result qualifiers as set forth by the EPA Contract Laboratory Program and as required by most certifying bodies including NELAC. In addition to the EPA qualifiers adopted by ESC, we have implemented ESC qualifiers to provide more information pertaining to our analytical results. Each qualifier is designated in the qualifier explanation as either EPA or ESC. Data qualifiers are intended to provide the ESC client with more detailed information concerning the potential bias of reported data. Because of the wide range of constituents and variety of matrices incorporated by most EPA methods,it is common for some compounds to fall outside of established ranges. These exceptions are evaluated and all reported data is valid and useable "unless qualified as 'R' (Rejected)."

Definitions

Accuracy - The relationship of the observed value of a known sample to the true value of a known sample. Represented by percent recovery and relevant to samples such as: control samples, matrix spike recoveries, surrogate recoveries, etc.

Precision - The agreement between a set of samples or between duplicate samples. Relates to how close together the results are and is represented by Relative Percent Differrence.

Surrogate - Organic compounds that are similar in chemical composition, extraction, and chromotography to analytes of interest. The surrogates are used to determine the probable response of the group of analytes that are chemically related to the surrogate compound. Surrogates are added to the sample and carried through all stages of preparation and analyses.

TIC - Tentatively Identified Compound: Compounds detected in samples that are not target compounds, internal standards, system monitoring compounds, or surrogates.

Summary of Remarks For Samples Printed
04/23/10 at 16:12:33

TSR Signing Reports: 151
R2 - Rush: Next Day

Client sends unpreserved vials for all projects; Run BTEXM by 8260 on separate dash. DO NOT RUSH ALK!!!

Sample: L455308-01 Account: CORCOMGCO Received: 04/22/10 09:00 Due Date: 04/23/10 00:00 RPT Date: 04/23/10 16:12

Sample: L455308-02 Account: CORCOMGCO Received: 04/22/10 09:00 Due Date: 04/23/10 00:00 RPT Date: 04/23/10 16:12

Sample: L455308-03 Account: CORCOMGCO Received: 04/22/10 09:00 Due Date: 04/23/10 00:00 RPT Date: 04/23/10 16:12

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Olsson Associates - GJ, CO
Ken Kreie
826 21 1/2 Road

Grand Junction, CO 81505

Quality Assurance Report
Level II

L455308

April 23, 2010

Laboratory Blank

Analyte	Result	Units	% Rec	Limit	Batch	Date Analyzed
pH	5.10	su			WG474537	04/22/10 14:54
Benzene	< .001	mg/l			WG474534	04/22/10 17:09
Ethylbenzene	< .001	mg/l			WG474534	04/22/10 17:09
Methyl tert-butyl ether	< .001	mg/l			WG474534	04/22/10 17:09
Toluene	< .005	mg/l			WG474534	04/22/10 17:09
Total Xylenes	< .003	mg/l			WG474534	04/22/10 17:09
4-Bromofluorobenzene		% Rec.	103.4	75-128	WG474534	04/22/10 17:09
Dibromofluoromethane		% Rec.	101.5	79-125	WG474534	04/22/10 17:09
Toluene-d8		% Rec.	99.94	87-114	WG474534	04/22/10 17:09
Dissolved Solids	< 10	mg/l			WG474466	04/23/10 10:32
Chloride	< 1	mg/l			WG474453	04/22/10 08:23
Sulfate	< 5	mg/l			WG474453	04/22/10 08:23
Specific Conductance	0.850	umhos/cm			WG474602	04/23/10 11:50
Toluene	< .005	mg/l			WG474632	04/23/10 01:09
4-Bromofluorobenzene		% Rec.	107.4	75-128	WG474632	04/23/10 01:09
Dibromofluoromethane		% Rec.	99.56	79-125	WG474632	04/23/10 01:09
Toluene-d8		% Rec.	99.95	87-114	WG474632	04/23/10 01:09

Duplicate

Analyte	Units	Result	Duplicate	RPD	Limit	Ref Samp	Batch
pH	su	7.50	7.40	1.34*	1	L455308-01	WG474537
Dissolved Solids	mg/l	580.	580.	0.516	5	L455316-01	WG474466
Chloride	mg/l	20.0	20.0	2.53	20	L454560-01	WG474453
Sulfate	mg/l	42.0	42.0	0.717	20	L454560-01	WG474453
Specific Conductance	umhos/cm	320.	330.	1.83	20	L455343-01	WG474602
Specific Conductance	umhos/cm	220.	220.	0.950	20	L455349-07	WG474602

Laboratory Control Sample

Analyte	Units	Known Val	Result	% Rec	Limit	Batch
pH	su	6.46	6.40	99.1	97.9-100.8	WG474537
Benzene	mg/l	.025	0.0228	91.3	67-126	WG474534
Ethylbenzene	mg/l	.025	0.0257	103.	76-129	WG474534
Methyl tert-butyl ether	mg/l	.025	0.0231	92.4	51-142	WG474534
Toluene	mg/l	.025	0.0216	86.3	72-122	WG474534
Total Xylenes	mg/l	.075	0.0760	101.	75-128	WG474534
4-Bromofluorobenzene				102.5	75-128	WG474534
Dibromofluoromethane				104.1	79-125	WG474534
Toluene-d8				100.2	87-114	WG474534

* Performance of this Analyte is outside of established criteria.
For additional information, please see Attachment A 'List of Analytes with QC Qualifiers.'

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Ken Kreie
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Grand Junction, CO 81505

Quality Assurance Report
Level II

L455308

April 23, 2010

Analyte	Units	Laboratory Control Sample Known Val	Result	% Rec	Limit	Batch
Dissolved Solids	mg/l	8800	8720	99.1	85-115	WG474466
Chloride	mg/l	40	39.4	98.5	90-110	WG474453
Sulfate	mg/l	40	39.2	98.0	90-110	WG474453
Specific Conductance	umhos/cm	406	410.	101.	85-115	WG474602
Toluene	mg/l	.025	0.0239	95.6	72-122	WG474632
4-Bromofluorobenzene				104.2	75-128	WG474632
Dibromofluoromethane				98.62	79-125	WG474632
Toluene-d8				97.49	87-114	WG474632

Analyte	Units	Laboratory Control Sample Duplicate Result	Ref	%Rec	Limit	RPD	Limit	Batch
pH	su	6.40	6.40	99.0	97.9-100.8	0	20	WG474537
Benzene	mg/l	0.0227	0.0228	91.0	67-126	0.421	20	WG474534
Ethylbenzene	mg/l	0.0252	0.0257	101.	76-129	1.79	20	WG474534
Methyl tert-butyl ether	mg/l	0.0232	0.0231	93.0	51-142	0.338	20	WG474534
Toluene	mg/l	0.0218	0.0216	87.0	72-122	0.868	20	WG474534
Total Xylenes	mg/l	0.0755	0.0760	101.	75-128	0.690	20	WG474534
4-Bromofluorobenzene				101.4	75-128			WG474534
Dibromofluoromethane				101.9	79-125			WG474534
Toluene-d8				99.17	87-114			WG474534
Dissolved Solids	mg/l	8720	8720	99.0	85-115	0	20	WG474466
Chloride	mg/l	39.5	39.4	99.0	90-110	0.253	20	WG474453
Sulfate	mg/l	39.3	39.2	98.0	90-110	0.255	20	WG474453
Specific Conductance	umhos/	410.	410.	101.	85-115	0	20	WG474602
Toluene	mg/l	0.0239	0.0239	95.0	72-122	0.155	20	WG474632
4-Bromofluorobenzene				104.8	75-128			WG474632
Dibromofluoromethane				98.07	79-125			WG474632
Toluene-d8				98.24	87-114			WG474632

Analyte	Units	Matrix Spike MS Res	Ref Res	TV	% Rec	Limit	Ref Samp	Batch
Benzene	mg/l	0.0229	0	.025	91.8	16-158	L454344-01	WG474534
Ethylbenzene	mg/l	0.0254	0	.025	101.	29-150	L454344-01	WG474534
Methyl tert-butyl ether	mg/l	0.0242	0	.025	96.8	24-167	L454344-01	WG474534
Toluene	mg/l	0.0217	0	.025	86.7	22-152	L454344-01	WG474534
Total Xylenes	mg/l	0.0755	0	.075	101.	27-151	L454344-01	WG474534
4-Bromofluorobenzene					100.1	75-128		WG474534
Dibromofluoromethane					102.1	79-125		WG474534
Toluene-d8					98.54	87-114		WG474534

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Analyte	Units	Matrix Spike MS Res	Ref Res	TV	% Rec	Limit	Ref Samp	Batch
Chloride	mg/l	52.4	2.50	50	99.8	80-120	L454480-01	WG474453
Toluene	mg/l	0.0162	0	.025	64.7	22-152	L454188-02	WG474632
4-Bromofluorobenzene					101.6	75-128		WG474632
Dibromofluoromethane					97.67	79-125		WG474632
Toluene-d8					97.81	87-114		WG474632

Analyte	Units	Matrix Spike Duplicate MSD	Ref	%Rec	Limit	RPD	Limit	Ref Samp	Batch
Benzene	mg/l	0.0227	0.0229	90.7	16-158	1.17	21	L454344-01	WG474534
Ethylbenzene	mg/l	0.0249	0.0254	99.6	29-150	1.90	24	L454344-01	WG474534
Methyl tert-butyl ether	mg/l	0.0240	0.0242	96.0	24-167	0.827	22	L454344-01	WG474534
Toluene	mg/l	0.0216	0.0217	86.3	22-152	0.483	22	L454344-01	WG474534
Total Xylenes	mg/l	0.0744	0.0755	99.2	27-151	1.45	23	L454344-01	WG474534
4-Bromofluorobenzene				101.6	75-128				WG474534
Dibromofluoromethane				100.9	79-125				WG474534
Toluene-d8				99.96	87-114				WG474534
Chloride	mg/l	51.7	52.4	98.4	80-120	1.34	20	L454480-01	WG474453
Toluene	mg/l	0.0160	0.0162	63.8	22-152	1.36	22	L454188-02	WG474632
4-Bromofluorobenzene				106.2	75-128				WG474632
Dibromofluoromethane				96.46	79-125				WG474632
Toluene-d8				99.55	87-114				WG474632

Batch number /Run number / Sample number cross reference

WG474537: R1192368: L455308-01 02 03
WG474534: R1192808: L455308-01 02 03
WG474466: R1193148: L455308-01 02 03
WG474453: R1193368: L455308-01 02 03
WG474602: R1193528: L455308-01 02 03
WG474632: R1193870: L455308-02 03

* * Calculations are performed prior to rounding of reported values .
* Performance of this Analyte is outside of established criteria.
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L455308

April 23, 2010

The data package includes a summary of the analytic results of the quality control samples required by the SW-846 or CWA methods. The quality control samples include a method blank, a laboratory control sample, and the matrix spike/matrix spike duplicate analysis. If a target parameter is outside the method limits, every sample that is effected is flagged with the appropriate qualifier in Appendix B of the analytic report.

Method Blank - an aliquot of reagent water carried through the entire analytic process. The method blank results indicate if any possible contamination exposure during the sample handling, digestion or extraction process, and analysis. Concentrations of target analytes above the reporting limit in the method blank are qualified with the "B" qualifier.

Laboratory Control Sample - is a sample of known concentration that is carried through the digestion/extraction and analysis process. The percent recovery, expressed as a percentage of the theoretical concentration, has statistical control limits indicating that the analytic process is "in control". If a target analyte is outside the control limits for the laboratory control sample or any other control sample, the parameter is flagged with a "J4" qualifier for all effected samples.

Matrix Spike and Matrix Spike Duplicate - is two aliquots of an environmental sample that is spiked with known concentrations of target analytes. The percent recovery of the target analytes also has statistical control limits. If any recoveries that are outside the method control limits, the sample that was selected for matrix spike/matrix spike duplicate analysis is flagged with either a "J5" or a "J6". The relative percent difference (%RPD) between the matrix spike and the matrix spike duplicate recoveries is all calculated. If the RPD is above the method limit, the effected samples are flagged with a "J3" qualifier.

Attachment C

Liner Manufacturer Specifications

RUFCO® E-Series E30WBS

Enhanced Grip Surface

PRODUCT DESCRIPTION

Rufco® E-Series E30WBS is a multi-layer, metallocene and linear low density polyethylene geomembrane with an enhanced grip surface on both sides. Fine N110 carbon black (black layer) and high performance U.V. stabilizers (white layer) provide long term protection from thermal oxidation and ultraviolet degradation. A combination of premium linear polyethylenes provide exceptional toughness, multi-axial elongation and impact resistance.

PRODUCT USE

Rufco E30WBS is used in lining and cover applications requiring good outdoor weatherability, toughness and puncture resistance. A lightly textured surface provides enhanced grip for ease of installation and worker safety without the *VELCRO® type adhesion that can make deployment over non-wovens difficult. The products ability to conform to uneven surfaces and resist puncture through multi-axial elongation allows it to be used in a wide variety of applications.

SIZE & PACKAGING

Rufco E30WBS is available in various increments up to 30,000 square foot panels. All panels are accordion folded and tightly rolled on a heavy-duty core for ease of handling and time saving installation.

RAVEN INDUSTRIES

*VELCRO® is a registered trademark of Velcro Industries B.V.

Product	Part Number
Rufco	E30WBS

COMMON APPLICATIONS

- **Containment Liners**
- **Canal Linings**
- **Oilfield Plt Liners**
- **Decorative Ponds**
- **Fish Hatchery Liners**
- **Farm Ponds**
- **Remediation Liners**
- **Brine Ponds**
- **Leachate Collection Ponds**
- **Interim Landfill Covers**
- **Outdoor Covers**

Rufco®

RUFCO® E-Series E30WBS

Enhanced Grip Surface

PROPERTIES	TEST METHOD	TYPICAL AVG	MINIMUM AVG	METRIC AVG	METRIC MIN AVG
APPEARANCE		White/Black	White/Black	White/Black	White/Black
THICKNESS, MIL (NOMINAL)	ASTM D 5199	33 mil	30 mil	0.84 mm	0.76 mm
WEIGHT / AREA		150 lbs/msf	130 lbs/msf	732 g/m²	635 g/m²
TENSILE STRENGTH	ASTM D 6693	130 lbf/in	114 lbf/in	578 N/cm	507 N/cm
TENSILE ELONGATION	ASTM D 6693	800 %	750 %	800 %	750 %
TEAR RESISTANCE	ASTM D 1004	17 lbf	14 lbf	76 N	62 N
PUNCTURE RESISTANCE	ASTM D 4833	60 lbf	46 lbf	267 N	205 N
MULTI-AXIAL TENSION	**ASTM D 5617**	**130 %**	**100 %**	**130 %**	**100 %**
IMPACT RESISTANCE	ASTM D 1709	3600 g	2600 g	3600 g	2600 g
CARBON BLACK (Black Layer)	ASTM D 1603 or ASTM D 4218	2.5 %	2.0 %	2.5 %	2.0 %
MAXIMUM USE TEMPERATURE		180° F	180° F	82° C	82° C
MINIMUM USE TEMPERATURE		-70° F	-70° F	-57° C	-57° C

Rufco E30WBS properties are based on Rufco E30BS (Black) test data and may change as new data is available.

RUFCO E30WBS is a multi-layer membrane consisting of premium metallocene and linear low density polyethylene. Carbon black is added to the black layer and UV additives and thermal stabilizers are added to the white layer to assure outdoor longevity and extended service life. An enhanced grip surface is added to both sides providing for ease of installation and job site safety. RUFCO E30WBS is not a textured geomembrane to be used for slope stabilization.

RAVEN INDUSTRIES

RAVEN INDUSTRIES, INC. / Engineered Films Division
P.O. Box 5107 • Sioux Falls, SD 57117-5107
Ph: (605) 335-0174 • Fx: (605) 331-0333
Toll Free: 800-635-3456

ISO 9001:2000 CERTIFIED MANAGEMENT SYSTEM

www.ravengeo.com

2/09 EFD 1173

WESTERN
ENVIRONMENTAL LINER

High Performance XR-5 8130 Reinforced Geomembrane SPECIFICATION SHEET

XR-5® 8130 Reinforced	Test Method	Standard	Metric
Base Fabric Type **Base Fabric Weight (nominal)**		Polyester 6.5 oz/yd2	Polyester 220 g/m2
Thickness	ASTM D 751	30.0 mils min	0.75 mm min
Weight	ASTM D 751	30.0 ± 2 oz/yd2	1020 ± 70 g/m2
Tear Strength	ASTM D 4533 Trapezoid Tear	35/35 lb min	155/155 N min
Breaking **Yield Strength**	ASTM D 751 Grab Tensile Procedure A	550/550 lb min	2450/2450 N min
Low Temperature	ASTM D 2136 4 hr - 1/8" mandrel	Pass @ -30° F	Pass @ -35° C
Dimensional Stability	ASTM D 1204 212° F - 1 hr	1.5% max each direction	1.5% max each direction
Adhesion **Heat Sealed Seam**	ASTM D 751 Dielectric Weld	35 lb/2 in min	150 N/5 cm min
Dead Load **Seam Shear Strength**	ASTM D 751 4-hour test	2 in seam, 1 in strip 210 lb @ 70° F 105 lb @ 160° F	5 cm seam, 2.5 cm strip 935 N @ 21° C 465 N @ 70° C
Bursting Strength	ASTM D 751 Ball Tip	650 lb min 800 lb typical	2890 N min 3560 N typical
Hydrostatic Resistance	ASTM D 751 Method A	800 psi min	540 N/sq cm min
Blocking Resistance	ASTM D 751 180° F/82° C	#2 Rating max	
Adhesion - Ply	ASTM D 413 Type A	15 lb/in min or Film Tearing Bond	65 N/2.5 cm min or Film Tearing Bond
Bonded Seam Strength	ASTM D 751 Grab Test Method Procedure A	550 lb min	2450 N min
Abrasion Resistance	ASTM D 3389 H-18 Wheel 1000 g Load	2000 cycles (min) before fabric exposure 50 mg/100 cycles max weight loss	
Weathering **Resistance**	ASTM G153 (Carbon-Arc)	8000 hrs (min)-No appreciable changes or stiffening or cracking of coating	
Water Absorption	ASTM D 471 Section 12 7 Days	0.025 kg/m2 max @ 70° F/21° C 0.14 kg/m2 max @ 212° F/100° C	
Wicking	ASTM D 751	1/8 in max	0.3 cm max
Puncture Resistance	ASTM D 4833	250 lb min	110 N min
Coefficient Of Thermal **Expansion/Contraction**	ASTM D 696	8 x 10-6 in/in/°F max	1.4 x 10-5 cm/cm/°C max

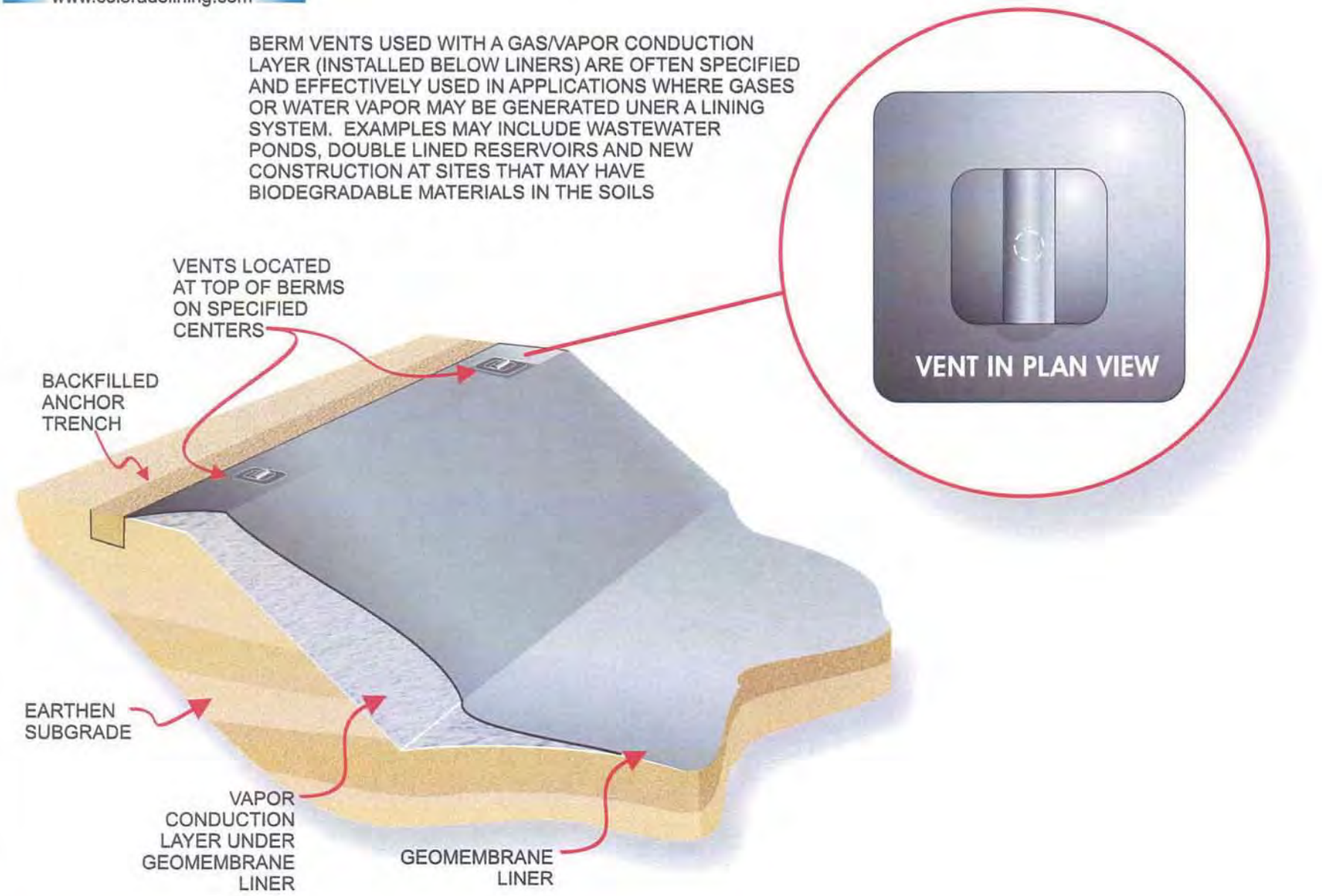
Seaming: Thermal welding methods are recommended. No glues or solvents are suggested.

