

FORM 15 Rev 6/99

PIT ID: PT7199



State of Colorado Oil and Gas Conservation Commission

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



RECEIVED FEB 2 - 2012 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

FORM SUBMITTED FOR:

Pit Report Pit Permit

Attachment Checklist table with items like Detailed Site Plan, Topo Map, etc.

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

Contact Name and Telephone: Karolina Blaney No: (970) 589-0743 Fax: (970) 285-9573

API Number (of associated well): NA OGCC Facility ID (of other associated facility): Form 2A # 400231362

Pit Location (Qtr Qtr, Sec, Twp, Rng, Meridian): SWSW 54 T7S R94W 6pm

Latitude: 39.460272 Longitude: 107.90133 County: Garfield

Pit Use: Production Drilling (Attach mud program) Special Purpose (Describe Use): Multi-Well

Pit Type: Lined Unlined Surface Discharge Permit: Yes No

Offsite disposal of pit contents: Injection Commercial Pit/Facility Name: SPRUCE CREEK Pit/Facility No: 14-4-714

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: 386 ground water: 210 water wells: 266

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 Per 2A Rangeland

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

Soil map units from USNRCS survey: Sheet No: Soil Complex/Series No: 69

Soils Series Name: Potts Horizon thickness (in inches): A: 0-4 ; B: 4-28 ; C: 28-60

Soils Series Name: Ildefonso Horizon thickness (in inches): A: 0-8 ; B: 8-60 ; C:

Attach detailed site plan and topo map with pit location.

Pit Design and Construction

Size of pit (feet): Length: 440 Width: 180 Depth: 16

Calculated pit volume (bbls): 95,000 Daily Inflow rate (bbls/day): varies

Daily disposal rates (attach calculations): Evaporation: 145 bbls/day Percolation: none bbls/day

Type of liner material: See attached specifications Thickness: See attached specifications

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): gravity separation tanks

Is pit fenced? Yes No Is pit netted? Yes No

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

Print Name: Karolina Blaney Signed: Karolina Blaney

Title: Environmental Specialist Date: 12/6/2011

OGCC Approved: David Kulis Title: Location Assessment Specialist Date: 02/15/2012

CONDITIONS OF APPROVAL, IF ANY:

FACILITY NUMBER: 427583

**Williams Production RMT, Spruce Creek Production Pit 14-4-794, SWSW Sec 4  
T7S R94W, Garfield County, Form 2A (#400231362); Form 15 Pit Permit  
Conditions of Approval, Pit Facility Number: 427583**

**COA 90** - Notify COGCC Oil and Gas Location Assessment (OGLA) Specialist for Western Colorado (Dave Kubeczko; email [dave.kubeczko@state.co.us](mailto:dave.kubeczko@state.co.us)) and the COGCC Field Inspection Supervisor for Northwest Colorado (Shaun Kellerby; email [shaun.kellerby@state.co.us](mailto:shaun.kellerby@state.co.us)) 48 hours prior to start of construction of the pad and pit.

**COA 22** - After installation of the uppermost liner and prior to operating the pit, the synthetic liner(s) shall be tested by filling the pit with at least 12 feet of fresh and/or produced water, measured from the base of the pit (not to exceed the 2-foot freeboard requirement). The operator shall monitor the pit for leaks for a period of 72 hours prior to draining the pit and commencing operations. The leak detection system must also be monitored during the entire test. Operator shall notify the COGCC Oil and Gas Location Assessment (OGLA) Specialist for Western Colorado (Dave Kubeczko; email [dave.kubeczko@state.co.us](mailto:dave.kubeczko@state.co.us)) 48 hours prior to start of the hydrotest. Hydrotest monitoring results must be maintained by the operator for the life of the pit and provided to COGCC prior to using the pit.

**COA 67** - In lieu of conducting an initial hydrostatic test of the pit, the operator can monitor fluid levels in the pit continuously using a minimum of two pressure transducers located at the upgradient and downgradient ends of the pit (based on the original topographic profile). These pressure transducers should be linked to the operator's SCADA system such that they can be remotely monitored. In addition, the pit liner will be marked at the two foot freeboard depth line so that operations personnel (as well as COGCC inspectors) can easily verify that the required fluid free board is being maintained. The electronically collected water level measurement data shall be used to confirm changes in pit inflow and outflow during operations based on estimates from truck and/or pipeline delivery or removal activities. Any abnormalities that are noticed during operations will be reported to the operator's field supervisor immediately so that any necessary follow-up can be scheduled.

**COA 23** - Operator must ensure 110 percent secondary containment for any volume of fluids contained at the water handling facility site during natural gas development activities and operations; including, but not limited to, construction of a berm or diversion dike, diversion/collection trenches within and/or outside of berms/dikes, site grading, or other comparable measures (i.e., best management practices (BMPs) associated with stormwater management) sufficiently protective of nearby surface water. Any berm constructed at the well pad location will be stabilized, inspected at regular intervals (at least every 14 days), and maintained in good condition.

**COA 5** - Operator must implement best management practices to contain any unintentional release of fluids, including any fluids conveyed via buried or temporary surface pipelines.

**COA 39** - No portion of any pit that will be used to hold liquids shall be constructed on fill material, unless the pit and fill slope are designed and certified by a professional engineer, subject to review and approval by the director prior to construction of the pit. The construction and lining of the pit shall be supervised by a professional engineer or their agent. The entire base of the pit must be in cut.

**COA 47** - The production pit must be double-lined. The pit will also require a leak detection system (Rule 904.e).

**COA 66** - Delivery and vacuum truck hoses will not be allowed to be placed directly onto the pit liner. Operator will construct a loading/unloading station located next to the pit, to deliver fluids to or remove fluids from the pit by truck. The loading/unloading station shall be designed and utilized to

prevent hoses from being dropped into the pits and dragged over the liner, which could lead to liner damage. The loading/unloading station will be the only permitted access for manual fluids transfers to or from the pit. Vehicles will not be allowed to approach the pit any closer than the loading/unloading station. Each station will have a catch basin in case a leak occurs while operations personnel are connecting or disconnecting hoses. Signs clearly marking the truck loading/unloading station shall be provided and maintained by the operator.

**COA 48** - Operator must submit a professional engineer (PE) approved/stamped as-built drawing (plan view and cross-sections) of the production pit within 14 calendar days of construction.

**COA 49** - The production pit must be fenced and netted. The operator must maintain the fencing and netting until the pit is closed in accordance with Rule 905. Closure of Pits, and Buried or Partially Buried Produced Water Vessels.

**COA 11** - Operator shall pressure test pipelines in accordance with Rule 1101.e.(1) prior to putting into initial service any temporary surface pipelines or configuration of the permanent pipeline network.