COLORADO LINING INTERNATIONAL

www.coloradolining.com

BERM VENTS FOR REINFORCED MEMBRANE LINER SYSTEMS

BERM VENTS USED WITH A GAS/VAPOR CONDUCTION LAYER (INSTALLED BELOW LINERS) ARE OFTEN SPECIFIED AND EFFECTIVELY USED IN APPLICATIONS WHERE GASES OR WATER VAPOR MAY BE GENERATED UNER A LINING SYSTEM. EXAMPLES MAY INCLUDE WASTEWATER PONDS, DOUBLE LINED RESERVOIRS AND NEW CONSTRUCTION AT SITES THAT MAY HAVE BIODEGRADABLE MATERIALS IN THE SOILS



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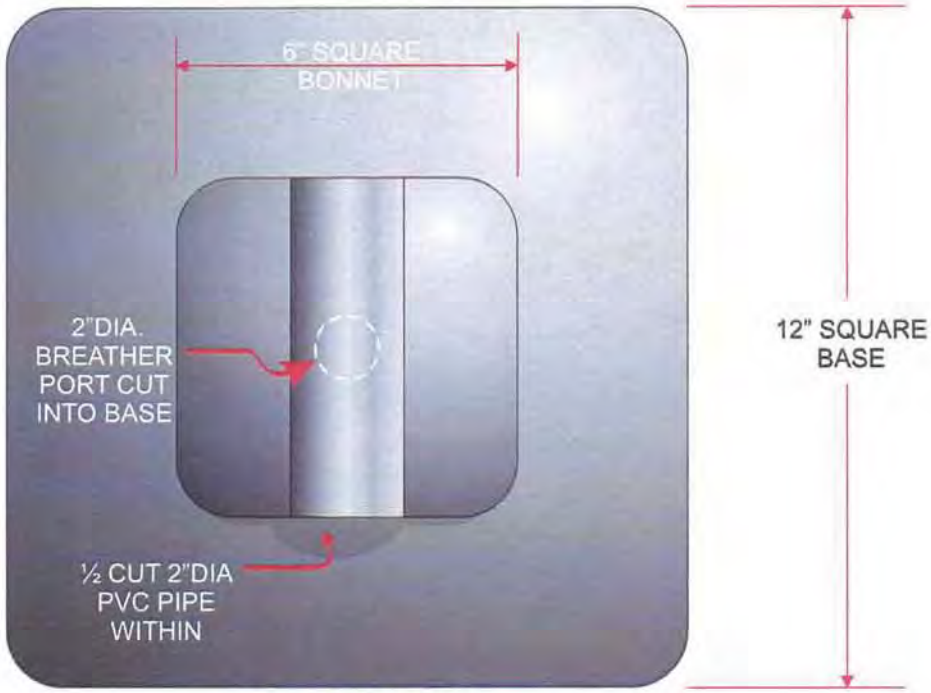
BERM VENT DETAIL FOR REINFORCED MEMBRANE LINER SYSTEMS



PLAN VIEW

SECTION VIEW

(INSTALLED)

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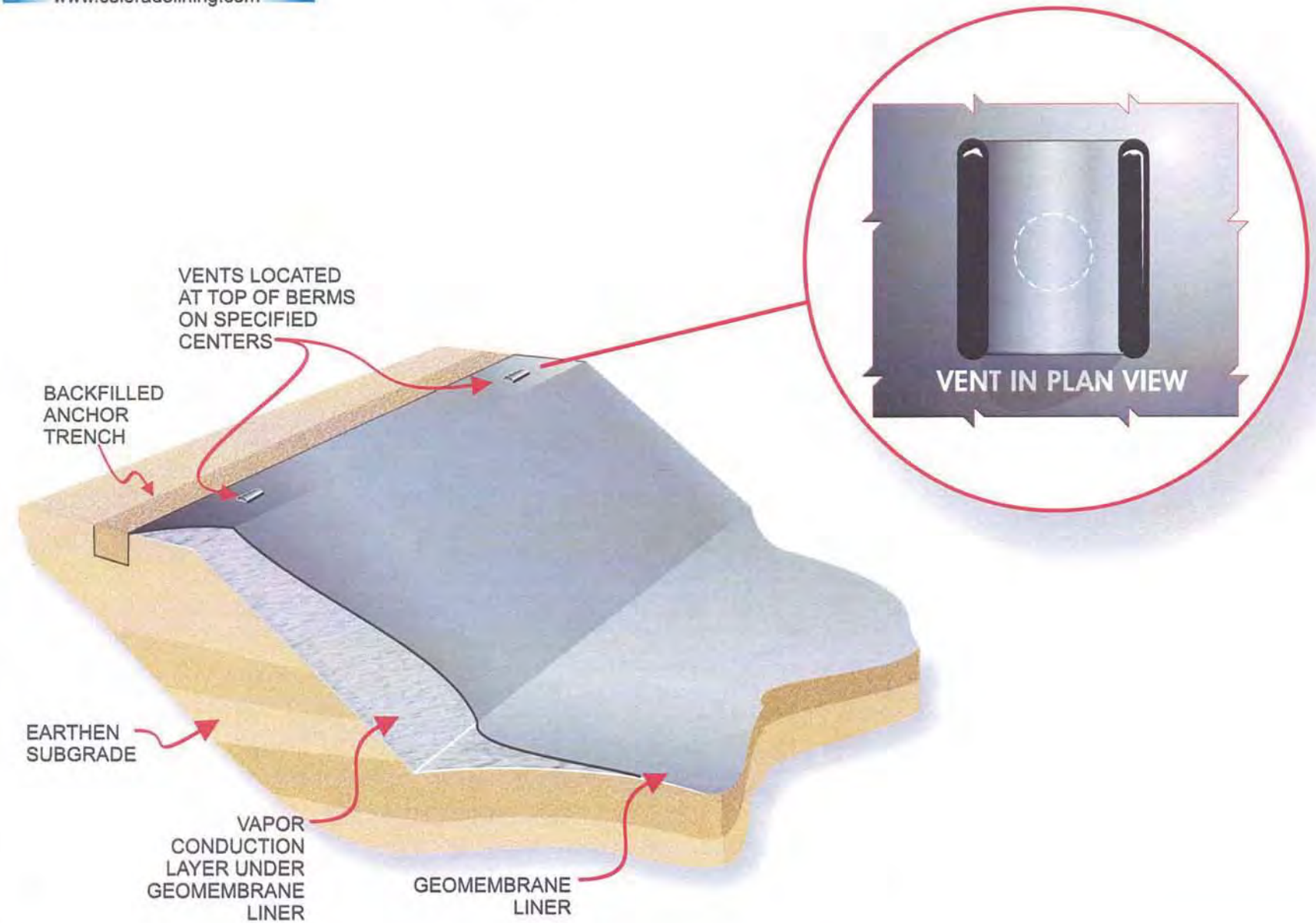
BERM VENTS FOR POLYETHYLENE MEMBRANE LINER SYSTEMS



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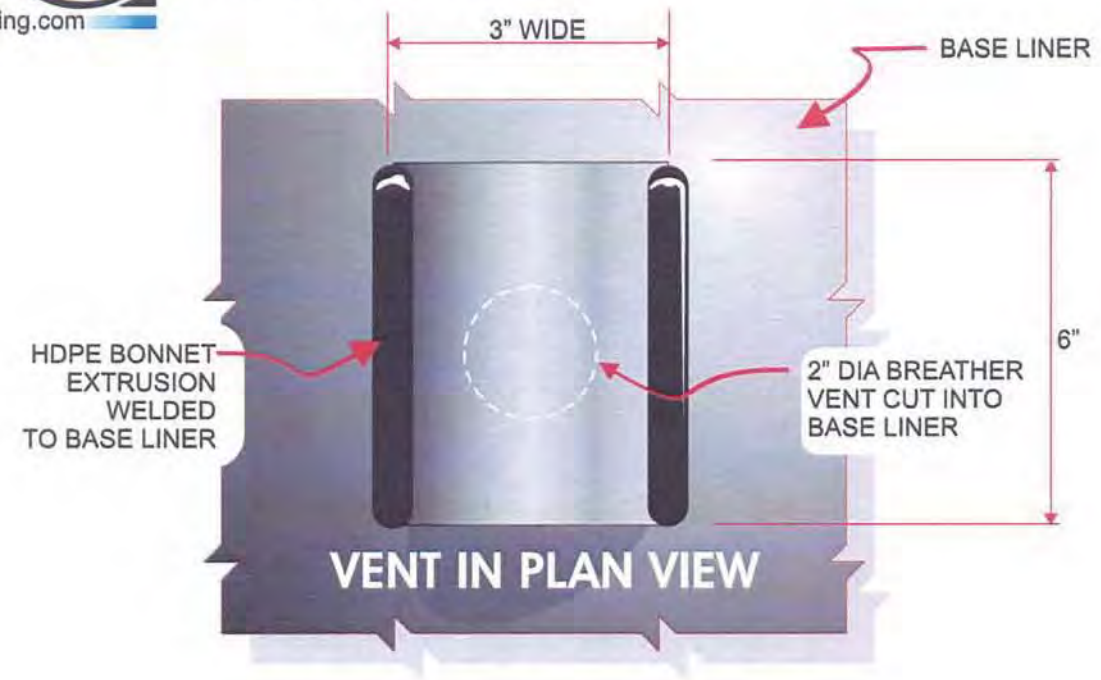
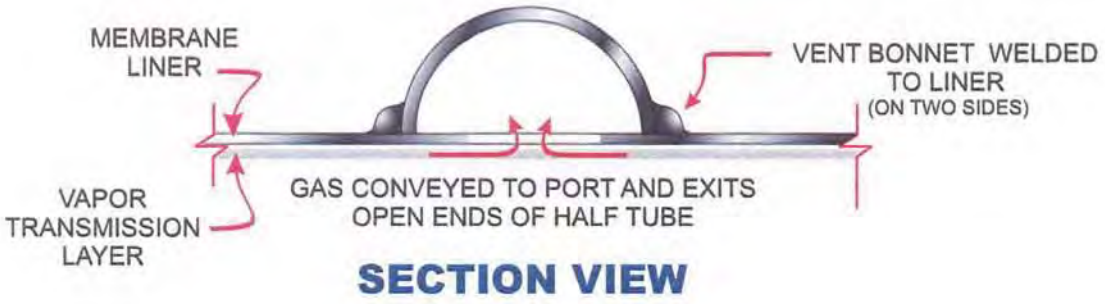
BERM VENTS FOR POLYETHYLENE MEMBRANE LINER SYSTEMS

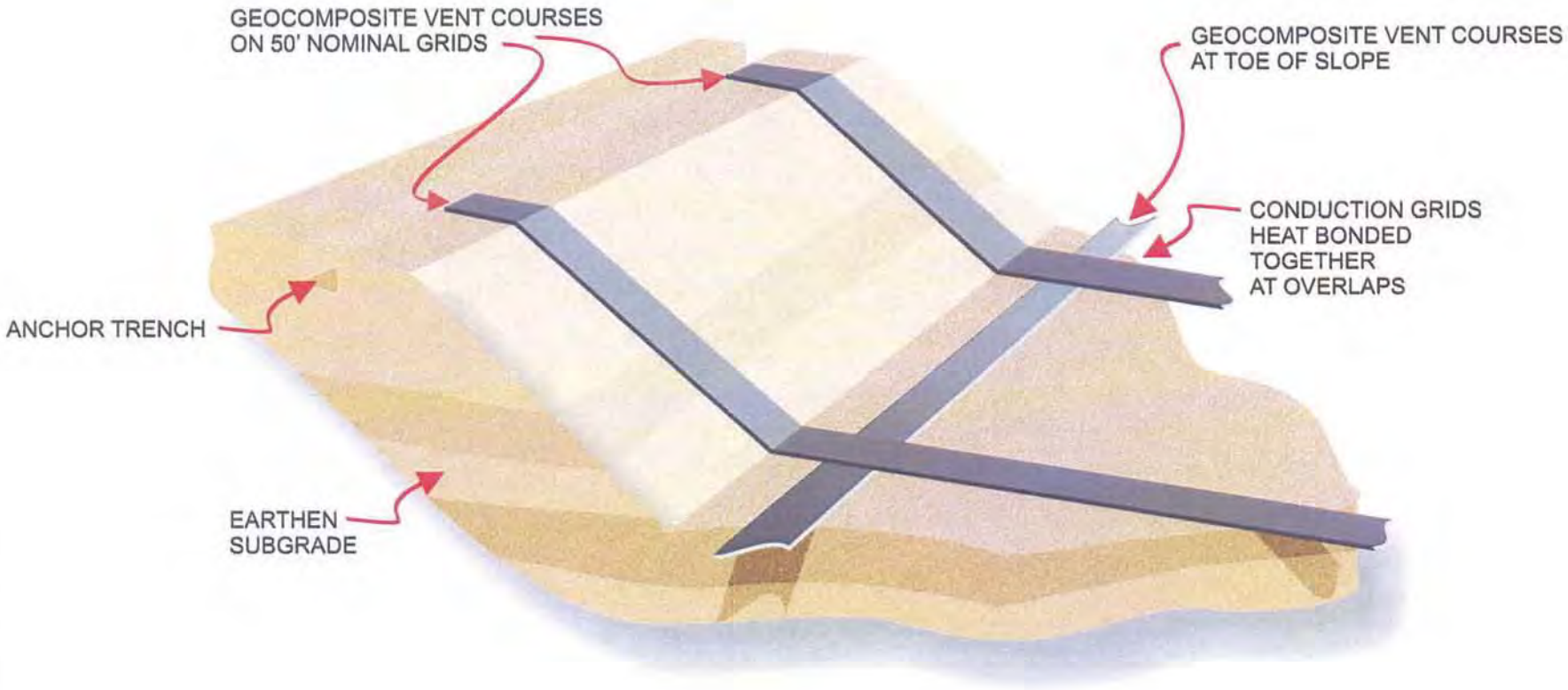




COLORADO LINING INTERNATIONAL
www.coloradolining.com

GEOCOMPOSITE GAS VENTILATION GRID SYSTEM

AS AN ALTERNATIVE TO A COMPLETE GROUND COVER CONDUCTION LAYER SYSTEM, 3' NOMINAL WIDTH GEOCOMPOSITE VENT COURSES ON 50' NOMINAL CENTER GRIDS CAN BE INSTALLED FOR GAS/VAPOR CONDUCTION TO BERM VENTS. TYPICALLY A DOUBLE SIDED GEOCOMPOSITE (GEOTEXTILE LAMINATED ON EITHER SIDE OF A CONDUCTION GRID) IS USED.



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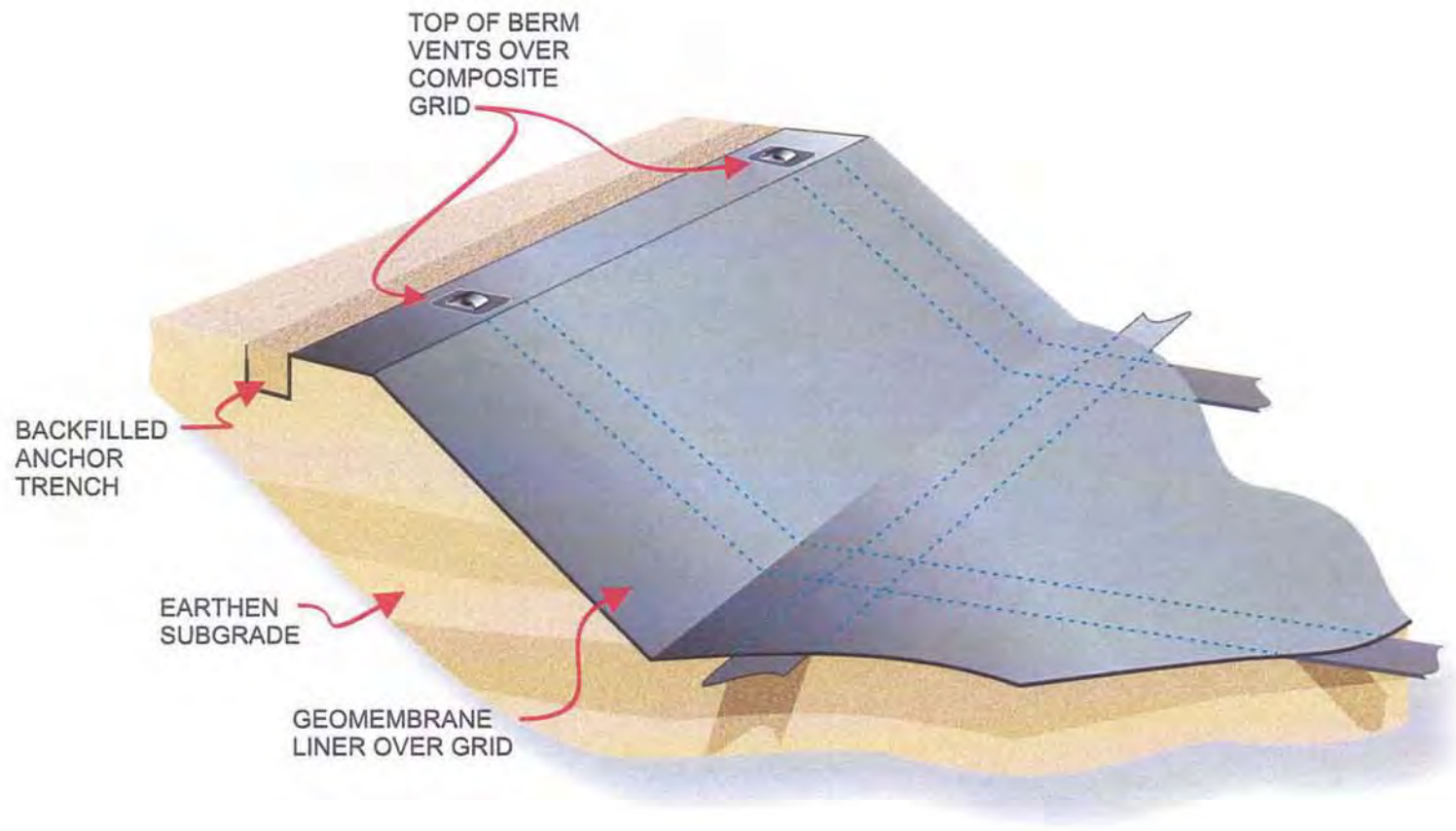
FINISHED GEOCOMPOSITE GAS VENTILATION GRID SYSTEM WITH GEOMEMBRANE LINER SYSTEM AND BERM VENTS



Technical Data and Specifications for

XR® Geomembranes

XR-3®
XR-5®
XR-3® PW

Industrial, Municipal and Potable Water Grade Geomembranes

Seaman Corporation
1000 Venture Blvd.
Wooster, Ohio 44691
(330) 262-1111
www.xr-5.com

Seaman Corp. XR Geomembranes

Section 1 - Product Overview/Applications

- All XR Geomembrane products are classified as an Ethylene Interpolymer Alloy (EIA)
- XR-5 grade is high strength and chemically resistant for maximum resistance to high temperature, and broad chemical resistance, including acids, oils and methane
- XR-3 grade for moderate chemical resistant requirement applications such as stormwater and domestic wastewater
- NSF 61 approved XR-3 PW grade for potable water contact
- Heat weldable-thermal weldable for seams as strong as the membrane. Factory panels over 15,000 square feet (1400 sq meters) for less field seaming
- Stability is excellent, with low thermal expansion-contraction properties
- 30+ year application history

Product Application Chart

	XR-5			XR-3	XR-3 PW
	8130	**8138**	**6730**	**8228**	**8130**
High Puncture Resistance	X	X	X		X
UV Resistance	X	X	X	X	X
High Strength Applications	X	X	X		X
Floating Covers (Nonpotable)	X	X	X	X	
Diesel/Jet Fuel Containment	X	X	X		
Industrial Wastewater	X	X	X		
Stormwater	X	X	X	X	
Municipal/Domestic Wastewater	X	X	X	X	
Floating Diversion Baffles/Curtains	X		X		X
Potable Water					X
<-65 Deg F Applications	Contact Seaman Corp.				
Chemically Resistant Applications	X	X	X		

Section 2 - Physical Properties

Part 1- Material Specifications

Property	Test Method	8130 XR-5	8138 XR-5	6730 XR-5
Base Fabric Type Base Fabric Weight	ASTM D 751	Polyester 6.5 oz/yd² nominal (220 g/m² nominal)	Polyester 6.5 oz/yd² nominal (220 g/m² nominal)	Polyester 7 oz/yd² nominal (235 g/m² nominal)
Thickness	ASTM D 751	30 mils min. (0.76 mm min.)	40 mils nom. (1.0 mm nom.)	30 mils min. (0.76 mm min.)
Weight	ASTM D 751	30.0 +- 2 oz/sq yd (1017 +- 2 g/m²)	38.0 +- 2 oz/sq yd (1288 +- 70 g/m²)	30.0 +- 2 oz/sq yd (1017 +- 70 g/m²)
Tear Strength	ASTM D 751 Trap Tear	40/55 lbs. min. (175/245 N min.)	40/55 lbs. min. (175/245 N min.)	
Breaking Yield Strength	ASTM D 751 Grab Tensile	550/550 lbs. min. (2,447/2,447 N min.)	550/550 lbs. min. (2,447/2,447 N min.)	600/550 lbs. min. (2,670/2,447 N min.)
Low Temperature Resistance	ASTM D 2136 4 hrs-1/8" Mandrel	Pass @ -30° F Pass @ -35° C	Pass @ -30° F Pass @ -35° C	Pass @ -30° F Pass @ -35° C
Dimensional Stability	ASTM D 1204 100° C-1 Hr.	0.5% max. each direction	0.5% max. each direction	0.5% max. each direction
Hydrostatic Resistance	ASTM D 751 Procedure A	800 psi min. (5.51 MPa min.)	800 psi min. (5.51 MPa min.)	800 psi min. (5.51 MPa min.)
Blocking Resistance	ASTM D 751 180° F	#2 Rating max.	#2 Rating max.	#2 Rating max.
Adhesion-Ply	ASTM D 413 Type A	15 lbs./in. min. or film tearing bond (13 daN/5 cm min. or FTB)	15 lbs./in. min. or film tearing bond (13 daN/5 cm min. or FTB)	15 lbs./in. min. or film tearing bond (13 daN/5 cm min. or FTB)
Adhesion (minimum) Heat Welded Seam	ASTM D 751 Dielectric Weld	40 lbs./2in. RF weld min. (17.5 daN/5 cm min.)	40 lbs./2in. RF weld min. (17.5 daN/5 cm min.)	15 lbs./in. RF weld min. (15 daN/5 cm min.)
Dead Load Seam Strength	ASTM D 751, 4-Hour Test	Pass 220 lbs/in @ 70° F (Pass 980 N/2.54 cm @ 21° C) Pass 120 lbs/in @ 160° F (Pass 534 N/2.54 cm @ 70° C)	Pass 220 lbs/in @ 70° F (Pass 980 N/2.54 cm @ 21° C) Pass 120 lbs/in @ 160° F (Pass 534 N/2.54 cm @ 70° C)	
Bonded Seam Strength	ASTM D 751 Procedure A, Grab Test Method	550 lbs. min. (2,450 N min.)	550 lbs. min. (2,450 N min.)	550 lbs. min. (2,560 N min.)

Abrasion Resistance	ASTM D 3389 H-18 Wheel 1 kg Load	2,000 cycles min. before fabric exposure, 50 mg/100 cycles max. weight loss	2,000 cycles min. before fabric exposure, 50 mg/100 cycles max. weight loss	2,000 cycles min. before fabric exposure, 50 mg/100 cycles max. weight loss
Weathering Resistance	Carbon-Arc ASTM G 153	8,000 hours min. with no appreciable changes or stiffening or cracking of coating	8000 hours min. with no appreciable change or stiffening or cracking of coating	8000 hours min. with no appreciable change or stiffening or cracking of coating
Water Absorption	ASTM D 471, Section 12 7 Days	0.025 kg/m² max. @70° F/21° C 0.14 kg/m² max at 212° F/100° C	0.025 kg/m² max. @70° F/21° C 0.14 kg/m² max at 212° F/100° C	0.025 kg/m² max. @70° F/21° C 0.14 kg/m² max at 212° F/100° C
Wicking	ASTM D 751	1/8" max (0.3 cm max)	1/8" max. (0.3 cm max.)	1/8" max. (0.3 cm max.)
Bursting Strength	ASTM D 751 Ball Tip	750 lbs. min. (3,330 N min.)	750 lbs. min. (3,330 N min.)	750 lbs. min. (3,330 N min.)
Puncture Resistance	ASTM D 4833	275 lbs. min. 1,200 N min.	275 lbs. min. 1,200 N min.	275 lbs. min. 1,200 N min.
Coefficient of Thermal Expansion/ Contraction	ASTM D 696	8 x 10^{-6} in/in/° F max. (1.4 x 10^{-5} cm/cm/° C max.)	8 x 10^{-6} in/in/° F max. (1.4 x 10^{-5} cm/cm/° C max.)	8 x 10^{-6} in/in/° F max. (1.4 x 10^{-5} cm/cm/° C max.)
Environmental/Chemical Resistant Properties		See Chemical Resistance Table, Page 8	See Chemical Resistance Table, Page 8	See Chemical Resistance Table, Page 8
Puncture Resistance	FED-STD-101C Method 2031	350 lbs. (approx.)	350 lbs. (approx.)	
Cold Crack	ASTM D 2136 4 Hrs, 1/8" Mandrel	Pass at -30° F/-34° C	Pass @ -30° F/-34° C	Pass @ -30° F/-34° C

Section 2 - Physical Properties

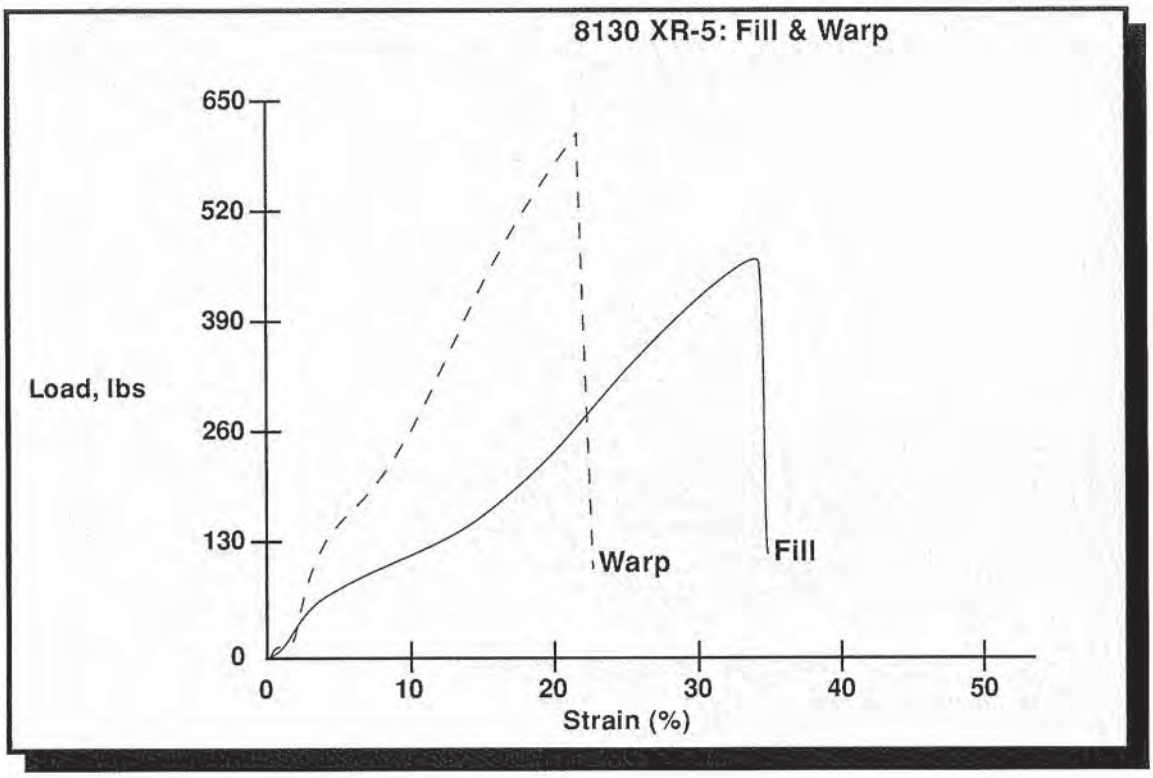
Part 1- Material Specifications (cont.)

Property	Test Method	8130 XR-3 PW	8228 XR-3
Base Fabric Type Base Fabric Weight	ASTM D 751	Polyester 6.5 oz/yd² nominal (220 g/m² nominal)	Polyester 3.0 oz/yd² nominal (100 g/m² nominal)
Thickness	ASTM D 751	30 mils min. (0.76 mm min.)	30 mils min. (0.76 mm min.)
Weight	ASTM D 751	30.0 +- 2 oz./sq. yd. (1017 +- 70 g/sq. m)	28.0 +- 2 oz./sq. yd. (950 +- 70 g/sq. m)
Tear Strength	ASTM D 751 Trap Tear	40/55 lbs. min. (175/245 N min.)	30/30 lbs. nom. (133/133 N nom.)
Breaking Yield Strength	ASTM D 751 Grab Tensile	550/550 lbs. min. (2,447/2447 N min.)	250/200 lbs. min. (1,110/890 N min.)
Low Temperature Resistance	ASTM D 2136 4hrs-1/8" Mandrel	Pass @ -30° F (Pass @ -35° C)	Pass @ -25° F (Pass @ -32° C)
Dimensional Stability	ASTM D 1204 100° C-1 hr.	0.5% max. each direction	5% max. each direction
Hydrostatic Resistance	ASTM D 751 Method A	800 psi min. (5.51 MPa min.)	300 psi min. (2.07 MPa min.)
Blocking Resistance	ASTM D 751 180° F	#2 Rating max.	#2 Rating max.
Adhesion-Ply	ASTM D 413 Type A	15 lbs./in. min. or film tearing bond (13 daN/5 cm min. or FTB)	12 lbs./in. (approx.) (10 daN/5 cm approx.)
Adhesion-Heat Welded Seam	ASTM D 751 Dielectrc Weld	40 lbs./2in. min. (17.5 daN/5 cm min.)	10 lbs./in min. (9 daN/5 cm min.)
Dead Load Seam Strength	ASTM D 751, 4-Hour Test	Pass 220 lbs/in. @ 70° F (Pass 980 N/2.54 cm @ 21° C) Pass 120 lbs/in. @ 160° F (Pass 534 N/2.54 cm @ 70° C)	Pass 100 lbs/in @ 70° F (Pass 445 N @ 21° C) Pass 50 lb @ 160° F (Pass 220 N @ 70° C)
Bonded Seam Strength	ASTM D 751 Procedure A, Grab Test Method	550 lbs. min. (2,450 N min.)	250 lbs. (approx.) (1,112 N min.)

Abrasion Resistance	ASTM D 3389 H-18 Wheel 1 kg Load	2000 cycles min. before fabric exposure, 50 mg/100 cycles max. weight loss	2000 cycles min.
Weathering Resistance	ASTM G 153	8000 hours min. with no appreciable change or stiffening or cracking of coating	8000 hours min.
Water Absorption	ASTM D 471, Section 12 7 Days	0.025 kg/m² max. @ 70° F/21° C 0.14 kg/m² max @ 212° F/100° C	0.05 kg/m² max. @ 70° F/21° C (approx.) 0.28 kg/m² max. @ 212° F/100° C (approx.)
Wicking	ASTM D 751	1/8" max. (0.3 cm max.)	1/8" max (0.3 cm max.)
Bursting Strength	ASTM D 751 Ball Tip	750 lbs. min. (3330 N min.)	350 lbs. (approx.) (1557 N min.)
Puncture Resistance	ASTM D 4833	275 lbs. min. 1200 N min.	50 lb typ. (225 N typ.)
Coefficient of Thermal Expansion/ Contraction	ASTM D 696	8 x 10^{-6} in/in/° F max. (1.4 x 10^{-5} cm/cm/° C max.)	8 x 10^{-6} in/in/° F max. (approx.) (1.4 x 10^{-5} cm/cm/° C max. approx.)
Environmental/Chemical Resistant Properties	ASTM D 741 7-Day Total Immersion With Exposed Edges	NSF 61 approved for potable water	Crude oil 5% max. weight gain Diesel fuel 5% max. weight gain
Puncture Resistance	FTMS 101C Method 2031	350 lbs. (approx.)	205 lbs. (approx.)
Tongue Tear	ASTM D 751		50 lbs. (approx.)

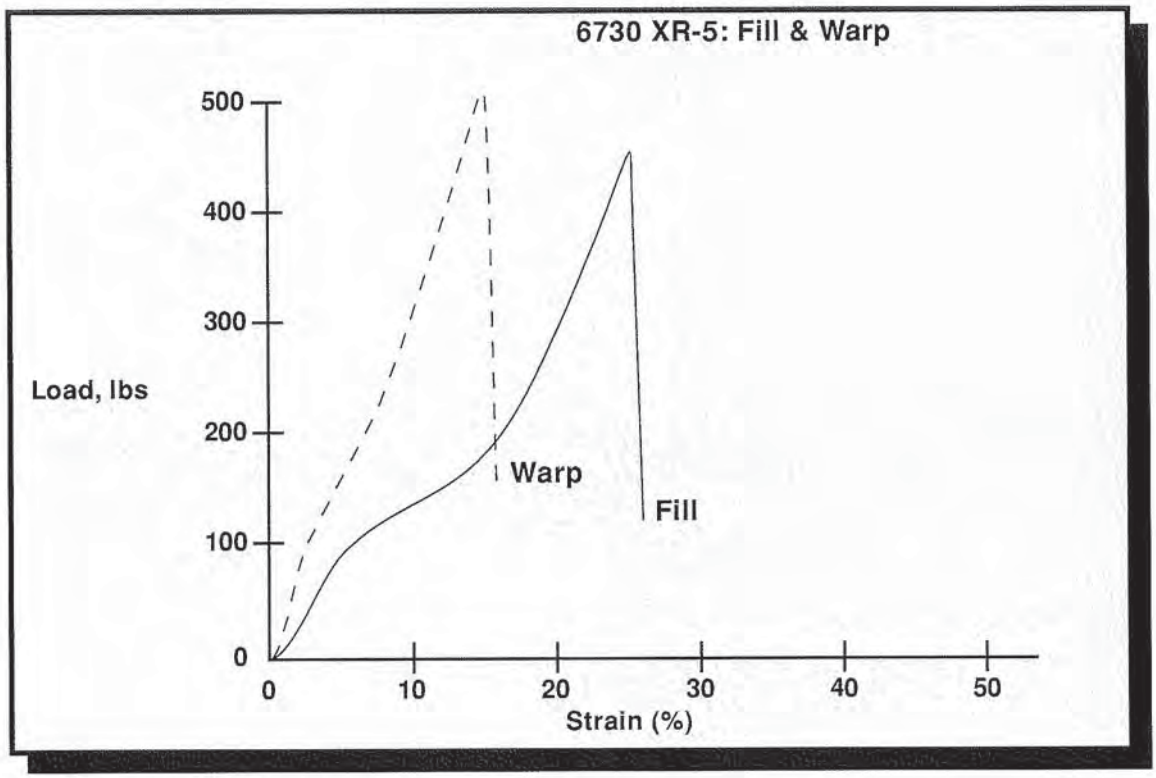
Part 2 - Elongation Properties Test

8130 XR-5



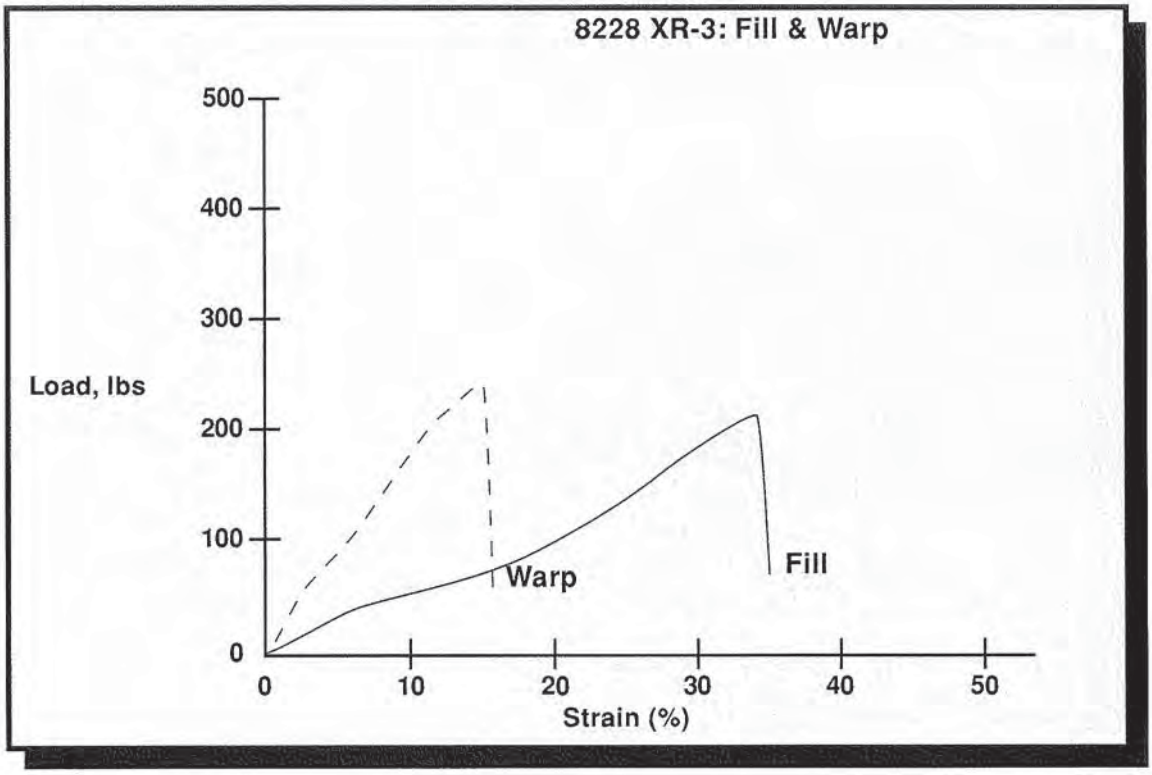
Part 2 - Elongation Properties Test

6730 XR-5



Part 2 - Elongation Properties Test

8228 XR-3



Section 3 - Chemical/Environmental Resistance

Part 1 - XR-5® Fluid Resistance Guidelines

The data below is the result of laboratory tests and is intended to serve only as a guide. No performance warranty is intended or implied. The degree of chemical attack on any material is governed by the conditions under which it is exposed. Exposure time, temperature, and size of the area of exposure usually varies considerably in application, therefore, this table is given and accepted at the user's risk. Confirmation of the validity and suitability in specific cases should be obtained. Contact a Seaman Corporation Representative for recommendation on specific applications.