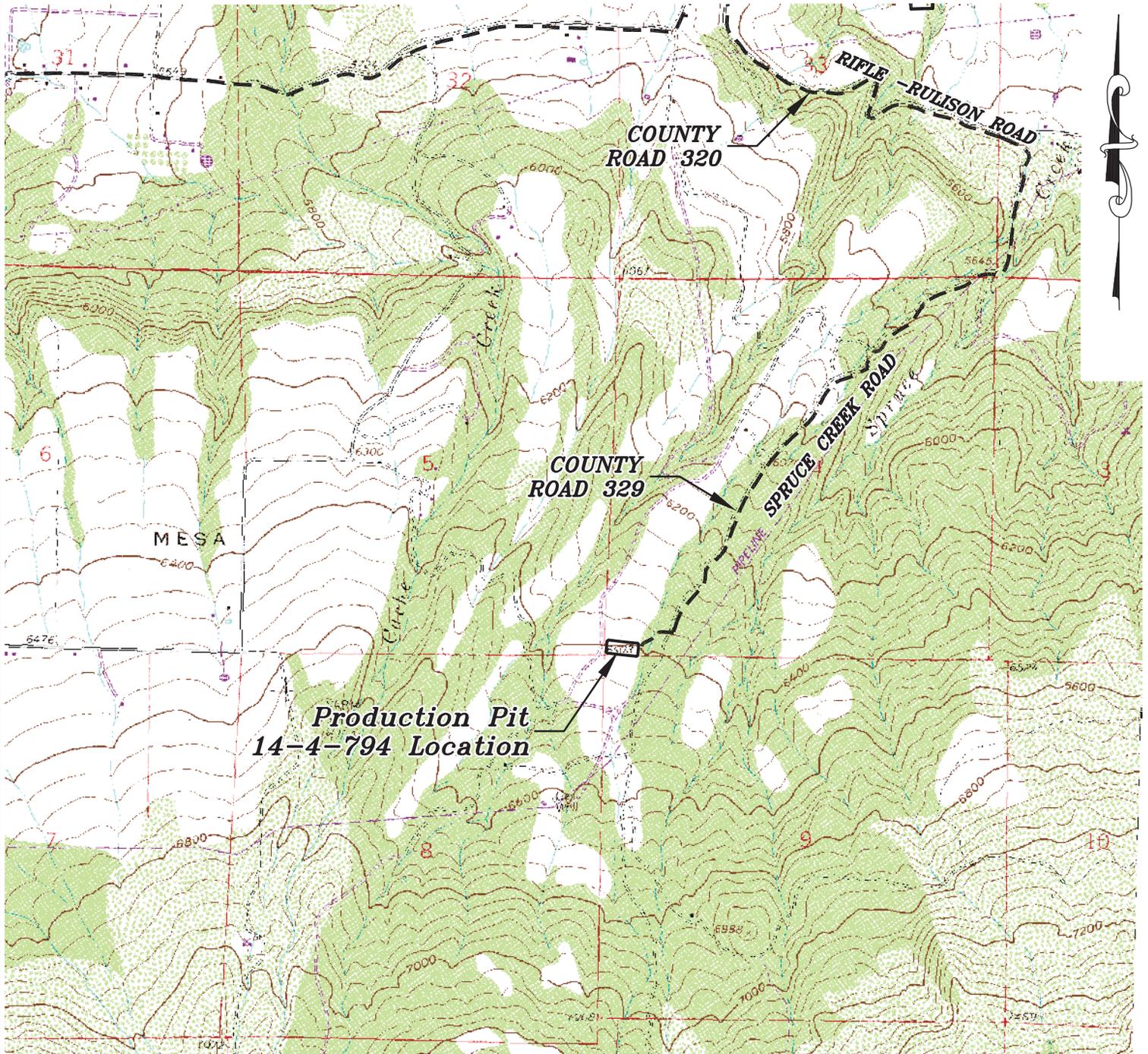
**COA 19** - This production pit will comply with **Rule 902. PITS - GENERAL AND SPECIAL RULES. e.** Pits used for a period of no more than three (3) years for storage, recycling, reuse, treatment, or disposal of E&P waste or fresh water, as applicable, may be permitted in accordance with **Rule 903** to service multiple wells.

**COA 27** - Submit disposal facilities (wells, pits, landfills, etc.) for pit contents since none were provided on the Form 15, to COGCC via a Form 4 Sundry prior to disposal.

**COA 20** - The operator will conduct baseline sampling of the domestic/irrigation water well (Permit No. 228041 - - 4508058-Williams Well, total depth of 210 feet bgs, depth to groundwater of 176 feet bgs, and a pumping rate of 8 gpm) located approximately 266 feet to the east-northeast, prior to pit operation. The operator may conduct additional groundwater monitoring at their own discretion. This water well will also be sampled every 12 months to evaluate potential impacts from pit operations. Laboratory analysis at a minimum will include the following: pH (lab), TDS, specific conductivity (lab, not resistivity), SAR calculation, Ca, K, Mg, Na, As, B, Ba, Cd, Cr, Cu, Fe, Mn, Pb, Se (all total recoverable), Br, Cl, F, SO<sub>4</sub>, Alkalinity (Total, HCO<sub>3</sub> and CO<sub>3</sub> – all expressed as CaCO<sub>3</sub>), BTEX (benzene, toluene, ethyl benzene, o-xylene, m- + p-xylene), MBAS, DRO, GRO, and field parameters including pH, temperature, and specific conductivity (SC) shall be recorded prior to collecting the sample for laboratory analysis. Field observations such as odor, water color, sediment, bubbles and effervesce shall also be included. Copies of all test results, field parameters and field observations described above shall be provided to the Director, LGD, and the water well owner within three (3) months of collecting the sample. The analytical data and surveyed sample location shall also be submitted to the Director in an electronic data deliverable format.

**COA 91** - At the time of pit closure, operator must submit disposal information via a Form 4 Sundry Notice to the COGCC Location Specialist for Western Colorado (Dave Kubeczko; email [dave.kubeczko@state.co.us](mailto:dave.kubeczko@state.co.us)). The disposal method will need to be approved prior to operator starting pit closure. In addition, operator will collect a pit water sample and, at a minimum, analyze for the following parameters: pH; alkalinity; specific conductance; major cations/anions (chloride, fluoride, sulfate, sodium); total dissolved solids (TDS); BTEX/DRO; TPH; PAH's (including benzo[a]pyrene); and metals (arsenic, barium, calcium, chromium, iron, magnesium, selenium). At the time of closure/disposal of pit water, COGCC may require additional analytes, as appropriate.