When considering XR-5 for specific applications, it is suggested that a sample be tested in actual service before specification. Where impractical, tests should be devised which simulate actual service conditions as closely as possible.

EXPOSURE	RATING	EXPOSURE	RATING
AFFF	A	JP-4 Jet Fuel	A
Acetic Acid (5%)	B	JP-5 Jet Fuel	A
Acetic Acid (50%)	C	JP-8 Jet Fuel	A
Ammonium Phosphate	T	Kerosene	A
Ammonium Sulfate	T	Magnesium Chloride	T
Antifreeze (Ethylene Glycol)	A	Magnesium Hydroxide	T
Animal Oil	A	Methanol	A
Aqua Regia	X	Methyl Alcohol	A
ASTM Fuel A (100% Iso-Octane)	A	Methyl Ethyl Ketone	X
ASTM Oil #2 (Flash Pt. 240° C)	A	Mineral Spirits	A
ASTM Oil #3	A	Naphtha	A
Benzene	X	Nitric Acid (5%)	B
Calcium Chloride Solutions	T	Nitric Acid (50%)	C
Calcium Hydroxide	T	Perchloroethylene	C
20% Chlorine Solution	A	Phenol	X
Clorox	A	Phenol Formaldehyde	B
Conc. Ammonium Hydroxide	A	Phosphoric Acid (50%)	A
Corn Oil	A	Phosphoric Acid (100%)	C
Crude Oil	A	Phthalate Plasticizer	C
Diesel Fuel	A	Potassium Chloride	T
Ethanol	A	Potassium Sulphate	T
Ethyl Acetate	C	Raw Linseed Oil	A
Ethyl Alcohol	A	SAE-30 Oil	A
Fertilizer Solution	A	Salt Water (25%)	B
#2 Fuel Oil	A	Sea Water	A
#6 Fuel Oil	A	Sodium Acetate Solution	T
Furfural	X	Sodium Bisulfite Solution	T
Gasoline	B	Sodium Hydroxide (60%)	A
Glycerin	A	Sodium Phosphate	T
Hydraulic Fluid- Petroleum Based	A	Sulphuric Acid (50%)	A
Hydraulic Fluid- Phosphate Ester Based	C	Tanic Acid (50%)	A
Hydrocarbon Type II (40% Aromatic)	C	Toluene	C
Hydrochloric Acid (50%)	A	Transformer Oil	A
Hydrofluoric Acid (5%)	A	Turpentine	A
Hydrofluoric Acid (50%)	A	Urea Formaldehyde	A
Hydrofluosilicic Acid (30%)	A	UAN	A
Isopropyl Alcohol	T	Vegetable Oil	A
Ivory Soap	A	Water (200°F)	A
Jet A	A	Xylene	X
		Zinc Chloride	T

Ratings are based on visual and physical examination of samples after removal from the test chemical after the samples of Black XR-5 were immersed for 28 days at room temperature. Results represent ability of material to retain its performance properties when in contact with the indicated chemical.

Rating Key:

A – Fluid has little or no effect
B – Fluid has minor to moderate effect
C – Fluid has severe effect
T – No data - likely to be acceptable
X – No data - not likely to be acceptable

Vapor Transmission Data

Tested according to ASTM D814-55 Inverted Cup Method

Perhaps a more meaningful test is determination of the diffusion rate of the liquid through the membrane. The vapor transmission rate of Style 8130 XR-5® to various chemicals was determined by the ASTM D814-55 inverted cup method. All tests were run at room temperature and results are shown in the table.

Chemical	8130 XR-5 Black g/hr/m2
Water	0.11
#2 Diesel Fuel	0.03
Jet A	0.11
Kerosene	0.15
Hi-Test Gas	1.78
Ohio Crude Oil	0.03
Low-Test Gas	5.25
Raw Linseed Oil	0.01
Ethyl Alcohol	0.23
Naphtha	0.33
Perchlorethylene	38.58
Hydraulic Fluid	0.006
100% Phosphoric Acid	7.78
50% Phosphoric Acid	0.43
Ethanol (E-96)	0.65
Transformer Oil	0.005
Isopropyl Alcohol	0.44
JP4 (E-96)	0.81
JP8 (E-96)	0.42
Fuel B (E-96)	6.28
Fuel C (E-96)	7.87

Note: The tabulated values are measured Vapor Transmission Rates (VTR). Normal soil testing methods to determine permeability are impractical for synthetic membranes. An "equivalent hydraulic" permeability coefficient can be calculated but is not a direct units conversion. Contact Seaman Corporation for additional technical information.

Seam Strength

Style 8130 XR-5 Black Seam Strength After Immersion

Two pieces of Style 8130 were heat sealed together (seam width 1 inch overlap) and formed into a bag. Various oils and chemicals were placed in the bags so that the seam area was entirely covered. After 28 days at room temperature, the chemicals were removed and one inch strips were cut across the seam and the breaking strength immediately determined. Results are listed below.

Chemical	Seam Strength
None	340 Lbs. Fabric Break- No Seam Failure
Kerosene	355 Lbs. Fabric Break- No Seam Failure
Ohio Crude Oil	320 Lbs. Fabric Break- No Seam Failure
Hydraulic Fluid- Petroleum Based	385 Lbs. Fabric Break- No Seam Failure
Toluene	0 Lbs. Adhesion Failure
Naphtha	380 Lbs. Fabric Break- No Seam Failure
Perchloroethylene	390 Lbs. Fabric Break- No Seam Failure

Even though 1-inch overlap seams are used in the tests to study the accelerated effects, it is recommended that XR-5 be used with a 2-inch nominal overlap seam in actual application. In some cases where temperatures exceed 160°F and the application demands extremely high seam load, it may be necessary to use a wider width seam.

Long Term Seam Adhesion

11 Years Immersion
ASTM D 751
Lbs./In.

Seam samples of 8130 XR-5® were dielectrically welded together and totally immersed in the liquids for 11 years. The samples were taken out, dried for 24 hours and visually observed for any signs of swelling, cracking, stiffening or degradation of the coating. The coating showed no appreciable degradation and no stiffening, swelling, cracking or peeling.

The adhesion, or resistance to separation of the coating from the base cloth, was then measured by ASTM D 751. Results show 8130 XR-5 maintains seam strength over this long period (11 years).

	Control	Crude Oil	JP-4 Jet Fuel	Diesel Fuel	Kerosene	Naphtha
8130 XR-5	20+	18	33	25	40	33*

Values in lbs./in.

*The naphtha sample was sticky.

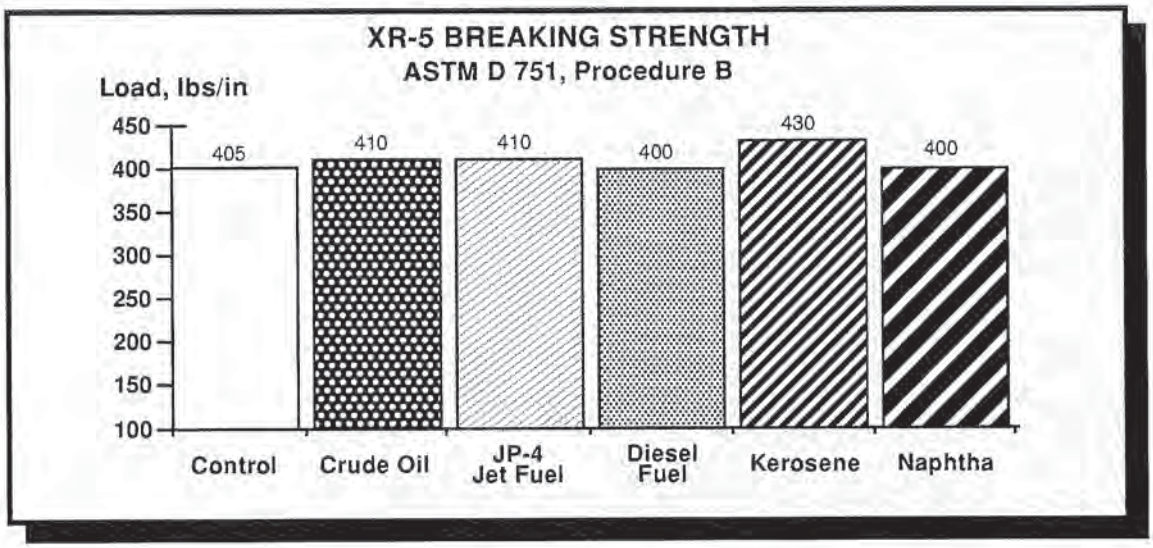
Fuel Compatibility - Long Term Immersion

Test: Samples of 8130 XR-5® Black were immersed in Diesel Fuel, JP-4 Jet Fuel, Crude Oil, Kerosene, and Naphtha for 6 1/2 years.

The samples were then taken out of the test chemicals, blotted and dried for 24 hours. The samples were observed for blistering, swelling, stiffening, cracking or delamination of the coating from the fiber.

Results: It was found in all cases that the 8130 XR-5, after immersion for six years, maintained its strength and there was no evidence of blistering, swelling, stiffening, cracking or delamination.

The strip tensile strength, or breaking strength, of the samples was measured after six years of immersion and the following are the results.



XR-3 Chemical Resistance Statement (Summary)

XR-3® is recommended for moderate chemical resistant applications such as stormwater and municipal wastewater and is not recommended for prolonged contact with pure solutions. XR-3 PW® membranes are recommended only for contact with drinking water and are resistant to low levels of chlorine found in drinking water. XR-5 has a broad range of chemical resistance which is detailed in this section.

Part 2: XR-5® Comparative Chemical Resistance

Chemical Resistance Chart
Comparative Chemical Resistance

	XR-5	HDPE	PVC	Hypalon	Polypropylene
Kerosene	A	B	C	C	C
Diesel Fuel	A	A	C	C	C
Acids (General)	A	A	A	B	A
Naphtha	A	A	C	B	C
Jet Fuels	A	A	C	B	C
Saltwater, 160° F	A	A	C	B	A
Crude Oil	A	B	C	B	C
Gasoline	B	B	C	C	C

A= Excellent B= Moderate C= Poor

Source: Manufacturer's Literature

XR-5 data based on conditions detailed in Section 3, Part 1.

Part 3: Weathering Resistance

Accelerated Weathering Test

XR-5 has been tested in the carbon arc weatherometer for over 10,000 hours of exposure and in the Xenon weatherometer for over 12,000 hours of exposure. The sample showed no loss in flexibility and no significant color change. Based on field experience of Seaman Corporation products and similar weatherometer exposure tests, XR-5 should have an outdoor weathering life significantly longer than competitive geomembranes, particularly in tropical or subtropical applications.

EMMAQUA Testing: ASTM E-838-81 was performed on a modified form of XR-5, FiberTite, used in the single-ply roofing industry. After 3 million Langleys in Arizona, no signs of degradation were noted with no evidence of cracking, blistering, swelling or adhesion delamination failure of the coating.

Natural Exposure

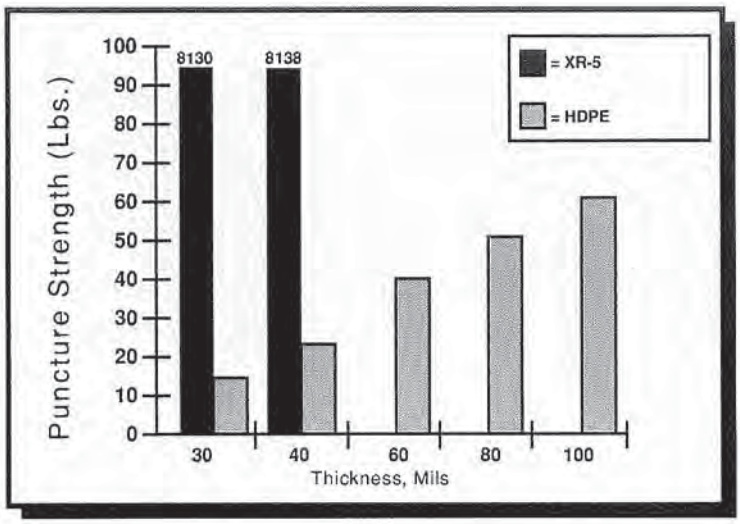
After over 17 years as a holding basin at a large oil company in the Texas desert, XR-5 showed no signs of environmental stress cracking, thermal expansion/contraction, or low yield strength problems. Temperature ranges from near zero to over 100° F.

In service approximately 17 years in a solar pond application at a research facility in Ohio, UV exposed samples, as well as immersed samples, retained over 90% of the tensile strength. Examination of the material determined there was little effect on the coating compound. The solar pond was exposed to temperatures from below zero to over 100° F.

XR5 was exposed for 12½ years in Sarasota, Florida, on a weathering rack, facing the southern direction at 45°. No significant color loss, cracking, crazing, blistering, or adhesion delamination failure of the coating was noted.

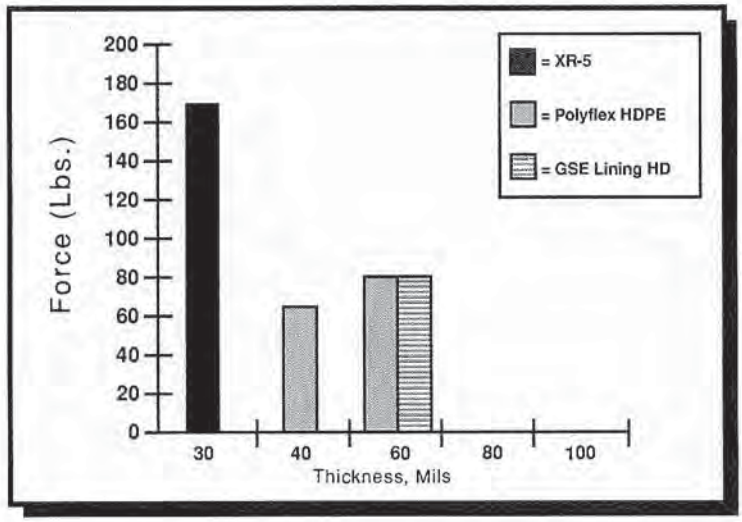
Section 4 - Comparative Physical Properties

XR-5/HDPE Comparative Properties

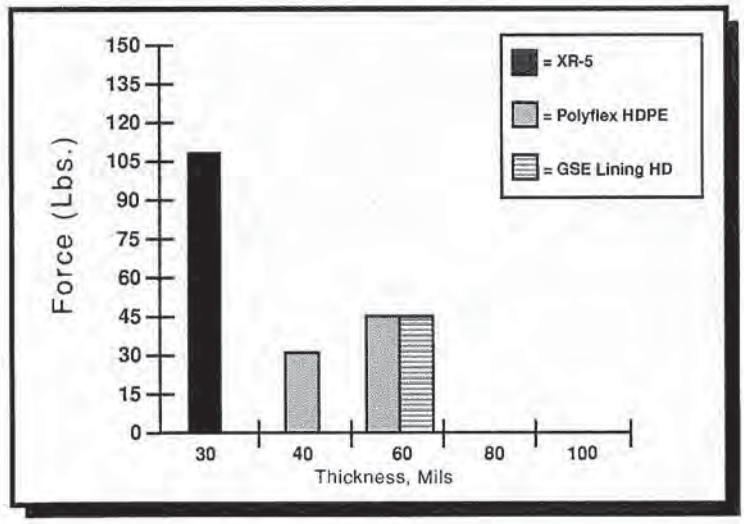


Puncture Resistance

1. ASTM D 751, Screwdriver Tip, 45° Angle (Room Temperature) Puncture Resistance, XR5 vs. HDPE



2. FED-STD-101C Method 2065 (Room Temperature)*



3. FED-STD-101C Method 2065 (70°C)*

* Data provided by E.I. DuPont de Nemours & Co. Wilmington, Delaware

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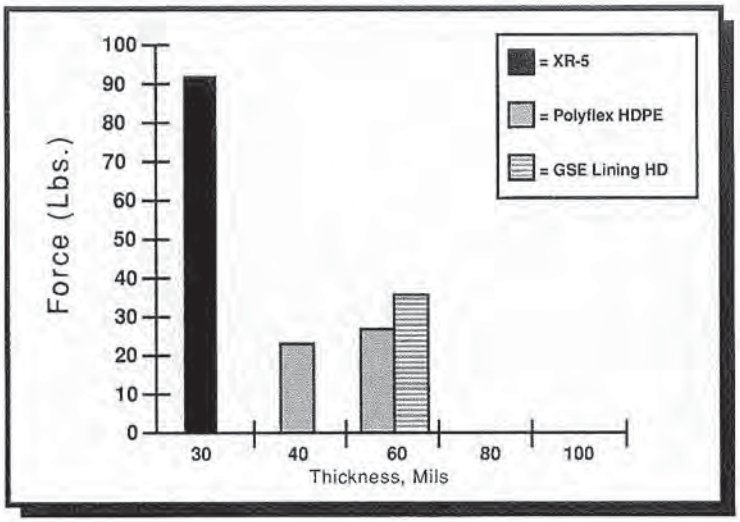
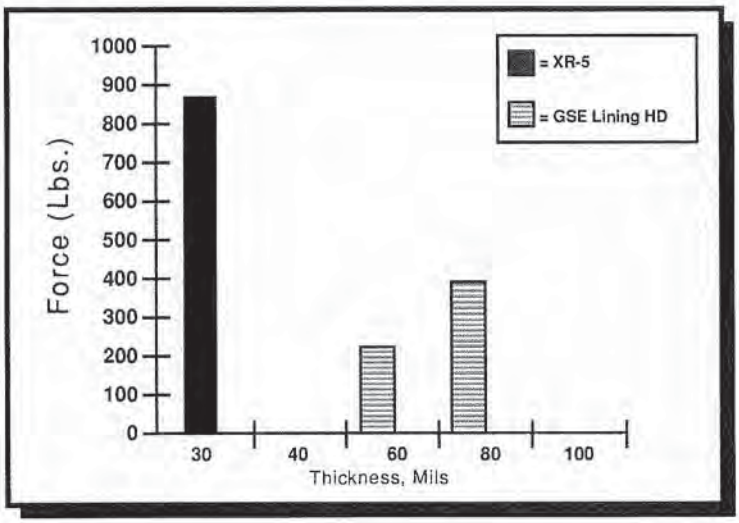
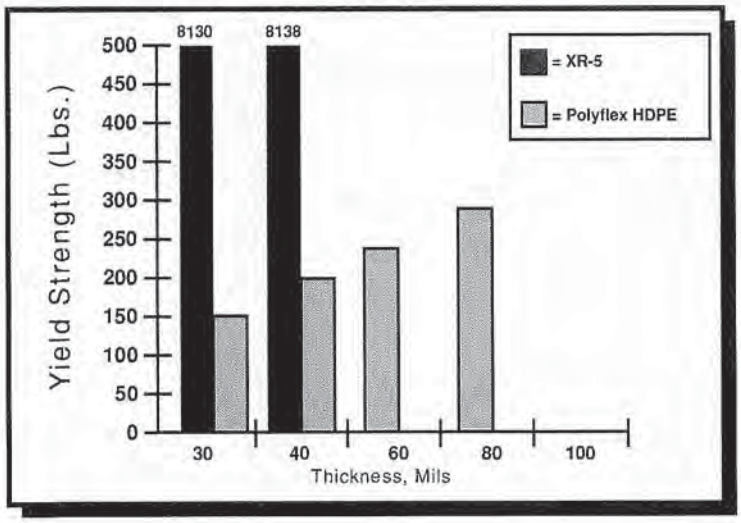