## Topo Map with Pit Location



GRAPHIC SCALE IN FEET  
1 INCH = 2000 FEET

**ACCESS DESCRIPTION:**

FROM THE INTERSECTION OF STATE HIGHWAY 6 AND COUNTY ROAD 323 (RULISON ROAD) NORTH OF RULISON, PROCEED SOUTHERLY ALONG COUNTY ROAD 323 (RULISON ROAD) ±1.1 MILES TO THE INTERSECTION WITH COUNTY ROAD 309 (RULISON PARACHUTE ROAD), PROCEED LEFT IN AN EASTERLY DIRECTION ±2.3 MILES TO THE INTERSECTION WITH COUNTY ROAD 320 (RIFLE RULISON ROAD), PROCEED RIGHT IN AN EASTERLY DIRECTION ±1.0 MILES TO THE INTERSECTION WITH COUNTY ROAD 329 (SPRUCE CREEK ROAD), PROCEED RIGHT IN A SOUTHERLY DIRECTION ±1.8 MILES TO AN INTERSECTION WITH A DIRT/GRAVEL ROAD, PROCEED RIGHT IN A WESTERLY DIRECTION TO THE 14-4-794 PRODUCTION PIT LOCATION, AS SHOWN HEREON.

SCALE: 1" = 2000'  
DATE: 11/22/11  
PLAT: 3 of 4  
PROJECT: Williams Valley  
DFT: cws

Construction Plan Prepared for:  
**Williams** Williams Production, RMT

Production Pit 14-4-794 - Plat 5  
ACCESS ROAD MAP

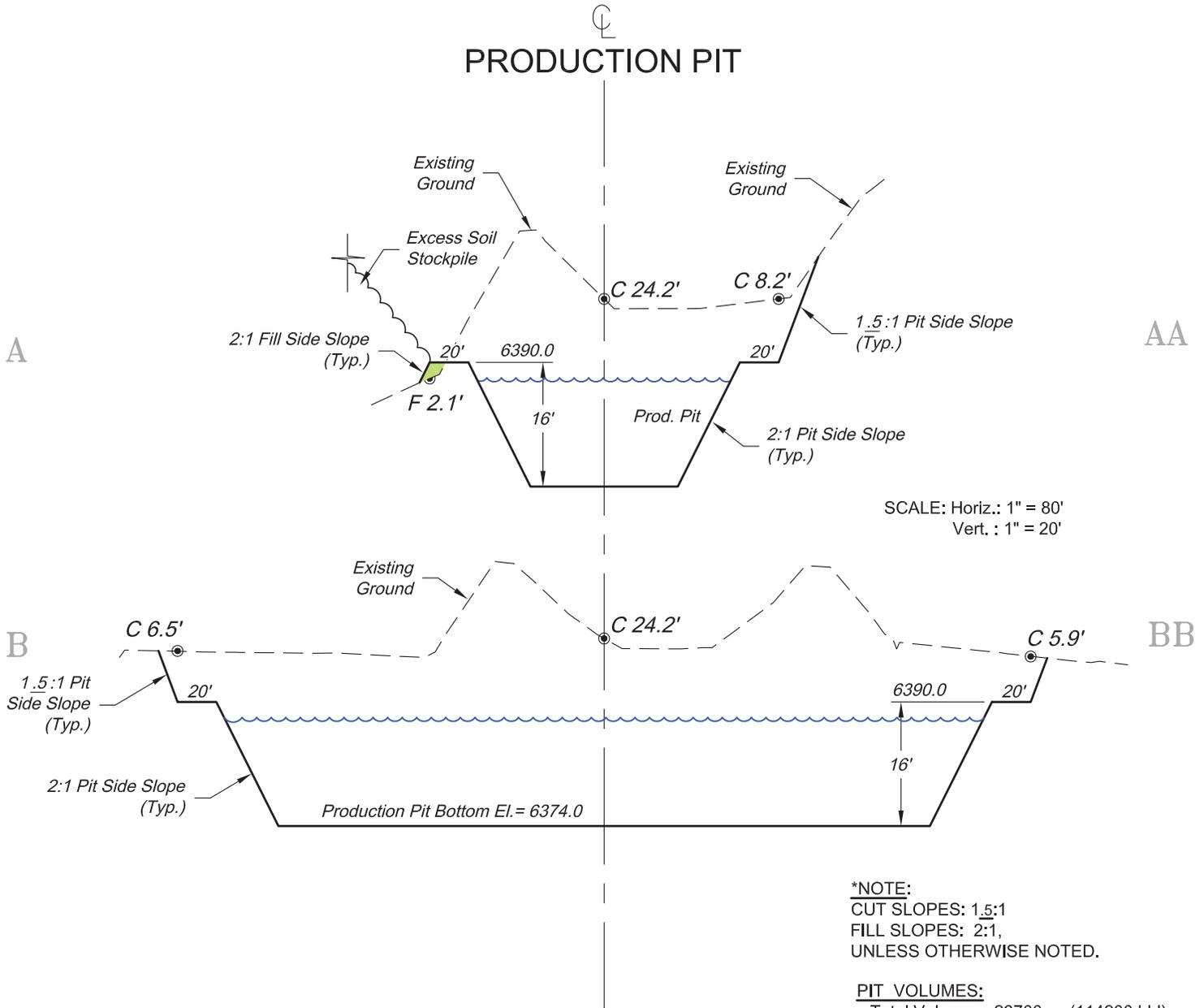
136 East Third Street  
Rifle, Colorado 81650  
Ph. (970) 625-2720  
Fax (970) 625-2773



Detailed Site Plan  
Pit Design Plan and Cross Sections



# PRODUCTION PIT



**\*NOTE:**  
CUT SLOPES: 1.5:1  
FILL SLOPES: 2:1,  
UNLESS OTHERWISE NOTED.

**PIT VOLUMES:**  
Total Volume: 23700 cy (114200 bbl)  
2' Free Board: 19700 cy (95000 bbl)

**EXIST. STOCK POND VOLUME:**  
Total Volume: 3610 cy (17300 bbl)

SCALE: As Noted  
DATE: 11/22/11  
PLAT: 2 of 4  
PROJECT: Williams Valley  
DFT: cws

Construction Plan Prepared for:  
**Williams** Williams Production, RMT  
*Production Pit 14-4-794  
CONSTRUCTION LAYOUT  
CROSS SECTIONS*

136 East Third Street  
Rifle, Colorado 81650  
Ph. (970) 625-2720  
Fax (970) 625-2773



## Sensitive Area Determination

## Sensitive Area Determination Checklist

Williams Production RMT Company		
<b>Person(s) Conducting Field Inspection</b>	Jennifer Belcastro	12/02/11
	<i>Environmental Scientist</i>	
<b>Site Information</b>		
Location:	Spruce Creek	Time: 1300
Type of Facility:	Proposed Production Pit	
<b>Environmental Conditions</b>	Overcast with frozen ground conditions.	
Temperature (°F)	41°	

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

Yes       No

### SURFACE WATER

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

Yes       No

If yes, list type of surface water feature(s), i.e. rivers, creeks, streams, seeps, springs, wetlands: Three (3) unnamed USGS identified intermittent drainages.