4. FED-STD-101C Method 2065 (100°C)*



5. ASTM D 751 Ball Burst Puncture

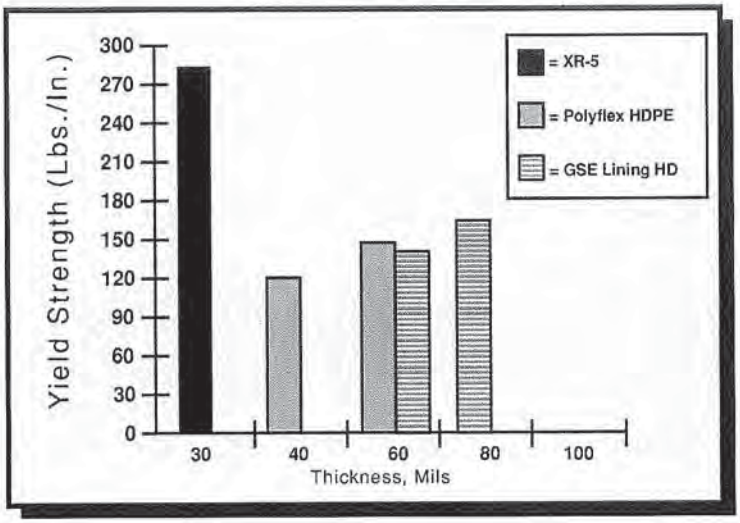


Yield Strength

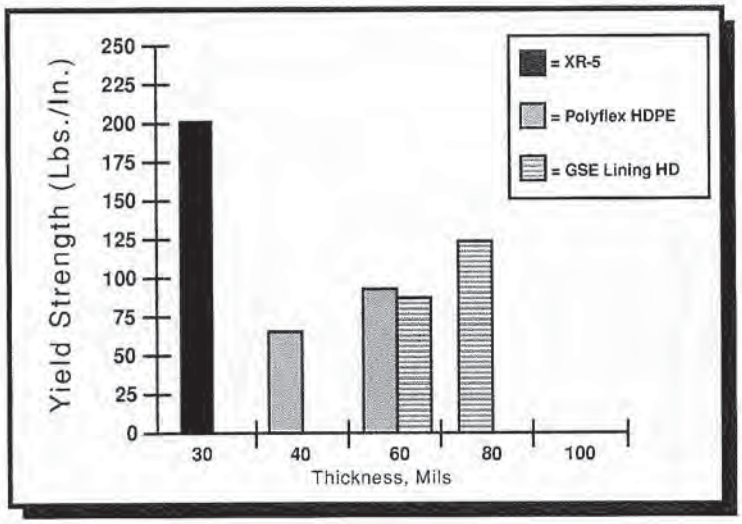
1. Yield Strength, XR-5 vs. HDPE

Test Method: Grab Tensile, ASTM D 751, 70° C

* Data provided by E.I. DuPont de Nemours & Co. Wilmington, Delaware

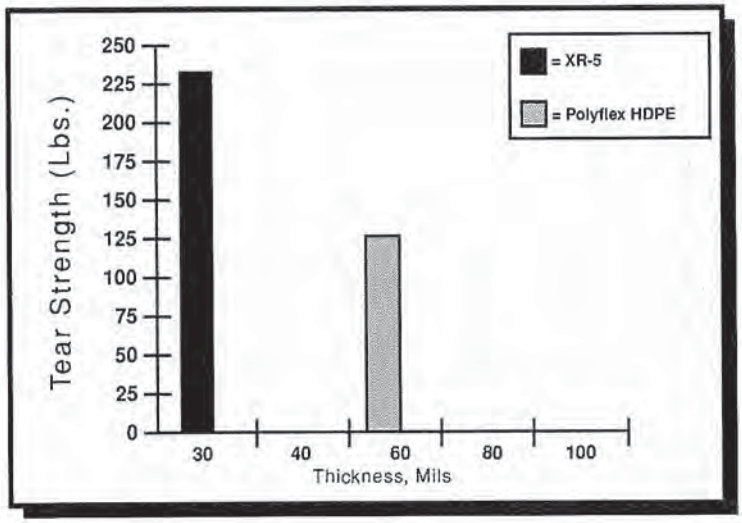


2. Strip Tensile, ASTM D 751, Room Temperature*



3. Strip tensile, ASTM D 751, 70°C*

Tear Strength



1. Tongue Tear (8" x 10" Specimens), ASTM D 751, Room Temperature*

* Data provided by E.I. DuPont de Nemours & Co. Wilmington, Delaware

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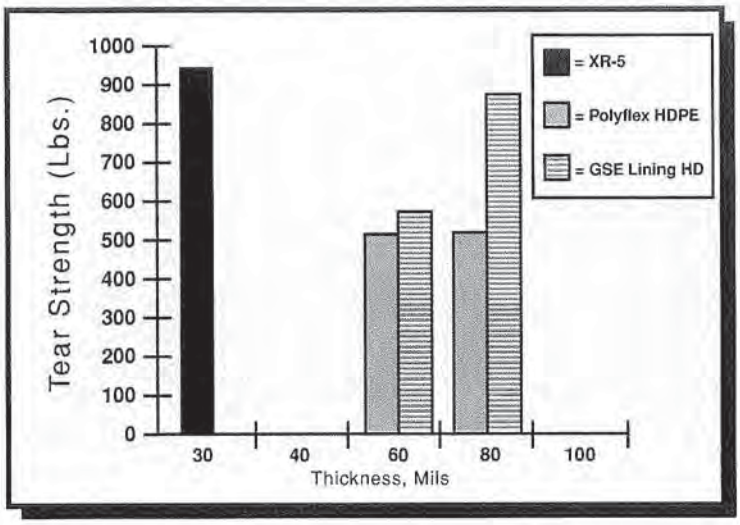
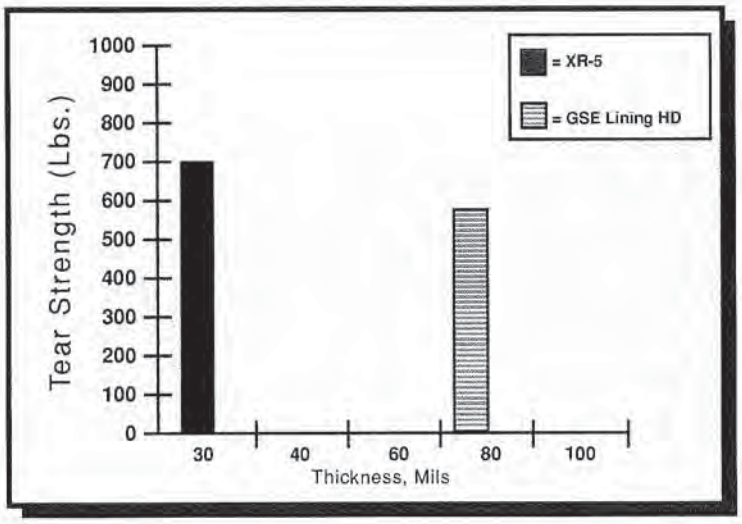


1. Graves Tear, ASTM D 624, Die C, Room Temperature*



2. Graves Tear, ASTM D 624, Die C, 70°C*

* Data provided by E.I. DuPont de Nemours & Co. Wilmington, Delaware

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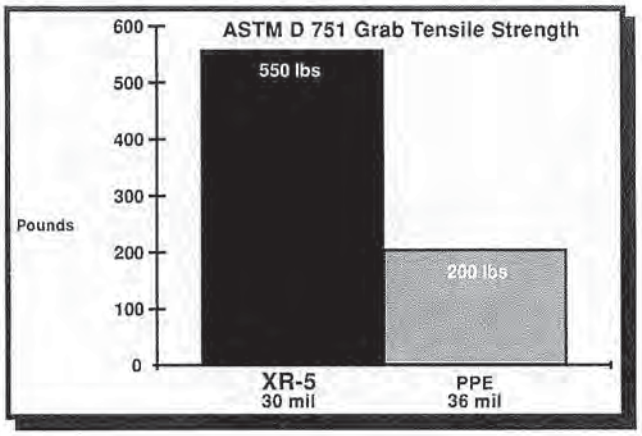
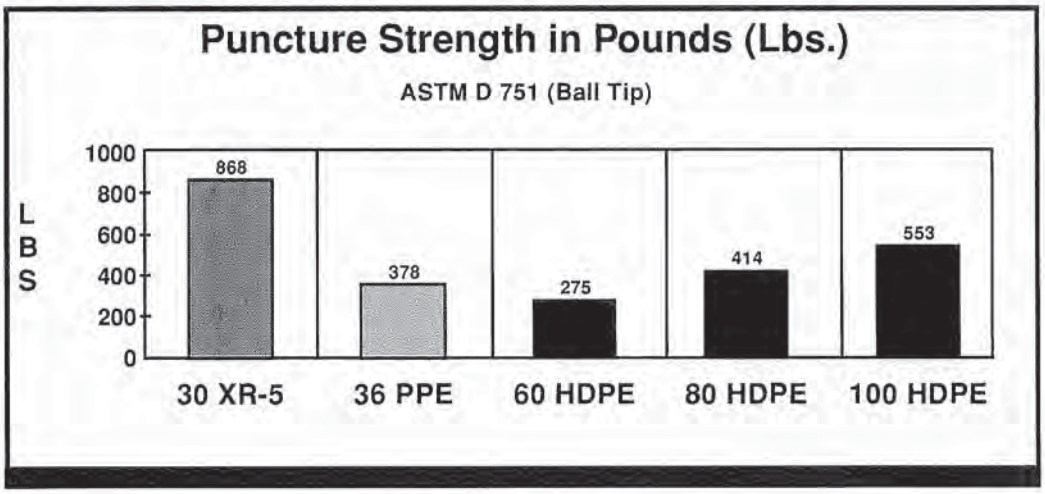
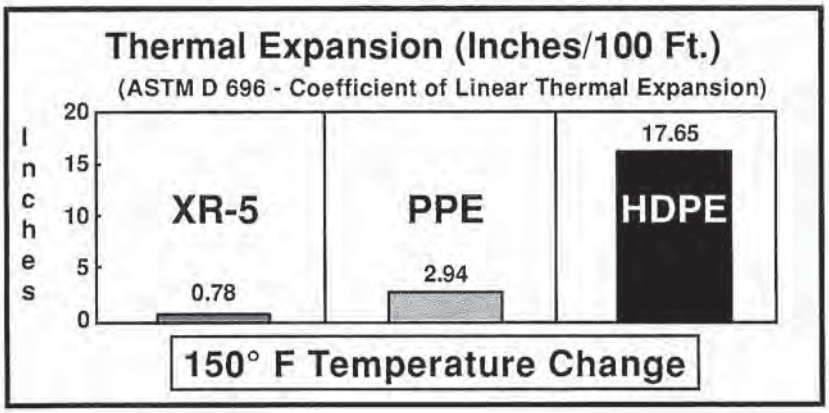
Grab Strength – XR-5® vs. Polypropylene Tensile



Puncture Strength Comparison



Coated Fabric Thermal Stability



Specification For Geomembrane Liner

(Sample specification: 8130 XR-5®. For other product specifications, go to www.xr-5.com)

General

1.01 Scope Of Work

Furnish and install flexible membrane lining in the areas shown on the drawings. All work shall be done in strict accordance with the project drawings, these specifications and membrane lining fabricator's approved shop drawings.

Geomembrane panels will be supplied sufficient to cover all areas, including appurtenances, as required in the project, and shown on the drawings. The fabricator/installer of the liner shall allow for shrinkage and wrinkling of the field panels.

1.02 Products

The lining material shall be 8130 XR-5 as manufactured by Seaman Corporation (1000 Venture Boulevard, Wooster, OH 44691; 330-262-1111), with the following physical specifications:

Base- (Type)	Polyester
Fabric Weight (ASTM D 751)	6.5 oz./sq. yd.
Finished Coated Weight (ASTM D 751)	30 ± 2 oz./sq. yd.
Trapezoid Tear (ASTM D 751)	40/55 lbs. min.
Grab Yield Tensile (ASTM D 751, Grab Method Procedure A)	550/550 lbs. min.
Elongation @ Yield (%)	20% min.
Adhesion- Heat Seam (ASTM D 751, Dielectric Weld)	40 lbs./2in. weld min.
Adhesion- Ply (ASTM D 413, Type A)	15 lbs./in. or film tearing bond
Hydrostatic Resistance (ASTM D 751, Method A)	800 psi min.
Puncture Resistance (ASTM D 4833)	275 lbs. min.
Bursting Strength (ASTM D 751 Ball Tip)	750 lbs. min.
Dead Load (ASTM D 751) Room Temperature	220 lbs. min.
(2" overlap seam, 4 hours) 160°F	120 lbs. min.
Bonded Seam Strength (ASTM D 751 Grab Test Method, Procedure A)	575 lbs. min.
Low Temperature (ASTM D 2136, 4 hours- 1/8" Mandrel)	Pass @ -30°F
Weathering Resistance ASTM G 153 Carbon Arc	8,000 hours min. With no appreciable changes or stiffening or cracking of coating
Dimensional Stability (ASTM D 1204, 212°F 1 Hour, Each Direction)	0.5% max.
Water Absorption (ASTM D 471, 7 Days)	0.025 kg/m² max. @ 70°F 0.14 kg/m² max. @ 212°F
Abrasion Resistance ASTM D 3389,	2000 cycles before fabric exposure;
H-18 Wheel, 1000 g load	50 mg/100 cycles max. wgt. Loss
Coefficient of Thermal Expansion/Contraction (ASTM D 696)	8×10^{-5} in/in/° F max.

1.03 Submittals

The fabricator of panels used in this work shall prepare shop drawings with a proposed panel layout to cover the liner area shown in the project plans. Shop drawings shall indicate the direction of factory seams and shall show panel sizes consistent with the material quantity requirements of 1.01.

Details shall be included to show the termination of the panels at the perimeter of lined areas, the methods of sealing around penetrations, and methods of anchoring.

Placement of the lining shall not commence until the shop drawings and details have been approved by the owner, or his representative.

1.04 Factory Fabrication
The individual XR-5® liner widths shall be factory fabricated into large sheets custom designed for this project so as to minimize field seaming. The number of factory seams must exceed the number of field seams by a factor of at least 10.

A two-inch overlap seam done by heat or RF welding is recommended. The surface of the welded areas must be dry and clean. Pressure must be applied to the full width of the seam on the top and bottom surface while the welded area is still in a melt-type condition. The bottom welding surface must be flat to insure that the entire seam is welded properly. Enough heat shall be applied in the welding process that a visible bead is extruded from both edges being welded. The bead insures that the material is in a melt condition and a successful chemical bond between the two surfaces is accomplished.

Two-inch overlapped seams must withstand a minimum of 240 pounds per inch width dead load at 70° F. and 120 pounds per inch width at 160° F. as outlined in ASTM D 751. All seams must exceed 550 lbs. bonded seam strength per ASTM D 751 Bonded Seam Strength Grab Test Method, Procedure A.

1.05 Inspection And Testing Of Factory Seams
The fabricator shall monitor each linear foot of seam as it is produced. Upon discovery of any defective seam, the fabricator shall stop production of panels used in this work and shall repair the seam, and determine and rectify the cause of the defect prior to continuation of the seaming process.

The fabricator must provide a Quality Control procedure to the owner or his representative which details his method of visual inspection and periodic system checks to ensure leak-proof factory fabrication.

1.06 Certification and Test Reports
Prior to installation of the panels, the fabricator shall provide the owner, or his representative, with written certification that the factory seams were inspected in accordance with Section 1.05.

1.07 Panel Packaging and Storage
Factory fabricated panels shall be accordian-folded, or rolled, onto a sturdy wooden pallet designed to be moved by a forklift or similar equipment. Each factory fabricated panel shall be prominently and indelibly marked with the panel size. Panels shall be protected as necessary to prevent damage to the panel during shipment.

Panels which have been delivered to the project site shall be stored in a dry area.

1.08 Qualifications of Suppliers
The fabricator of the lining shall be experienced in the installation of flexible membrane lining, and shall provide the owner or his representative with a list of not less than five (5) projects and not less than 500,000 square feet of successfully installed XR-5 synthetic lining. The project list shall show the name, address, and telephone number of an appropriate party to contact in each case. The manufacturer of the sheet goods shall provide similar documentation with a 10 million square foot minimum, with at least 5 projects demonstrating 10+ years service life.

The installer shall provide similar documentation to that required by the fabricator.

1.09 Subgrade Preparation By Others
Lining installation shall not begin until a proper base has been prepared to accept the membrane lining. Base material shall be free from angular rocks, roots, grass and vegetation. Foreign materials and protrusions shall be removed, and all cracks and voids shall be filled and the surface made level, or uniformly sloping as indicated

on the drawings. The prepared surface shall be free from loose earth, rocks, rubble and other foreign matter. Generally, no rock or other object larger than USCS sand (SP) should remain on the subgrade in order to provide an adequate safety factor against puncture. Geotextiles may be used to compensate for irregular subgrades. The subgrade shall be uniformly compacted to ensure against settlement. The surface on which the lining is to be placed shall be maintained in a firm, clean, dry and smooth condition during lining installation.

1.10 Lining Installation
Prior to placement of the liner, the installer will indicate in writing to the owner or his representative that he believes the subgrade to be adequately prepared for the liner placement.

The lining shall be placed over the prepared surface in such a manner as to assure minimum handling. The sheets shall be of such lengths and widths and shall be placed in such a manner as to minimize field seaming.

In areas where wind is prevalent, lining installation should be started at the upwind side of the project and proceed downwind. The leading edge of the liner shall be secured at all times with sandbags or other means sufficient to hold it down during high winds.

Sandbags or rubber tires may be used as required to hold down the lining in position during installation. Materials, equipment or other items shall not be dragged across the surface of the liner, or be allowed to slide down slopes on the lining. All parties walking or working upon the lining material shall wear soft-sole shoes.

Lining sheets shall be closely fit and sealed around inlets, outlets and other projections through the lining. Lining to concrete seals shall be made with a mechanical anchor, or as shown on the drawings. All piping, structures and other projections through the lining shall be sealed with approved sealing methods.

1.11 XR-5 Field Seaming
All requirements of Section 1.04 and 1.05 apply. A visible bead should be extruded from the hot air welding process.

Field fabrication of lining material will not be allowed.

1.12 Inspection
All field seams will be tested using the Air Lance Method. A compressed air source will deliver 55 psi minimum to a 3/16 inch nozzle. The nozzle will be directed to the lip of the field seam in a near perpendicular direction to the length of the field seam. The nozzle will be held 4 inches maximum from the seam and travel at a rate not to exceed 40 feet per minute. Any loose flaps of 1/8" or greater will require a repair.

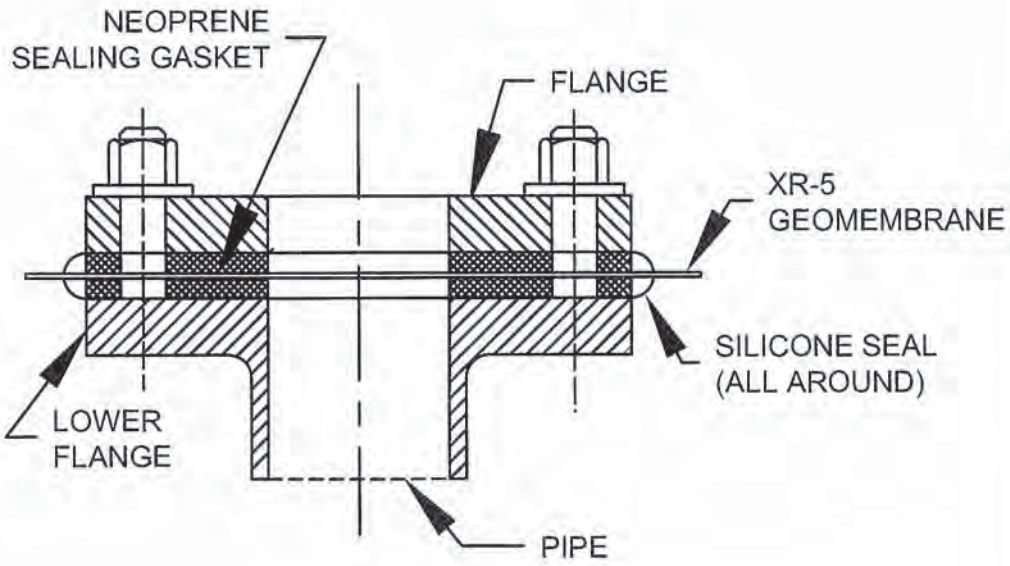
Alternatively all field seams should also be inspected utilizing the Vacuum Box Technique as described in Standard Practice for Geomembrane Seam Evaluation by Vacuum Chamber (ASTM D 5641-94 (2006)), using a 3 to 5 psi vacuum pressure. All leaks shall be repaired and tested.

All joints, on completion of work, shall be tightly bonded. Any lining surface showing injury due to scuffing, penetration by foreign objects, or distress from rough subgrade, shall as directed by the owner or his representative be replaced or covered, and sealed with an additional layer of lining of the proper size, in accordance with the patching procedure.

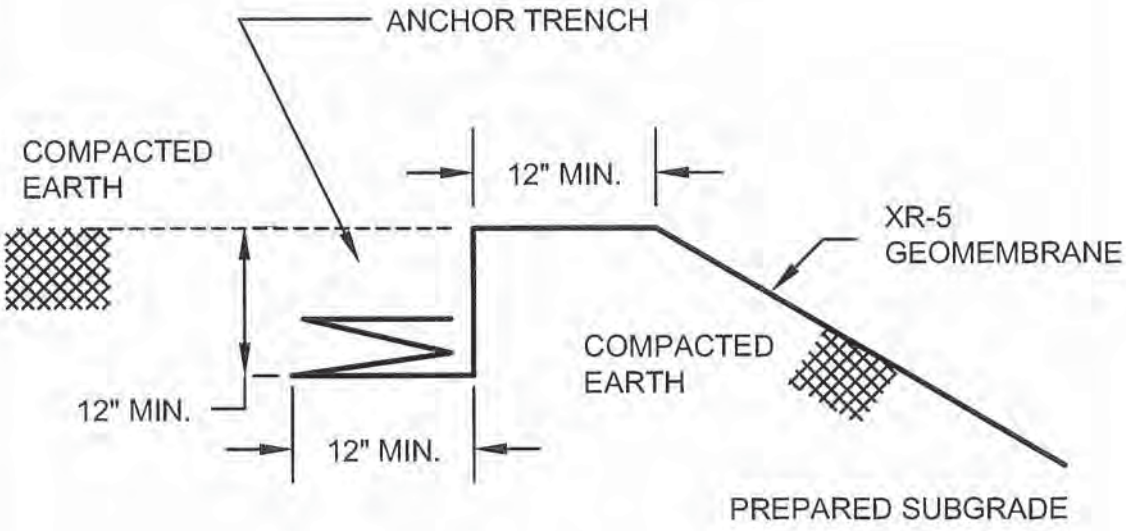
1.13 Patching
Any repairs to the lining shall be patched with the lining material. The patch material shall have rounded corners and shall extend a minimum of four inches (4") in each direction from the damaged area.

Seam repairs or seams which are questionable should be cap stripped with a 1" wide (min.) strip of the liner material. The requirements of Section 1.11 apply to this cap stripping.

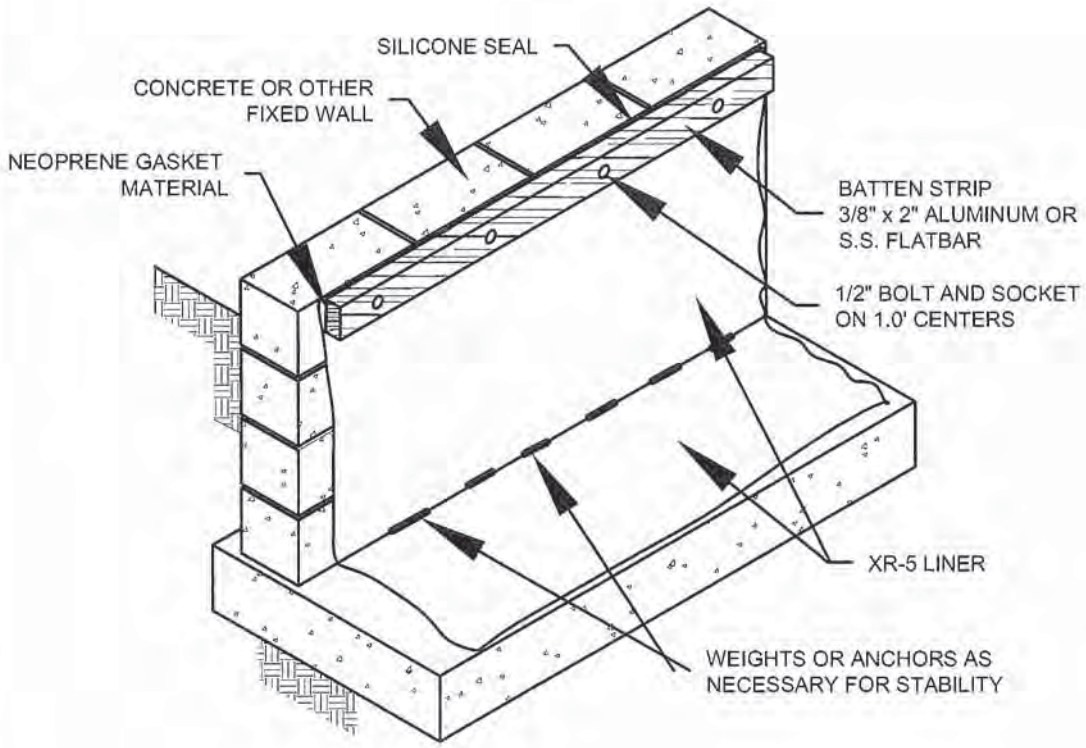
1.14 Warranty
The lining material shall be warranted on a pro-rated basis for 10 years against both weathering and chemical compatibility in accordance with Seaman Corporation warranty for XR-5® Style 8130. A test immersion will be performed by the owner and the samples evaluated by the manufacturer. Workmanship of installation shall be warranted for one year on a 100% basis.



Seaman Corporation ENGINEERED PRODUCTS GROUP 1000 Venture Blvd.,Wooster, Ohio 44691	
FLANGE CONNECTION TO PIPE SECTION	
SCALE: NONE	
SHEET 1 of 1	DRAW NO. XRD-019



Seaman Corporation	
ENGINEERED PRODUCTS GROUP 1000 Venture Blvd.,Wooster, Ohio 44691	
ELEVATION VIEW *TYPICAL ANCHOR DETAILS* *XR-5 LINER*	
SCALE: NONE	
SHEET 1 of 1	DRAW NO. XRD-001



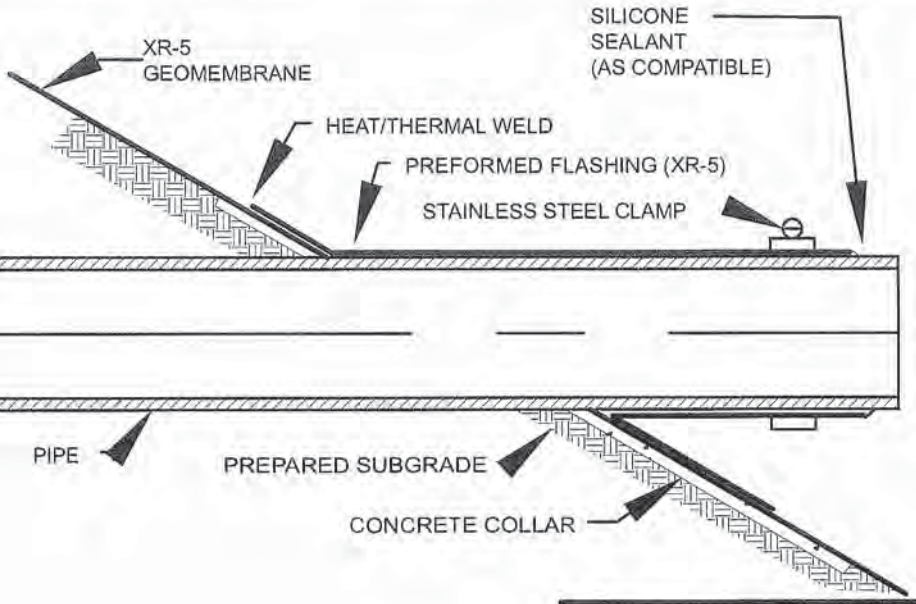
Seaman Corporation

ENGINEERED PRODUCTS GROUP

1000 Venture Blvd.,Wooster, Ohio 44691

ANCHORING DETAIL
XR-5 LINER TO FIXED WALL

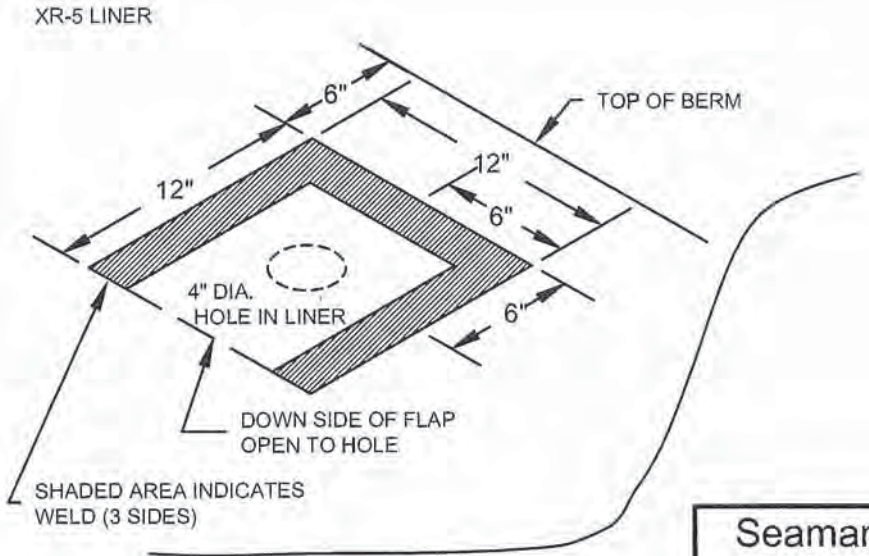
SCALE: NONE	
SHEET 1 of 1	DRAW NO. XRD-023



Seaman Corporation
ENGINEERED PRODUCTS GROUP
1000 Venture Blvd.,Wooster, Ohio 44691

ELEVATION VIEW
TYPICAL PIPE PUNCTURE
SEAL DETAIL XR-5 LINER

SCALE: NONE
SHEET 1 of 1
DRAW NO. XRD-018



Seaman Corporation
ENGINEERED PRODUCTS GROUP
1000 Venture Blvd.,Wooster, Ohio 44691

PLAN VIEW
FLAP VENT DETAIL
XR-5 LINER

SCALE: NONE
SHEET 1 of 1
DRAW NO. XRD-012

Section 6 - Warranty Information

Warranty

XR-5® is offered with Seaman Corporation standard warranty which addresses weathering and chemical compatibility for a 10-year period. A test immersion is required with subsequent testing and approval by Seaman Corporation.

Instructions for XR-5 Test Immersions and Warranty Requests

1. Completely immerse six Style 8130 XR-5 samples (8-1/2" x 11" size) in the liquid to be contained.
2. At the end of approximately thirty days, retrieve three of the samples. The samples should be rinsed with fresh water and dried.
3. Send the three samples to:

   Attn: Geomembrane Department
   Seaman Corporation
   1000 Venture Blvd.
   Wooster, OH 44691

4. Keep the other three samples immersed until further notice in case longer immersion data is required.
5. Complete and return the information form on the liner application.

8228 XR-3® and all PW Geomembranes are offered with a standard 10-year warranty for weathering. The attached information form should be completed.

XR® Membrane Application and Utilization Form

Installation Owner and Address:

Physical Location of Installation:

Expected Date of Installation: _____

Expected Beginning Date of Service: _____

Description of Application:
(Example: impoundment used to contain brine on an emergency basis.)

Physical Features of Application:
(Example: 1.3 million gallon earthen impoundment with overall top dimensions of 160′ x 160′ with 3:1 slopes and 10′ deep.)

Description of Liquid:

(Describe content of liquid including pollutants and expected temperature extremes in basin and at application point. Attach analysis of liquid chemistry, composition taken on a representative basis.)

Operational Characteristics:

(Describe the operation of the facility such as filling schedules, fluctuating liquid levels, operating temperatures, etc.)

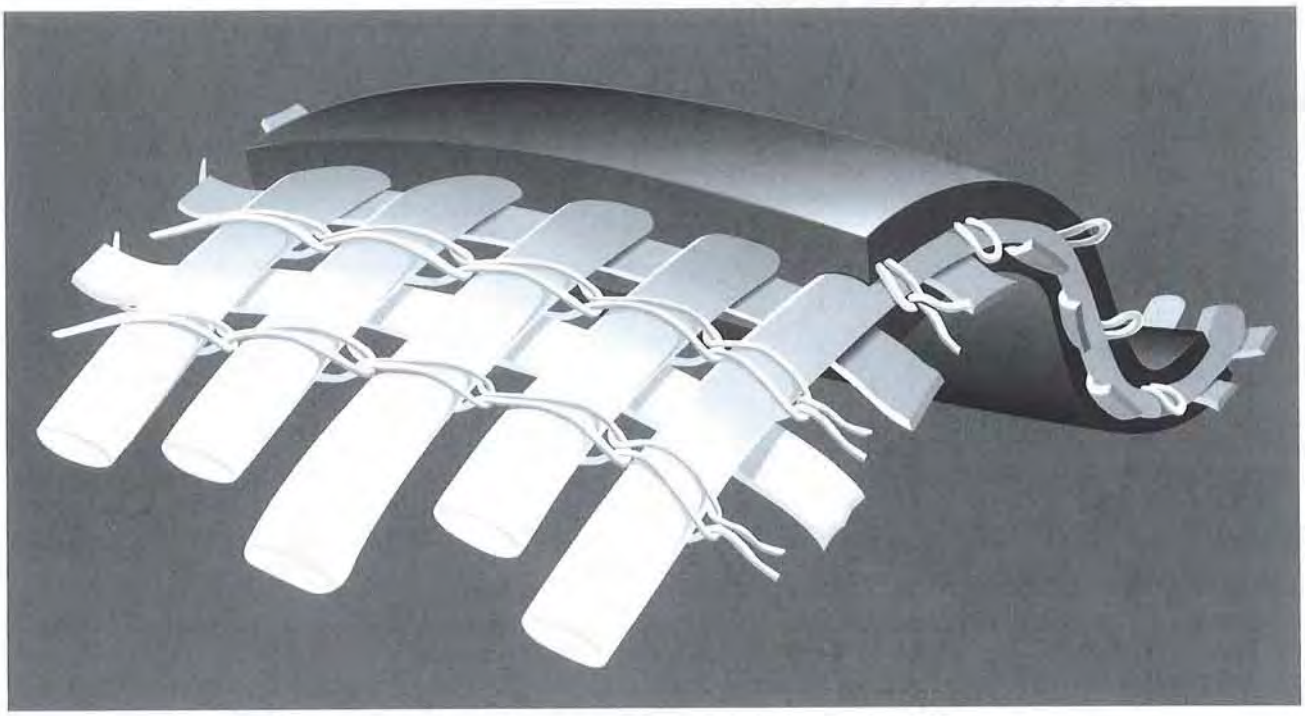
Performance Requirements, Etc:

(State any other requirements, such as rate of permeability required.)

Owner represents the information herein is complete and accurate, and understands and agrees that issuance of Seaman Corporation Warranty for XR products are conditioned upon such completeness and accuracy.