If yes, describe location relative to facility: One unnamed USGS identified intermittent drainage is located 911 feet northwest and two USGS identified intermittent drainages are located 395 and 1,000 feet respectively to the east southeast of the of the proposed facility.

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

Yes       No

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

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

Low       High

## GROUNDWATER

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

## **Additional Comments:**

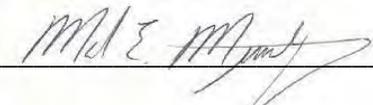
As stated in the surface water section of this sensitive area determination, there are three USGS identified unnamed intermittent drainages within a quarter (1/4) mile of the proposed facility. The greatest potential for impact to surface water features is to the unnamed intermittent drainage located 395 feet to the east southeast of the proposed facility. By COGCC decision this would classify the facility as being in a sensitive area. However, the facility as it is currently proposed, limits the direction of a potential release to the northern side. If a release were to migrate off the facility it would tend to flow to the north northeast following the natural contours of the area. Flow would tend to be parallel to the unnamed intermittent drainage. In addition, the drainage itself has a poorly defined channel and has a fairly heavily vegetated bottom indicating it does not flow a majority of the time. It is not anticipated that the drainage to the northwest would be impacted by a potential release from the facility. As stated above, flow would be parallel to the drainage and a majority of impact would be limited to the open field to the north. The second unnamed intermittent drainage to the east southeast of the proposed facility would not be impacted by any potential release. A ridgeline separates this drainage from the facility thus preventing any potential release from impacting it. It is strongly recommended that Best Management Practices (BMPs) be installed along the fill slope edges of the proposed facility. BMPs in the form of an earthen perimeter berm should be installed along the edge of the proposed facility and a diversion ditch should be constructed along the toe of the fill slope to contain any fluids that could potentially migrate off site. These should be monitored and maintained to ensure sight containment in the event of a potential release.

The State Engineers office and USGS records were reviewed and it was revealed that there is one (1) permitted water well located 263 feet northeast of the facility. Based on its location, it appears the well is utilized for providing water to livestock. The depth to groundwater in the well is 176 feet. The vegetative cover in the immediate vicinity of the proposed facility did not suggest the presence of shallow groundwater. No seeps or springs were identified during the site investigation.

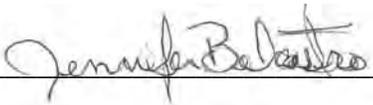
Based on the information collected during the site investigation and desktop review, the potential to impact surface water features has been deemed low. Although the permitted water well is located 263 to the northeast of the proposed facility, the depth to groundwater is fairly deep and it is not anticipated that it will be impacted by the proposed facility. An overland release would not impact the well due to the short duration of time involved and the fact it would tend to spread out over a large area based on the topography of the area. The greatest potential for impact to the well would be from a release that occurred over a longer period of time such as a leaking pit. Therefore, the proposed pit on this location should be constructed and lined as outlined in COGCC rule 904. The pit should also be hydro tested for a minimum of 72 hours before any production liquids are placed into it. It would also be recommended that a baseline water quality sample be collected from the well prior to filling the pit. In addition, periodic monitoring of the well should be conducted to ensure that no fluids from the proposed facility are impacting



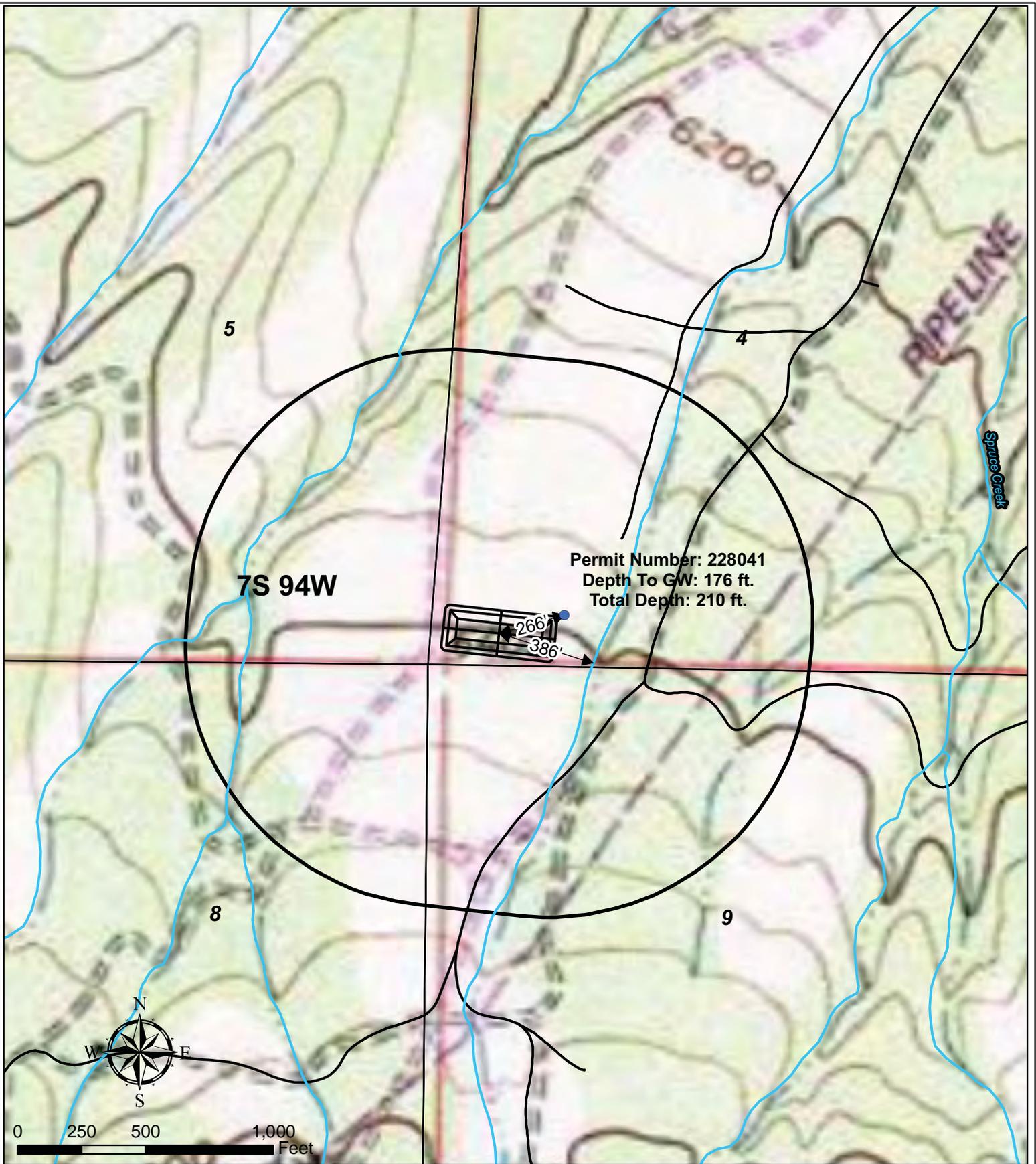
groundwater. With the potential to impact both surface and groundwater deemed to be low, and if the above recommendations are implemented, the facility can be designated as being located in a non-sensitive area.