OWNER'S SIGNATURE

Reference Materials:

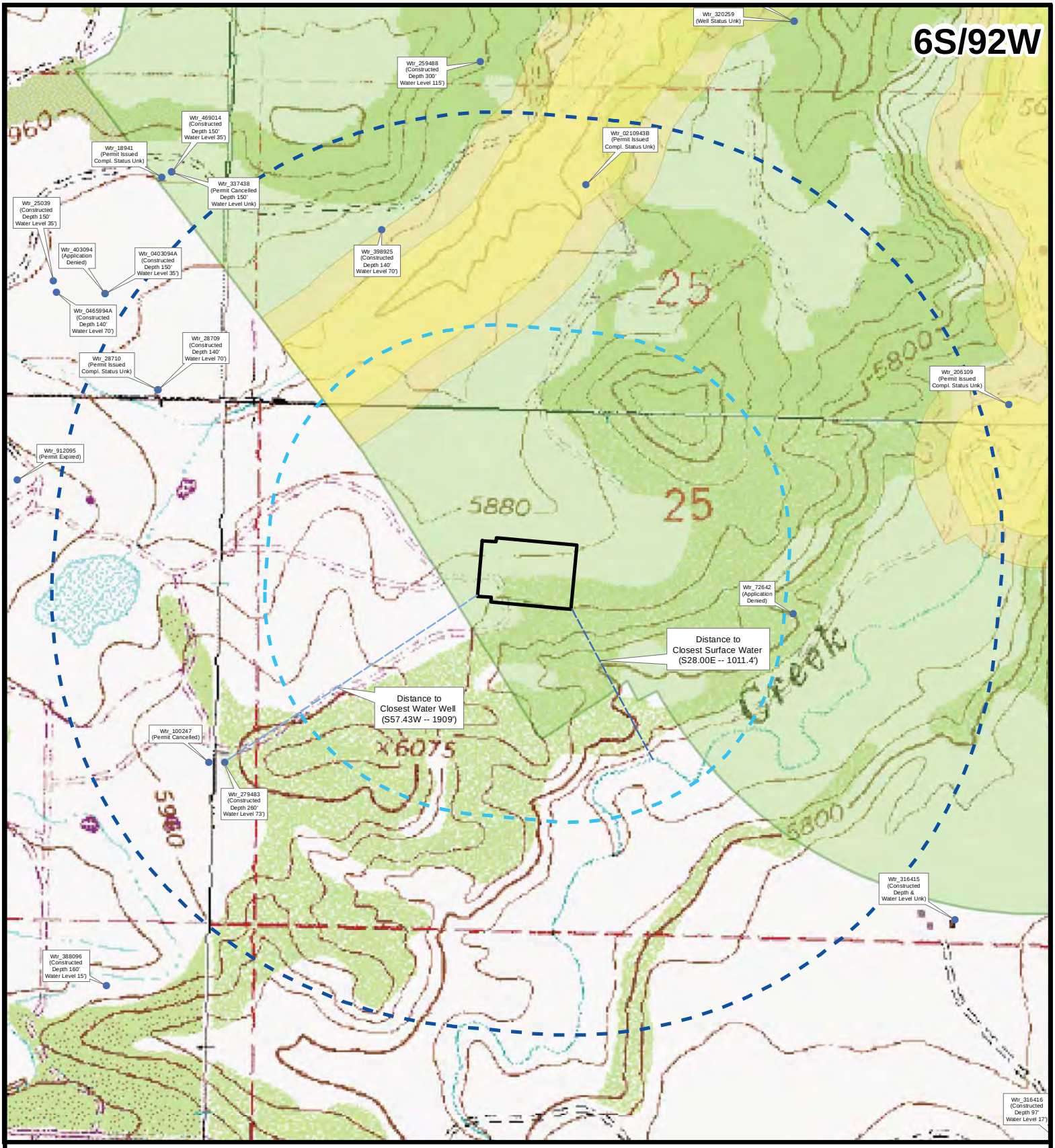


XR-5®: High Performance Composite Geomembrane

Seaman Corporation
1000 Venture Blvd.
Wooster, Ohio 44691
(330) 262-1111
www.xr-5.com

Attachment D

Information Utilized for Sensitive Area Determination
Form 2A



Hydrology Map

Kaufman 1 NESW 25-692 Pad
NESW, Section 25, T6S R92W
Garfield County, Colorado

0 365 730 1,460 Feet

Rule 317B

- Internal Buffer 0-300'
- Intermediate Buffer 301-500'
- External Buffer 501-2,640'

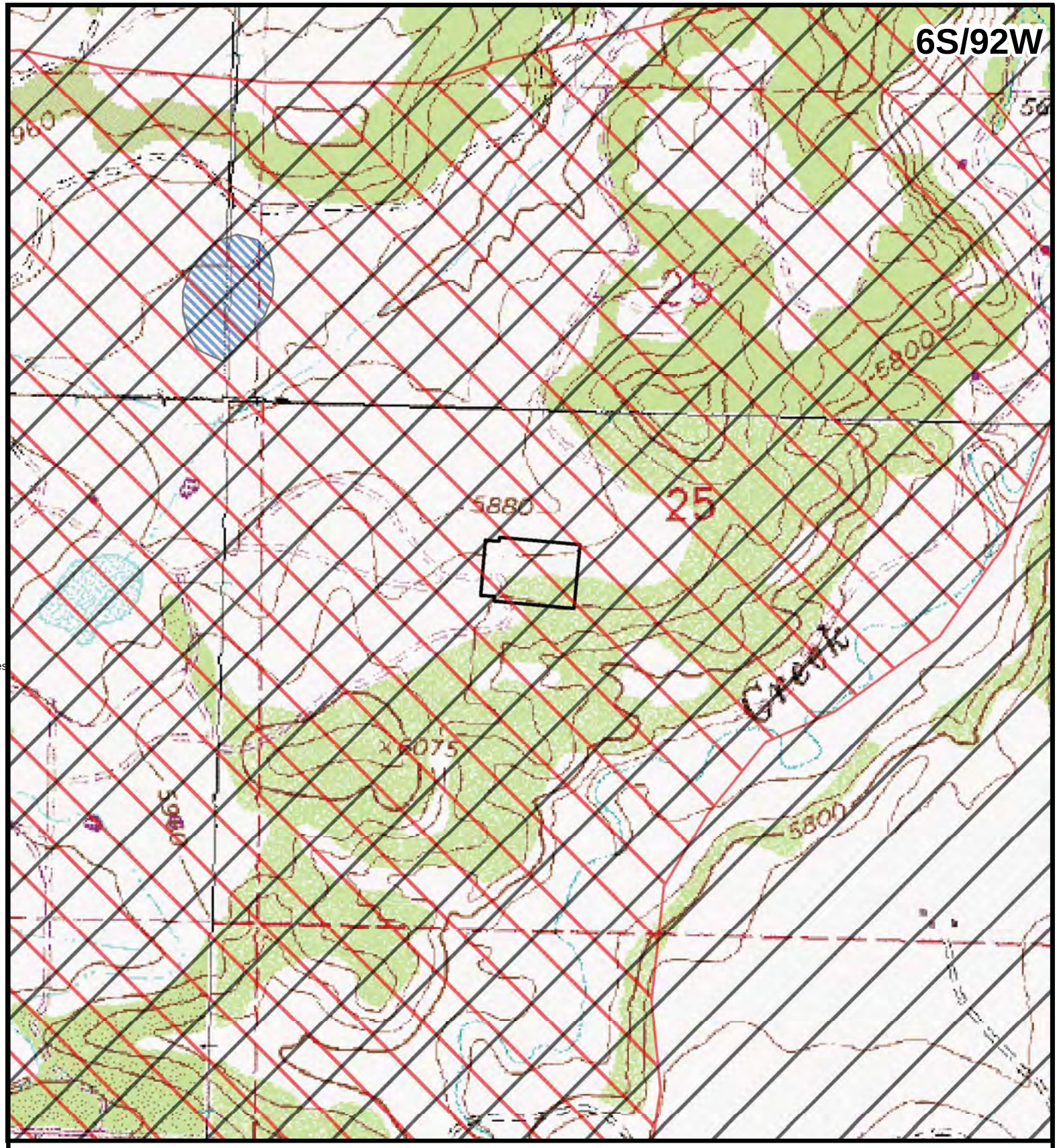
Wells

- Water Wells
- Pad/Pit Location

- 1/2 Mile Buffer
- 1/4 Mile Buffer

Bill Barrett Corporation

11/1/2011



Sensitive Wildlife Habitats Map

Kaufman 1 NESW 25-692 Pad
NESW, Section 25, T6S R92W
Garfield County, Colorado

0 365 730 1,460
Feet

Sensitive Wildlife Habitats

- Mule Deer Critical Winter Range
- Elk WInter Concentration Areas
- Bald Eagle Winter Night Roost Sites

Bill Barrett Corporation

Wells

- Water Wells
- Pad/Pit Location

11/10/2011

FORM 2A Rev 04/01

State of Colorado
Oil and Gas Conservation Commission

1120 Lincoln Street, Suite 801, Denver, Colorado 80205 Phone: (303) 894-2100 Fax: (303) 894-2109

DE	ET	OE	ES

Document Number: 400163120

Oil and Gas Location Assessment

☐ New Location ☒ Amend Existing Location Location#: 413830

Submit original plus one copy. This form is to be submitted to the COGCC prior to any ground disturbance activity associated with oil and gas development operations. This Assessment may be approved as a standalone application or submitted as an informational report accompanying an Application for Permit-To-Drill, Form 2. Approval of this Assessment will allow for the construction of the below specified location; however, it does not supersede any land use rules applied by the local land use authority. This form may serve as notice to land owners and other interested parties, please see the COGCC web site at http://colorado.gov/cogcc/ for all accompanying information pertinent to this Oil and Gas Location Assessment.

Location ID: **413830**

Expiration Date: **07/06/2014**

☒ This location assessment is included as part of a permit application.

1. CONSULTATION

☐ This location is included in a Comprehensive Drilling Plan. CDP #

☒ This location is in a sensitive wildlife habitat area.

☐ This location is in a wildlife restricted surface occupancy area.

☒ This location includes a Rule 306.d.(1)A.ii. variance request.

2. Operator

Operator Number: 10071

Name: BARRETT CORPORATION* BILL

Address: 1099 18TH ST STE 2300

City: DENVER State: CO Zip: 80202

3. Contact Information

Name: Mary Pobuda

Phone: (303) 3128511

Fax: (303) 2910420

email: mpobuda@billbarrettcorp.com

4. Location Identification:

Name: Kaufman (Pad #1) Number: 12A-25-692

County: GARFIELD

QuarterQuarter: NESW Section: 25 Township: 6S Range: 92W Meridian: 6 Ground Elevation: 5922

Define a single point as a location reference for the facility location. This point should be used as the point of measurement in the drawings to be submitted with this application. When the location is to be used as a well site then the point shall be a well location.

Footage at surface: 2140 feet FSL , from North or South section line, and 1563 feet FWL , from East or West section line.

Latitude: 39.496986 Longitude: -107.619168 PDOP Reading: 6.0 Date of Measurement: 03/05/2010

Instrument Operator's Name: Jim Kalmon

5. Facilities (Indicate the number of each type of oil and gas facility planned on location):

Special Purpose Pits:		Drilling Pits:	1	Wells:	15	Production Pits:		Dehydrator Units:	
Condensate Tanks:	6	Water Tanks:	2	Separators:	4	Electric Motors:		Multi-Well Pits:	
Gas or Diesel Motors:		Cavity Pumps:		LACT Unit:		Pump Jacks:		Pigging Station:	
Electric Generators:		Gas Pipeline:	1	Oil Pipeline		Water Pipeline:	2	Flare:	
Gas Compressors:		VOC Combustor:	1	Oil Tanks:		Fuel Tanks:			

Other: Separators are 4 quad separators; frac tanks - 30 (500 bbl) temporary tanks

6. Construction:

Date planned to commence construction: 04/26/2011 Size of disturbed area during construction in acres: 5.15

Estimated date that interim reclamation will begin: 09/01/2011 Size of location after interim reclamation in acres: 1.43

Estimated post-construction ground elevation: 5922 Will a closed loop system be used for drilling fluids: Yes [X]

Will salt sections be encountered during drilling: Yes [ ] No [X] Is H2S anticipated? Yes [ ] No [X]

Will salt (>15,000 ppm TDS Cl) or oil based muds be used: Yes [ ] No [X]

Mud disposal: Offsite [ ] Onsite [X] Method: Land Farming [ ] Land Spreading [ ] Disposal Facility [ ]

Other: Evaporating and Backfilling

7. Surface Owner:

Name: _____ Phone: _____

Address: _____ Fax: _____

Address: _____ Email: _____

City: _____ State: _____ Zip: _____ Date of Rule 306 surface owner consultation: 08/01/2010

Surface Owner: [X] Fee [ ] State [ ] Federal [ ] Indian

Mineral Owner: [X] Fee [ ] State [ ] Federal [ ] Indian

The surface owner is: [ ] the mineral owner [X] committed to an oil and gas lease [ ] is the executer of the oil and gas lease [ ] the applicant

The right to construct the location is granted by: [X] oil and gas lease [ ] Surface Use Agreement [ ] Right of Way [ ] applicant is owner

Surface damage assurance if no agreement is in place: [ ] $2000 [ ] $5000 [ ] Blanket Surety ID _____

8. Reclamation Financial Assurance:

[X] Well Surety ID: 20040060 [ ] Gas Facility Surety ID: _____ [ ] Waste Mgnt. Surety ID: _____

9. Cultural:

Is the location in a high density area (Rule 603.b.): Yes [ ] No [X]

Distance, in feet, to nearest building: 2239 , public road: 3048 , above ground utilit: 2239

, railroad: 23000 , property line: 297

10. Current Land Use (Check all that apply):

Crop Land: [ ] Irrigated [ ] Dry land [ ] Improved Pasture [ ] Hay Meadow [ ] CRP

Non-Crop Land: [X] Rangeland [ ] Timber [ ] Recreational [ ] Other (describe): _____

Subdivided: [ ] Industrial [ ] Commercial [ ] Residential

11. Future Land Use (Check all that apply):

Crop Land: [ ] Irrigated [ ] Dry land [ ] Improved Pasture [ ] Hay Meadow [ ] CRP

Non-Crop Land: [X] Rangeland [ ] Timber [ ] Recreational [ ] Other (describe): _____

Subdivided: [ ] Industrial [ ] Commercial [ ] Residential

12. Soils:

List all soil map units that occur within the proposed location. Attach the National Resource Conservation Service (NRCS) report showing the "Map Unit Description" report listing the soil typical vertical profile. This data is to used when segregating topsoil.

The required information can be obtained from the NRCS web site at http://soildatamart.nrcs.usda.gov/ or from the COGCC web site GIS Online map page found at http://colorado.gov/cogcc. Instructions are provided within the COGCC web site help section.

NRCS Map Unit Name: Map Unit Symbol: #56 (potts loam, 6 to 12 percent)

NRCS Map Unit Name: Map Unit Symbol: #66 (torriorthents-camborthids-rock outcrop complex, steep)

NRCS Map Unit Name:

13. Plant Community:

Complete this section only if any portion of the disturbed area of the location's current land use is on non-crop land.

Are noxious weeds present: Yes ☐ No ☒

Plant species from: ☐ NRCS or, ☒ field observation Date of observation: 03/05/2010

List individual species:

Check all plant communities that exist in the disturbed area.

- ☐ Disturbed Grassland (Cactus, Yucca, Cheatgrass, Rye)
- ☐ Native Grassland (Bluestem, Grama, Wheatgrass, Buffalograss, Fescue, Oatgrass, Brome)
- ☒ Shrub Land (Mahogany, Oak, Sage, Serviceberry, Chokecherry)
- ☐ Plains Riparian (Cottonwood, Willow, Aspen, Maple, Poplar, Russian Olive, Tamarisk)
- ☐ Mountain Riparian (Cottonwood, Willow, Blue Spruce)
- ☐ Forest Land (Spruce, Fir, Ponderosa Pine, Lodgepole Pine, Juniper, Pinyon, Aspen)
- ☐ Wetlands Aquatic (Bullrush, Sedge, Cattail, Arrowhead)
- ☐ Alpine (above timberline)
- ☐ Other (describe):

14. Water Resources:

Rule 901.e. may require a sensitive area determination be performed. If this determination is performed the data is to be submitted with the Form 2A.

Is this a sensitive area: ☐ No ☒ Yes Was a Rule 901.e. Sensitive Areas Determination performed: ☒ No ☐ Yes

Distance (in feet) to nearest surface water: 1020 , water well: 1366 , depth to ground water: 120

Is the location in a riparian area: ☒ No ☐ Yes Was an Army Corps of Engineers Section 404 permit filed ☒ No ☐ Yes

Is the location within a Rule 317B Surface Water Suppl Area buffer zone:

☐ No ☐ 0-300 ft. zone ☐ 301-500 ft. zone ☒ 501-2640 ft. zone

If the location is within a Rule 317B Surface Water Supply Area buffer have all public water supply systems within 15 miles been notified: ☐ No ☒ Yes

15. Comments:

This is an existing well pad location. This 2A is being amended to add a drilling pit to be utilized for completion operations and to update facilitiy information that will be associated with this pad. No additional disturbance is being proposed. The APDs associated with this well pad have been approved.

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

Signed: Date: 05/09/2011 Email: mpobuda@billbarrettcorp.com

Print Name: Mary Pobuda Title: Permit Analyst

Based on the information provided herein, this Application for Permit-to-Drill complies with COGCC Rules and applicable orders and is hereby approved.

COGCC Approved: David S. Neslin **Director of COGCC** Date: 7/7/2011

CONDITIONS OF APPROVAL, IF ANY:

All representations, stipulations and conditions of approval stated in this Form 2A for this location shall constitute representations, stipulations and conditions of approval for any and all subsequent operations on the location unless this Form 2A is modified by Sundry Notice, Form 4 or an Amended Form 2A.

Attachment Check List

Att Doc Num	Name
2033888	CORRESPONDENCE
2033889	FORM 2A
2033890	CORRESPONDENCE
400163120	FORM 2A APPROVED
400163150	CONST. LAYOUT DRAWINGS
400182602	FORM 2A SUBMITTED

Total Attach: 6 Files

BMP

Type	Comment
Planning	NOTIFICATIONS • Proper notifications required by COGCC regulations or policy memos will be adhered to.
Drilling/Completion Operations	TRENCHES/PITS/TEMPORARY FRAC TANKS • Unlined pits will not be constructed on fill material. • Drill cuttings from the wellbore will be directed temporarily stockpiled oninto a lined and bermed surface containments. Any free liquids accumulated in the containment would be removed as soon as practicable. • Drilling pits utilized for completion operations will be permitted (if applicable) and lined, operated in accordance with COGCC regulations, specifically Rule 903 and Rule 904. All permitted pits (Form 15) will be closed per Rule 905 and non-permitted drilling pits would be closed in accordance with Rule 1003. • Drilling pits used for completion will be fenced with appropriate wildlife mesh on the bottom portion. Appropriate netting will be installed within 30 days of the pit becoming inactive. • Flowback and stimulation fluids from the wells being completed will be sent to tanks and/or filters to allow the sand to settle out or pits constructed to minimize potential for abrasive damage to liners before the fluids are placed into the pit for reuse or disposal at a BBC SWD facility. • All flowback water will be confined to the lined completion pit or storage tanks for a period not to exceed ninety days and will be recycled for re-use, piped or trucked offsite to one of the approved disposal facilities below. Flowback sands stored on location will be remediated and buried on location or hauled to a state approved disposal facility. o Circle B Land 33A-35-692SWD, API# 05-045-18493, UIC# 159277 o GGU Rodreick #21B-31-691 SWD, API# 05-045-13803, UIC# 159176 o Specialty #13A-28-692 SWD, API# 05-045-14054, UIC# 159212 o Scott 41D-36-692 SWD, API# 05-045-11169, UIC# 159159 • Temporary frac tanks installed on location will have proper secondary containment according to SPCC regulations such as either putting a perimeter berm around location or around the frac tanks.

Total: 2 comment(s)

FORM 2A Rev 04/01

State of Colorado
Oil and Gas Conservation Commission

1120 Lincoln Street, Suite 801, Denver, Colorado 80205 Phone: (303) 894-2100 Fax: (303) 894-2109

DE	ET	OE	ES

Document Number: 400207122

Oil and Gas Location Assessment

☐ New Location ☒ Amend Existing Location Location#: 413830

Submit original plus one copy. This form is to be submitted to the COGCC prior to any ground disturbance activity associated with oil and gas development operations. This Assessment may be approved as a standalone application or submitted as an informational report accompanying an Application for Permit-To-Drill, Form 2. Approval of this Assessment will allow for the construction of the below specified location; however, it does not supersede any land use rules applied by the local land use authority. This form may serve as notice to land owners and other interested parties, please see the COGCC web site at http://colorado.gov/cogcc/ for all accompanying information pertinent to this Oil and Gas Location Assessment.

Location ID: **413830**

Expiration Date: **10/22/2014**

☒ This location assessment is included as part of a permit application.

1. CONSULTATION

☐ This location is included in a Comprehensive Drilling Plan. CDP #

☒ This location is in a sensitive wildlife habitat area.

☐ This location is in a wildlife restricted surface occupancy area.

☐ This location includes a Rule 306.d.(1)A.ii. variance request.

2. Operator

Operator Number: 10071

Name: BARRETT CORPORATION* BILL

Address: 1099 18TH ST STE 2300

City: DENVER State: CO Zip: 80202

3. Contact Information

Name: Mary Pobuda

Phone: (303) 312-8511

Fax: (303) 291-0420

email: mpobuda@billbarrettcorp.com

4. Location Identification:

Name: Kaufman (Pad #1) Number: 12A-25-692

County: GARFIELD

QuarterQuarter: NESW Section: 25 Township: 6S Range: 92W Meridian: 6 Ground Elevation: 5922

Define a single point as a location reference for the facility location. This point should be used as the point of measurement in the drawings to be submitted with this application. When the location is to be used as a well site then the point shall be a well location.