Inspector Signature(s):  Date: 12/05/2011

Mark E. Mumby, *Project Manager/RPG*  
HRL Compliance Solutions, Inc.

 Date: 12/02/2011

Jennifer Belcastro, *Environmental Scientist*  
HRL Compliance Solutions, Inc.



**Legend**

- Water Well
- Pad
- Stream
- 1000' Buffer

Williams Production RMT

Plat 5C  
 Spruce Creek Production Pit 14-4-794  
 Hydrology Map

T7S R94W, Section 4



**Williams Production RMT, Spruce Creek Production Pit 14-4-794, SWSW Sec 4  
T7S R94W, Garfield County, Form 2A (#400231362)**

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
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Document Number:  
400231362

Oil and Gas Location Assessment

New Location       Amend Existing Location      Location#: \_\_\_\_\_

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:

Expiration Date:

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: 96850  
 Name: WILLIAMS PRODUCTION RMT COMPANY LLC  
 Address: 1001 17TH STREET - SUITE #1200  
 City: DENVER State: CO Zip: 80202

3. Contact Information

Name: Howard Harris  
 Phone: (303) 606-4086  
 Fax: (303) 629-8268  
 email: howard.harris@williams.com

4. Location Identification:

Name: Spruce Cr. Production Pit Number: 14-4-794  
 County: GARFIELD  
 Quarter: SWSW Section: 4 Township: 7S Range: 94W Meridian: 6 Ground Elevation: 6390

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: 143 feet FSL, from North or South section line, and 258 feet FWL, from East or West section line.  
 Latitude: 39.460272 Longitude: -107.901133 PDOP Reading: 2.3 Date of Measurement: 10/04/2011  
 Instrument Operator's Name: J. Kirkpatrick

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

Special Purpose Pits: <input type="checkbox"/>	Drilling Pits: <input type="checkbox"/>	Wells: <input type="checkbox"/>	Production Pits: <input type="checkbox"/>	Dehydrator Units: <input type="checkbox"/>
Condensate Tanks: <input type="checkbox"/>	Water Tanks: <input type="checkbox"/>	Separators: <input type="checkbox"/>	Electric Motors: <input type="checkbox"/>	Multi-Well Pits: <input type="checkbox"/>
Gas or Diesel Motors: <input type="checkbox"/>	Cavity Pumps: <input type="checkbox"/>	LACT Unit: <input type="checkbox"/>	Pump Jacks: <input type="checkbox"/>	Pigging Station: <input type="checkbox"/>
Electric Generators: <input type="checkbox"/>	Gas Pipeline: <input type="checkbox"/>	Oil Pipeline: <input type="checkbox"/>	Water Pipeline: <input type="checkbox"/>	Flare: <input type="checkbox"/>
Gas Compressors: <input type="checkbox"/>	VOC Combustor: <input type="checkbox"/>	Oil Tanks: <input type="checkbox"/>	Fuel Tanks: <input type="checkbox"/>	

Other: \_\_\_\_\_

6. Construction:

Date planned to commence construction: 04/01/2012 Size of disturbed area during construction in acres: 4.60  
 Estimated date that interim reclamation will begin: 09/01/2012 Size of location after interim reclamation in acres: 0.00  
 Estimated post-construction ground elevation: 6390 Will a closed loop system be used for drilling fluids: Yes   
 Will salt sections be encountered during drilling: Yes  No  Is H2S anticipated? Yes  No   
 Will salt (>15,000 ppm TDS Cl) or oil based muds be used: Yes  No   
 Mud disposal: Offsite  Onsite  Method: Land Farming  Land Spreading  Disposal Facility   
 Other: NA

**7. Surface Owner:**

Name: Williams Phone: \_\_\_\_\_  
 Address: 1001 17th Street, Ste 1200 Fax: \_\_\_\_\_  
 Address: \_\_\_\_\_ Email: \_\_\_\_\_  
 City: Denver State: CO Zip: 80202 Date of Rule 306 surface owner consultation: \_\_\_\_\_  
 Surface Owner:  Fee  State  Federal  Indian  
 Mineral Owner:  Fee  State  Federal  Indian  
 The surface owner is:  the mineral owner  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  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:**

Well Surety ID: 20030107  Gas Facility Surety ID: \_\_\_\_\_  Waste Mgnt. Surety ID: \_\_\_\_\_

**9. Cultural:**

Is the location in a high density area (Rule 603.b.): Yes  No   
 Distance, in feet, to nearest building: 3300, public road: 542, above ground utilit: 3370  
 , railroad: 13700, property line: 143

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

Crop Land:  Irrigated  Dry land  Improved Pasture  Hay Meadow  CRP  
 Non-Crop Land:  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:  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: 69 Vale Silt Loam, 6 to 12% slopes  
NRCS Map Unit Name: \_\_\_\_\_  
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: \_\_\_\_\_  
List individual species: Cheatgrass

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: 386, water well: 266, depth to ground water: 176

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 location Assessment form 2A is being submitted for construction of a production pit to be used for both completions and production operations. A form 15 pit permit with supporting attachments will be submitted separately for this facility. Surface location is owned by Williams. Referencee area photos will be provided at a later date. The center of the pit is designated as the location reference point from which all measurements were taken.

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

Signed: \_\_\_\_\_ Date: 01/05/2012 Email: howard.harris@williams.com

Print Name: Howard Harris Title: Sr. Regulatory Specialist

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: \_\_\_\_\_ Director of COGCC Date: \_\_\_\_\_

**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.**

**SITE SPECIFIC COAs:**

Notify COGCC Oil and Gas Location Assessment (OGLA) Specialist for Western Colorado (Dave Kubeczko; email dave.kubeczko@state.co.us) and the COGCC Field Inspection Supervisor for Northwest Colorado (Shaun Kellerby; email shaun.kellerby@state.co.us) 48 hours prior to start of construction of the pad and pit.

After installation of the uppermost liner and prior to operating the pit, the synthetic liner(s) shall be tested by filling the pit with at least 12 feet of fresh and/or produced water, measured from the base of the pit (not to exceed the 2-foot freeboard requirement). The operator shall monitor the pit for leaks for a period of 72 hours prior to draining the pit and commencing operations. The leak detection system must also be monitored during the entire test. Operator shall notify the COGCC Oil and Gas Location Assessment (OGLA) Specialist for Western Colorado (Dave Kubeczko; email dave.kubeczko@state.co.us) 48 hours prior to start of the hydrotest. Hydrotest monitoring results must be maintained by the operator for the life of the pit and provided to COGCC prior to using the pit.

In lieu of conducting an initial hydrostatic test of the pit, the operator can monitor fluid levels in the pit continuously using a minimum of two pressure transducers located at the upgradient and downgradient ends of the pit (based on the original topographic profile). These pressure transducers should be linked to the operator's SCADA system such that they can be remotely monitored. In addition, the pit liner will be marked at the two foot freeboard depth line so that operations personnel (as well as COGCC inspectors) can easily verify that the required fluid free board is being maintained. The electronically collected water level measurement data shall be used to confirm changes in pit inflow and outflow during operations based on estimates from truck and/or pipeline delivery or removal activities. Any abnormalities that are noticed during operations will be reported to the operator's field supervisor immediately so that any necessary follow-up can be scheduled.

Delivery and vacuum truck hoses will not be allowed to be placed directly onto the pit liner. Operator will construct a loading/unloading station located next to the pit, to deliver fluids to or remove fluids from the pit by truck. The loading/unloading station shall be designed and utilized to prevent hoses from being dropped into the pits and dragged over the liner, which could lead to liner damage. The loading/unloading station will be the only permitted access for manual fluids transfers to or from the pit. Vehicles will not be allowed to approach the pit any closer than the loading/unloading station. Each station will have a catch basin in case a leak occurs while operations personnel are connecting or disconnecting hoses. Signs clearly marking the truck loading/unloading station shall be provided and maintained by the operator.

This production pit will comply with Rule 902. PITS - GENERAL AND SPECIAL RULES. e. Pits used for a period of no more than three (3) years for storage, recycling, reuse, treatment, or disposal of E&P waste or fresh water, as applicable, may be permitted in accordance with Rule 903 to service multiple wells.

Operator must ensure 110 percent secondary containment for any volume of fluids contained at the water handling facility site during natural gas development activities and operations; including, but not limited to, construction of a berm or diversion dike, diversion/collection trenches within and/or outside of berms/dikes, site grading, or other comparable measures (i.e., best management practices (BMPs) associated with stormwater management) sufficiently protective of nearby surface water. Any berm constructed at the well pad location will be stabilized, inspected at regular intervals (at least every 14 days), and maintained in good condition.

Operator must implement best management practices to contain any unintentional release of fluids, including any fluids conveyed via buried or temporary surface pipelines.

No portion of any pit that will be used to hold liquids shall be constructed on fill material, unless the pit and fill slope are designed and certified by a professional engineer, subject to review and approval by the director prior to construction of the pit. The construction and lining of the pit shall be supervised by a professional engineer or their agent. The entire base of the pit must be in cut.

The completion/flowback fluids multi-well pit must be double-lined. The pit will also require a leak detection system (Rule 904.e).

Operator must submit a professional engineer (PE) approved/stamped as-built drawing (plan view and cross-sections) of the completion/flowback pit within 14 calendar days of construction.

The nearby hillside and any fill-material bermed portions of the pit must be monitored for any day-lighting of fluids throughout pit operations.

The pit must be fenced and netted. The operator must maintain the fencing and netting until the pit is closed in accordance with Rule 905. Closure of Pits, and Buried or Partially Buried Produced Water Vessels.

Operator shall pressure test pipelines in accordance with Rule 1101.e.(1) prior to putting into initial service any temporary surface pipelines or configuration of the permanent pipeline network.

Submit disposal facilities (wells, pits, landfills, etc.) for pit contents since none were provided on the Form 15, to COGCC via a Form 4 Sundry prior to disposal.

The operator will conduct baseline sampling of the domestic/irrigation water well (Permit No. 228041 - - 4508058 -Williams Well, total depth of 210 feet bgs, depth to groundwater of 176 feet bgs, and a pumping rate of 8 gpm) located approximately 266 feet to the east-northeast, prior to pit operation. The operator may conduct additional groundwater monitoring at their own discretion. This water well will also be sampled every 12 months to evaluate potential impacts from pit operations. Laboratory analysis at a minimum will include the following: pH (lab), TDS, specific conductivity (lab, not resistivity), SAR calculation, Ca, K, Mg, Na, As, B, Ba, Cd, Cr, Cu, Fe, Mn, Pb, Se (all total recoverable), Br, Cl, F, SO<sub>4</sub>, Alkalinity (Total, HCO<sub>3</sub> and CO<sub>3</sub> – all expressed as CaCO<sub>3</sub>), BTEX (benzene, toluene, ethyl benzene, o-xylene, m- + p-xylene), MBAS, DRO, GRO, and field parameters including pH, temperature, and specific conductivity (SC) shall be recorded prior to collecting the sample for laboratory analysis. Field observations such as odor, water color, sediment, bubbles and effervesce shall also be included. Copies of all test results, field parameters and field observations described above shall be provided to the Director, LGD, and the water well owner within three (3) months of collecting the sample. The analytical data and surveyed sample location shall also be submitted to the Director in an electronic data deliverable format.

At the time of pit closure, operator must submit disposal information via a Form 4 Sundry Notice to the COGCC Location Specialist for Western Colorado (Dave Kubezko; email dave.kubezko@state.co.us). The disposal method will need to be approved prior to operator starting pit closure. In addition, operator will collect a pit water sample and, at a minimum, analyze for the following parameters: pH; alkalinity; specific conductance; major cations/anions (chloride, fluoride, sulfate, sodium); total dissolved solids (TDS); BTEX/DRO; TPH; PAH's (including benzo[a]pyrene); and metals (arsenic, barium, calcium, chromium, iron, magnesium, selenium). At the time of closure/disposal of pit water, COGCC may require additional analytes, as appropriate.