Footage at surface: 2140 feet FSL , from North or South section line, and 1563 feet FWL , from East or West section line.

Latitude: 39.496986 Longitude: -107.619168 PDOP Reading: 6.0 Date of Measurement: 03/05/2010

Instrument Operator's Name: Jim Kalmon

5. Facilities (Indicate the number of each type of oil and gas facility planned on location):

Special Purpose Pits:		Drilling Pits:		Wells:	15	Production Pits:		Dehydrator Units:	
Condensate Tanks:	6	Water Tanks:	2	Separators:	4	Electric Motors:		Multi-Well Pits:	1
Gas or Diesel Motors:		Cavity Pumps:		LACT Unit:		Pump Jacks:		Pigging Station:	
Electric Generators:		Gas Pipeline:	1	Oil Pipeline		Water Pipeline:	2	Flare:	
Gas Compressors:				VOC Combustor:	1	Oil Tanks:		Fuel Tanks:	

Other: Separators are 4 quad separators; frac tanks - 30 (500 bbl) temporary tanks

6. Construction:

Date planned to commence construction: 04/26/2011 Size of disturbed area during construction in acres: 5.15

Estimated date that interim reclamation will begin: 10/31/2011 Size of location after interim reclamation in acres: 1.43

Estimated post-construction ground elevation: 5922 Will a closed loop system be used for drilling fluids: Yes [X]

Will salt sections be encountered during drilling: Yes [ ] No [X] Is H2S anticipated? Yes [ ] No [X]

Will salt (>15,000 ppm TDS Cl) or oil based muds be used: Yes [ ] No [X]

Mud disposal: Offsite [ ] Onsite [X] Method: Land Farming [ ] Land Spreading [ ] Disposal Facility [ ]

Other: Evap & Bury

7. Surface Owner:

Name: _____ Phone: _____

Address: _____ Fax: _____

Address: _____ Email: _____

City: _____ State: _____ Zip: _____ Date of Rule 306 surface owner consultation: 08/01/2010

Surface Owner: [X] Fee [ ] State [ ] Federal [ ] Indian

Mineral Owner: [X] Fee [ ] State [ ] Federal [ ] Indian

The surface owner is: [X] the mineral owner [X] committed to an oil and gas lease [ ] is the executer of the oil and gas lease [ ] the applicant

The right to construct the location is granted by: [ ] oil and gas lease [X] Surface Use Agreement [ ] Right of Way [ ] applicant is owner

Surface damage assurance if no agreement is in place: [ ] $2000 [ ] $5000 [ ] Blanket Surety ID _____

8. Reclamation Financial Assurance:

[X] Well Surety ID: 20040060 [ ] Gas Facility Surety ID: _____ [ ] Waste Mgnt. Surety ID: _____

9. Cultural:

Is the location in a high density area (Rule 603.b.): Yes [ ] No [X]

Distance, in feet, to nearest building: 2239 , public road: 3048 , above ground utilit: 2239

, railroad: 23000 , property line: 297

10. Current Land Use (Check all that apply):

Crop Land: [ ] Irrigated [ ] Dry land [ ] Improved Pasture [ ] Hay Meadow [ ] CRP

Non-Crop Land: [X] Rangeland [ ] Timber [ ] Recreational [ ] Other (describe): _____

Subdivided: [ ] Industrial [ ] Commercial [ ] Residential

11. Future Land Use (Check all that apply):

Crop Land: [ ] Irrigated [ ] Dry land [ ] Improved Pasture [ ] Hay Meadow [ ] CRP

Non-Crop Land: [X] Rangeland [ ] Timber [ ] Recreational [ ] Other (describe): _____

Subdivided: [ ] Industrial [ ] Commercial [ ] Residential

12. Soils:

List all soil map units that occur within the proposed location. Attach the National Resource Conservation Service (NRCS) report showing the "Map Unit Description" report listing the soil typical vertical profile. This data is to used when segregating topsoil.

The required information can be obtained from the NRCS web site at http://soildatamart.nrcs.usda.gov/ or from the COGCC web site GIS Online map page found at http://colorado.gov/cogcc. Instructions are provided within the COGCC web site help section.

NRCS Map Unit Name: Map Unit Symbol: #56 (potts loam, 6 to 12 percent)

NRCS Map Unit Name: Map Unit Symbol: #66 (torriorthents-camborthids-rock outcrop complex, steep)

NRCS Map Unit Name:

13. Plant Community:

Complete this section only if any portion of the disturbed area of the location's current land use is on non-crop land.

Are noxious weeds present: Yes ☐ No ☒

Plant species from: ☐ NRCS or, ☒ field observation Date of observation: 03/05/2010

List individual species:

Check all plant communities that exist in the disturbed area.

- ☐ Disturbed Grassland (Cactus, Yucca, Cheatgrass, Rye)
- ☐ Native Grassland (Bluestem, Grama, Wheatgrass, Buffalograss, Fescue, Oatgrass, Brome)
- ☒ Shrub Land (Mahogany, Oak, Sage, Serviceberry, Chokecherry)
- ☐ Plains Riparian (Cottonwood, Willow, Aspen, Maple, Poplar, Russian Olive, Tamarisk)
- ☐ Mountain Riparian (Cottonwood, Willow, Blue Spruce)
- ☐ Forest Land (Spruce, Fir, Ponderosa Pine, Lodgepole Pine, Juniper, Pinyon, Aspen)
- ☐ Wetlands Aquatic (Bullrush, Sedge, Cattail, Arrowhead)
- ☐ Alpine (above timberline)
- ☐ Other (describe):

14. Water Resources:

Rule 901.e. may require a sensitive area determination be performed. If this determination is performed the data is to be submitted with the Form 2A.

Is this a sensitive area: ☐ No ☒ Yes Was a Rule 901.e. Sensitive Areas Determination performed: ☒ No ☐ Yes

Distance (in feet) to nearest surface water: 1020 , water well: 1366 , depth to ground water: 120

Is the location in a riparian area: ☒ No ☐ Yes Was an Army Corps of Engineers Section 404 permit filed ☒ No ☐ Yes

Is the location within a Rule 317B Surface Water Suppl Area buffer zone:

☐ No ☐ 0-300 ft. zone ☐ 301-500 ft. zone ☒ 501-2640 ft. zone

If the location is within a Rule 317B Surface Water Supply Area buffer have all public water supply systems within 15 miles been notified: ☐ No ☒ Yes

15. Comments:

This is an existing well pad location. This 2A is being amended to change the drilling pit to a multi-well pit. No additional disturbance is being proposed. The APDs associated with this pad have been approved.

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

Signed: Date: 09/22/2011 Email: mpobuda@billbarrettcorp.com

Print Name: Mary Pobuda Title: Permit Analyst

Based on the information provided herein, this Application for Permit-to-Drill complies with COGCC Rules and applicable orders and is hereby approved.

COGCC Approved: David S. Neslin **Director of COGCC** Date: 10/23/2011

CONDITIONS OF APPROVAL, IF ANY:

All representations, stipulations and conditions of approval stated in this Form 2A for this location shall constitute representations, stipulations and conditions of approval for any and all subsequent operations on the location unless this Form 2A is modified by Sundry Notice, Form 4 or an Amended Form 2A.

MULTI-WELL PIT COAs:

A Form 15 Earthen Pit Permit must be submitted to the COGCC Location Specialist for Western Colorado (Dave Kubeczko; email dave.kubeczko@state.co.us) and approval must be obtained prior to construction of the completion/flowback fluids pit.

The pit shall be closed in accordance with Rule 905. Closure of Pits, and Buried or Partially Buried Produced Water Vessels.

Attachment Check List

Att Doc Num	Name
400207122	FORM 2A SUBMITTED
400207438	CONST. LAYOUT DRAWINGS
400207481	SURFACE AGRMT/SURETY

Total Attach: 3 Files

General Comments

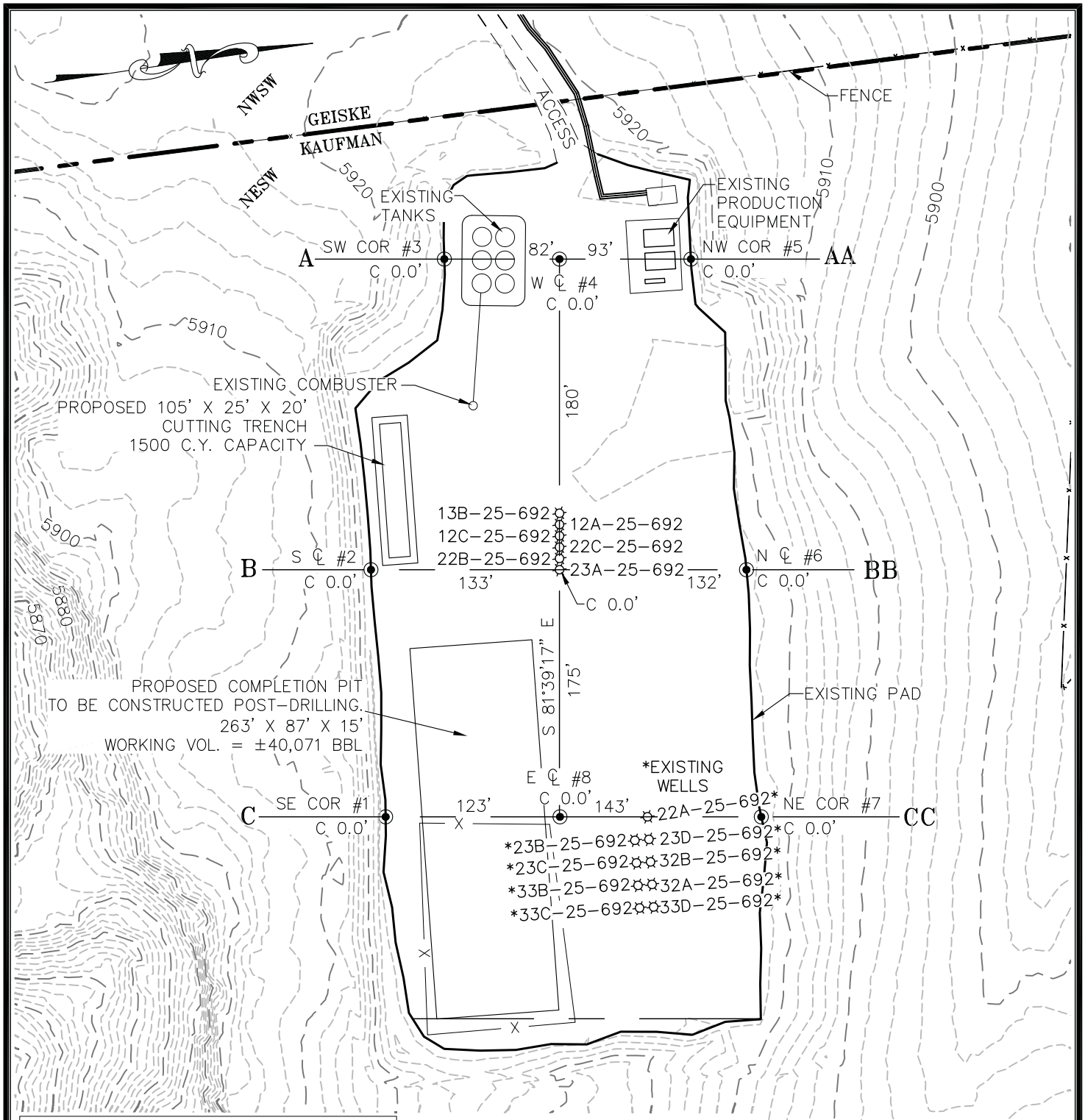
User Group	Comment	Comment Date
Permit	DOW comments above. LGD/pub.comm. waived. This 2A for pit expansion. APD's already approved. Final Comprehensive Review Status--passed.	10/20/2011 11:43:39 AM
DOW	This permit is a request for a multi well pit expansion. CPW requests that Rule 902.D be fully implemented and enforced to meet fence and netting specifications to exclude deer and elk and birds.The pit is located in mapped mule deer critical winter range and elk winter concentration area. Monday, October 17, 2011 at 10:35 a.m.	10/17/2011 10:34:21 AM
OGLA	Initiated/Completed OGLA Form 2A review on 10-10-11 by Dave Kubeczko; previously reviewed and approved From 2A#400055906 and 2A#400163120; same COAs from original permit apply to this permit; fluid containment, spill/release BMPs, lined pits/closed loop, cuttings low moisture content; pit permit required and closure by Rule 905 COAs; passed by CDOW on 10-17-11 with operator submitted BMPs and recommendation of pit fencing/netting acceptable; passed OGLA Form 2A review on 10-19-11 by Dave Kubeczko; fluid containment, spill/release BMPs, lined pits/closed loop, and cuttings low moisture content COAs; pit permit required and closure by Rule 905 COAs.	10/9/2011 7:10:43 PM
Permit	ready to approve in permitting when DOW exp. 11/1.	10/3/2011 10:08:32 AM
Permit	Returned to draft. Right to construct was changed to SUA so now it must be referenced.	9/22/2011 10:26:18 AM
Permit	Returned to draft. Surface owner must also be a mineral owner in order to be committed to an oil and gas lease.	9/22/2011 9:51:27 AM

Total: 6 comment(s)

BMP

Type	Comment

Total: 0 comment(s)



ESTIMATED DIRT QUANTITIES				
ITEM	CUT	FILL	TOPSOIL	EXCESS
PAD	0	0	0	0
TOTALS	0	0	0	0

NOTES:
1) NO ADDITIONAL PAD EXCAVATION WILL BE DONE FOR PHASE II WELLS.
2) WELL SPACING IS 8 FT.
3) CUTTINGS TRENCH VOLUME IS BASED ON 250 C.Y. PER WELL.

ECLIPSE surveying
111 E. THIRD ST., SUITE 208, RIFLE, CO 81650
(970) 625-3048

REV. DATE:	5/03/11
SCALE:	1" = 100'
DATE:	03/15/10
SHEET:	1 OF 7
PROJECT:	KAUF1
DFT:	JAK

Bill Barrett Corporation

KAUFMAN PAD 1 PHASE II
GRADING PLAN & PAD LAYOUT

Reception#: 758784
11/17/2008 03:44:45 PM Jean Alberico
1 of 3 Rec Fee:$16.00 Doc Fee:0.00 GARFIELD COUNTY CO

MEMORANDUM OF
SURFACE DAMAGE AND RELEASE AGREEMENT

WHEREAS on the date notarized as referenced below and effective the 1st day of August, 2008, **William G. Kaufman, Janette Kaufman, Donald J. Kaufman and Diana Kaufman**, ("Owner") entered into a Surface Damage and Release Agreement with **Bill Barrett Corporation**, ("Operator"), covering the below described lands in Garfield County, Colorado ("Surface Use Agreement").

Township 6 South, Range 91 West, 6th P.M.
SECTION 30: That portion of Lots1 (NWNW) and 2 (SWNW)lying South and West of County Road No. 311; and portion of Lot 3 described in Warranty Deed dated March 3, 1987, recorded in Book 706, Page 851, containing 70.75 acres, more or less in Garfield County, Colorado

TOWNSHP 6 SOUTH – RANGE 92 WEST, 6TH P.M.
SECTION 24: NW/4SE/4, SW/4NE/4, SESE
SECTION 25: N/2, N/2SW/4, NE/4SE/4, THAT PART OF NW/4SE/4 LYING NORTH AND WEST OF DIVIDE CREEK

WHEREAS said Surface Damage and Release Agreement provides for, among other things, the right to enter upon and use the Owners' property for the purpose of accessing wellsites and related facilities and the drilling, maintaining and operating of wells and associated facilities upon the above described lands of Owner and lands adjacent thereto. Said Damage and Release Agreement sets forth payment of specific amounts to cover damages resulting from the construction, use and maintenance of the well site location(s). Said Surface Use Agreement, with all of its terms, conditions, covenants and other provisions, is referred to and incorporated into this Memorandum for all purposes; and,

WHEREAS, Said Surface Use Agreement further provides that Owner has waived all thirty (30) day notices as required by the COGCC for ensuing APDs and as may be required under consultation provisions of the COGCC Rule 305 and 306; and,

WHEREAS, Said Surface Use Agreement further provides that Owner has waived the pad restriction of COGCC Order Numbers 191-8 and 191-10 for the purpose of allowing a maximum of two drilling pads to be located in the NW/4 SW/4 of Section 24, T6S, R92W and the NWNW of Section 30, T6S, R91W; and,

WHEREAS, Owner and Operator have negotiated and agreed to the location of drilling pads as depicted on the Plan of Development Map attached hereto as Exhibit "A". The parties also acknowledge that COGCC Order Numbers 191-8 and 191-10 the number of pads to one drilling pad per governmental quarter section of land; however, due to topographical constraints and other concerns its is necessary that two pads (or a portion thereof) be located in the NW/4 SW/4 of Section 24, T6S, R92W and the NWNW of Section 30, T6S, R91W. Therefore, Owner hereby waives the pad restriction of said order and hereby consents to the request for a variance in COGCC Order Numbers 191-8 and 191-10 for the purpose of allowing a maximum of two drilling pads in the foregoing governmental quarter quarters section of land. Should the pad locations in Exhibit "A" need to be relocated or reconfigured for any reason, OPERATOR agrees to consult with owner prior to such relocation. Owner also agrees not to request or consent to any permit-specific condition recommended or selected by the COGCC or its Director that is related to wildlife habitat or resources issues unless the permit-specific condition is both acceptable to OPERATOR and consistent with the terms of this Agreement. In the event a waiver or other letter is necessary to confirm the provisions of this paragraph, or the terms of this Agreement, Owner shall, upon the request of OPERATOR, execute and provide an appropriate letter.

Reception#: 758784
11/17/2008 03:44:45 PM Jean Alberico
2 of 3 Rec Fee:$16.00 Doc Fee:0.00 GARFIELD COUNTY CO

WHEREAS, Said Surface Use Agreement, with all of its terms, conditions, covenants and other provisions, is referred to and incorporated into this Memorandum for all purposes

NOW THEREFORE this Memorandum is placed of record for the purpose of giving notice of the Surface Damage and Release Agreement.

Owner:

William G. Kaufman

Janette Kaufman

Donald J. Kaufman

Diana Kaufman

Operator:

Bill Barrett Corporation

By:
Huntington T. Walker
Senior Vice-President – Land

Reception#: 758784
11/17/2008 03:44:45 PM Jean Alberico
3 of 3 Rec Fee:$16.00 Doc Fee:0.00 GARFIELD COUNTY CO

ACKNOWLEDGEMENTS
TO
MEMORANDUM OF SURFACE DAMAGE AND RELEASE AGREEMENT

STATE OF COLORADO }
COUNTY OF DENVER } **SS**

On this 7th day of October 2008, before me personally appeared Huntington T. Walker, known to me to be the Senior Vice President – Land for BILL BARRETT CORPORATION and that he executed the within and foregoing instrument, and acknowledged the said instrument to be the free and voluntary act and deed of said corporation, for the uses and purposes therein set forth.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal the day and year first above written.

My Commission Expires: 9/12/2010

Notary Public

STATE OF COLORADO }
COUNTY OF GARFIELD } **SS**

On this 8 day of October, 2008, before me, a Notary public in and for said State and County, personally appeared William G. Kaufman and Janette Kaufman, known to me and being the same parties who executed the above instrument in their individual capacity and acknowledged to me that such corporation executed the same.

Notary Public

My Commission Expires 03/23/09

STATE OF COLORADO }
COUNTY OF GARFIELD } **SS**

On this 8 day of October, 2008, before me, a Notary public in and for said State and County, personally appeared Donald J. Kaufman and Diana Kaufman, known to me and being the same parties who executed the above instrument in their individual capacity and acknowledged to me that such corporation executed the same.

Notary Public

My Commission Expires 7-23-2009

After document is recorded please return to:
Bill Barrett Corporation
Attn: Cindy Sandell
1099 18th Street, Suite 2300, Denver, CO 80202