### **Attachment Check List**

Att Doc Num	Name
2034133	CORRESPONDENCE
400231362	FORM 2A SUBMITTED
400238011	ACCESS ROAD MAP
400238012	CONST. LAYOUT DRAWINGS
400238014	HYDROLOGY MAP
400238015	LOCATION PICTURES
400238018	LOCATION DRAWING
400238019	NRCS MAP UNIT DESC
400238020	REFERENCE AREA MAP
400238040	SENSITIVE AREA DATA

Total Attach: 10 Files

**General Comments**

<b><u>User Group</u></b>	<b><u>Comment</u></b>	<b><u>Comment Date</u></b>
OGLA	Form 2A has been placed "ON HOLD" by Dave Kubeczko until the Form 15 has been submitted and approved. The same COAs on this Form 2A will also be placed on the Form 15. Additional COAs may also be placed on the Form 15 depending on the attachments submitted with the pit permit.	1/27/2012 10:15:07 AM
DOW	<p>Thank you for the opportunity to comment on this Production Pit project. It is clear that Williams Production Company recognizes the importance of protecting the wildlife and their habitat, and has laid out a good plan to minimize impact during and after primary construction. Their BMPs and Reclamation Plan address the CPW's primary concerns and reflects positively on Williams commitment to proactive conservation.</p> <p>Since this large pit will be in place and used a long time, the CPW strongly encourages Williams to implement COGCC Rule 902.d, regarding fencing guidelines, to adequately protect wildlife throughout the extended use time period. In addition, to help minimize disturbances to and confrontations with wildlife, CPW encourages water and liquid transports occur during mid-day.</p>	1/25/2012 8:12:11 AM
OGLA	Form 2A placed "ON HOLD" on 01-13-12 until Form 15 Pit Permit has been submitted. Initiated/Completed OGLA Form 2A review on 01-25-12 by Dave Kubeczko; placed fluid containment, spill/release BMPs, double-lined pit, no pit in fill, pit contents disposal options, fencing/netting of pit, as-builts, hydrotesting, GW testing of water well, and pipeline testing COAs on the Form 2A; same and/or additional COAs (truck loading/unloading station, 3-year use) were placed on the Form 15 permit; sent email to operator on 01-25-12; recent emails to operator on 02-14-12 and 02-15-12 with additional COAs; passed Form 15 Permit on 02-15-12 by Dave Kubeczko; passed by CDOW on 01-25-12 with BMPs submitted by operator (with permit application) acceptable; passed OGLA Form 2A review on 02-15-12 by Dave Kubeczko; placed fluid containment, spill/release BMPs, double-lined pit, no pit in fill, pit contents disposal options, fencing/netting of pit, as-builts, hydrotesting, GW testing of water well, truck loading/unloading station, 3-year use, and pipeline testing COAs.	1/13/2012 1:00:02 PM
Permit	Operator reattached all attachments. This form has passed completeness.	1/6/2012 6:28:07 AM
Permit	Returned to draft. Attachments will not open.	1/5/2012 3:00:05 PM

Total: 5 comment(s)

**BMP**

<b><u>Type</u></b>	<b><u>Comment</u></b>
Construction	<p>Construction</p> <ul style="list-style-type: none"> <li>• Surface roads to ensure that the anticipated volume of traffic and the weight and speed of vehicles using the road do not cause environmental damage, including generation of fugitive dust and contribution of sediment to downstream areas.</li> <li>• Protect culvert inlets from erosion and sedimentation and install energy dissipation structures at outfalls</li> <li>• Construct fluid pit fences and nets that are capable of withstanding animal pressure and environmental conditions and that are appropriately sized for the wildlife encountered.</li> <li>• Install impermeable barriers beneath fluid pits to protect groundwater, riparian areas and wetlands.</li> <li>• Salvage topsoil from all road construction and other rights-of-way and re-apply during interim and final reclamation.</li> <li>• Strip and segregate topsoil prior to construction. Appropriately configure topsoil piles and immediately seed to control erosion, prevent weed establishment and maintain soil microbial activity</li> </ul>

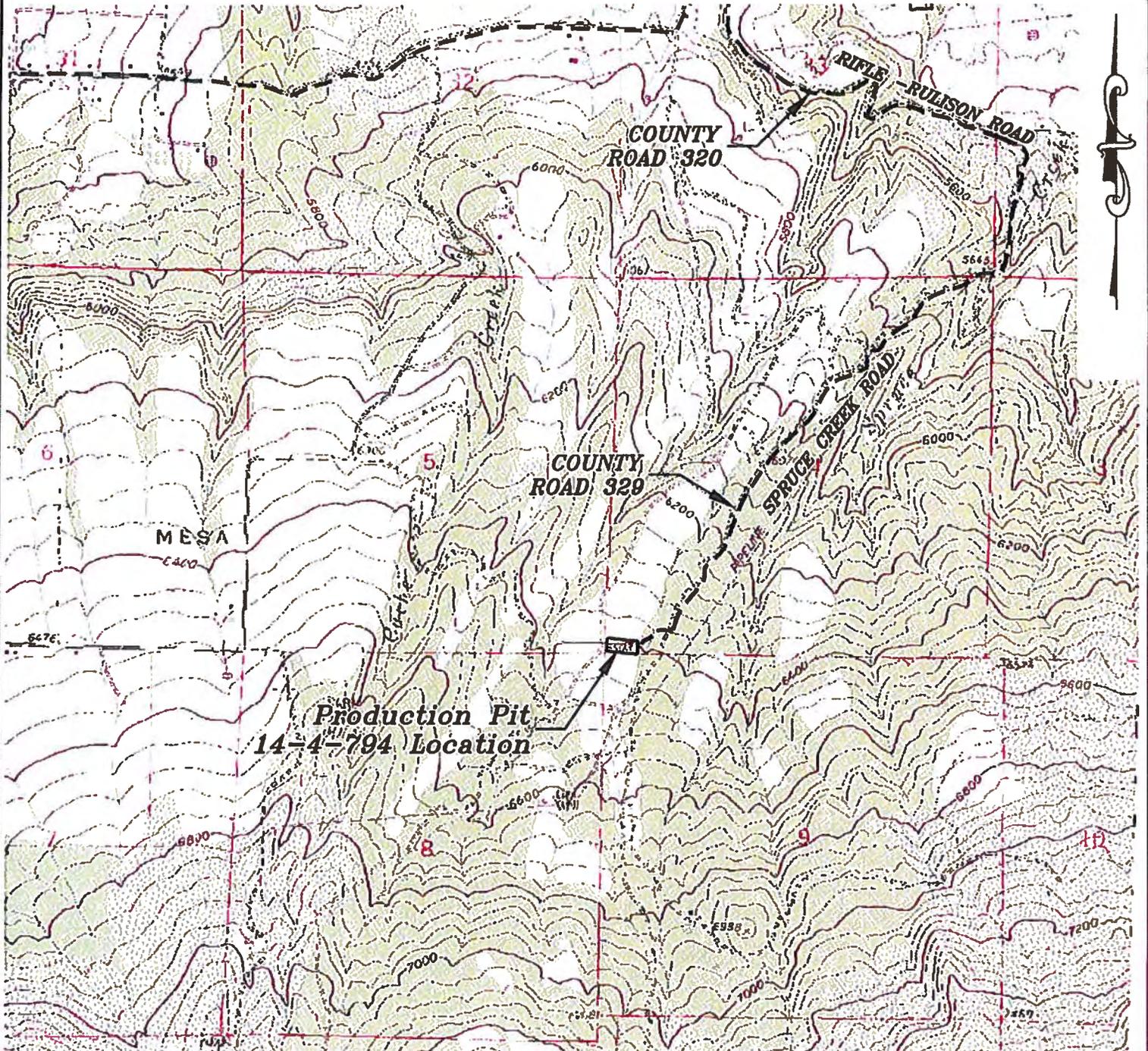
Drilling/Completion Operations	<p>Drilling/Completions</p> <ul style="list-style-type: none"> <li>• Continue application of BMPs to prevent wildlife from entering pits including fencing and netting where appropriate</li> <li>• Promptly report spills that affect wildlife to the CDOW.</li> <li>• Store and stage emergency spill response equipment at strategic locations so that it is available to expedite effective spill response.</li> <li>• Limit parking to already disturbed areas that have not yet been reclaimed</li> </ul>
Planning	<p>Planning</p> <ul style="list-style-type: none"> <li>• Conduct wildlife surveys to determine presence of game/non-game species/habitat</li> <li>• Identify and Protect “crucial habitats”</li> <li>• Site access roads, pads and facilities in locations that minimize habitat impacts</li> <li>• Identify private and Federal land seclusion areas where drilling will be voluntarily deferred in critical seasonal habitats</li> </ul>

Interim Reclamation	<p>Production/Reclamation</p> <ul style="list-style-type: none"> <li>• Install automated emergency response systems (e.g., high tank alarms, emergency shut-down systems, etc.).</li> <li>• Implement fugitive dust control program</li> <li>• Skim and eliminate oil from produced water ponds and fluid pits at a rate sufficient to prevent oiling of birds or other wildlife that could gain access to the pit.</li> <li>• Apply an aggressive, integrated, noxious and invasive weed management plan. Utilize an adaptive management strategy that permits effective responses to monitored findings and reflects local site and geologic conditions</li> <li>• Map the occurrence of existing weed infestations prior to development to effectively monitor and target areas that will likely become issues after development.</li> <li>• Evaluate the utility of soil amendment application or consider importing topsoil to achieve effective reclamation.</li> <li>• Use locally adapted seed whenever available and approved by landowner.</li> <li>• Use appropriately diverse reclamation seed mixes that mirror an appropriate reference area for the site being reclaimed where approved by landowner.</li> <li>• Conduct seeding in a manner that ensures that seedbed preparation and planting techniques are targeted toward the varied needs of grasses, forbs and shrubs (e.g., seed forbs and shrubs separately from grasses, broadcast big sagebrush but drill grasses, etc.)</li> <li>• Emphasize bunchgrass over sod-forming grasses in seed mixes in order to provide more effective wildlife cover and to facilitate forb and shrub establishment.</li> <li>• Seed during appropriate season to increase likelihood of reclamation success</li> <li>• Do not include aggressive, non-native grasses in reclamation seed mixes</li> <li>• Choose reference areas as goals for reclamation that have high wildlife value, with attributes such a diverse and productive understory of vegetation, productive and palatable shrubs, and a high prevalence of native species.</li> <li>• Establish vegetation with total perennial non-invasive plant cover of at least eighty (80) percent of pre-disturbance or reference area levels.</li> <li>• Establish vegetation with plant diversity of non-invasive species which is at least half that of pre-disturbance or reference area levels. Quantify diversity of vegetation using a metric that considers only species with at least 3 percent relative plant cover.</li> <li>• Establish permanent and monumented photo points and vegetation measurement plots or transects; monitor at least annually until plant cover, composition, and diversity standards have been met.</li> <li>• Observe and maintain a performance standard for reclamation success characterized by the establishment of a self-sustaining, vigorous, diverse, locally appropriate plant community on the site, with a density sufficient to control erosion and non-native plant invasion and diversity sufficient to allow for normal plant community development.</li> <li>• Use early and effective reclamation techniques, including interim reclamation to accelerate return of disturbed areas for use by wildlife</li> <li>• Remediate hydrocarbon spills on disturbed areas prior to reclamation.</li> <li>• Complete final reclamation activities so that seeding occurs during the first optimal season following plugging and abandonment of oil and gas wells.</li> <li>• Perform interim reclamation on all disturbed areas not needed for active support of production operations</li> <li>• Control weeds in areas surrounding reclamation areas in order to reduce weed competition</li> <li>• Educate employees and contractors about weed issues</li> <li>• Where possible, fence livestock and/or wildlife out of newly reclaimed areas until reclamation standards have been met and plants are capable of sustaining herbivory</li> <li>• Conduct necessary reclamation and invasive plant monitoring.</li> <li>• Census and assess the utilization of the reclaimed areas by the target species</li> <li>• Maintain pre and post development site inspection records and monitor operations for compliance</li> <li>• Utilize GIS technologies to assess the extent of disturbance and document the reclamation progression and the footprint of disturbances</li> </ul>
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Site Specific	<p>Although this location is located within 500 ft. of perennial, ephemeral, or intermittent surface water according to USGS mapped surface waters, the attached Sensitive Area Determination concludes that the location is not within a sensitive area due to the low potential for impacts to surface water in the case of a facility release. However, in order to satisfy COGCC guidance requiring that all locations within 500 ft. of mapped surface water incorporate BMPs to protect that surface water, Williams will employ the following BMPs at this location:</p> <ul style="list-style-type: none"> <li>• Williams will ensure 110 percent secondary containment for any volume of fluids contained at well site during drilling and completion operations.</li> <li>• Williams will implement best management practices to contain any unintentional release of fluids.</li> <li>• Either a lined drilling pit or closed loop system will be implemented.</li> </ul>
General Housekeeping	<p>General</p> <ul style="list-style-type: none"> <li>• Treat/control noxious weeds/plants including Tamarisk</li> <li>• Focus BMPs on critical wildlife seclusion and “crucial habitats”</li> <li>• Contribute to organizations that acquire/manage habitat</li> <li>• Continue to Support Operation Game Thief</li> <li>• Continue to support CDOW sportsman’s programs</li> <li>• Participate in wildlife seminars and conferences (e.g. AFWA)</li> <li>• Focus Ranch and Property Management (Williams’ owned/managed properties) on wildlife resources</li> <li>• Identify conservation easement opportunities on Williams-owned/managed properties</li> <li>• Enforce policies to protect wildlife (e.g., no poaching, no firearms, no dogs on location, no feeding of wildlife, etc.).</li> <li>• Support research to test the effectiveness of specific Best Management Practices</li> </ul>

Total: 6 comment(s)

Section 14  
T. 7 S., R. 94 W



**ACCESS DESCRIPTION:**

FROM THE INTERSECTION OF STATE HIGHWAY 6 AND COUNTY ROAD 323 (RULISON ROAD) NORTH OF RULISON, PROCEED SOUTHERLY ALONG COUNTY ROAD 323 (RULISON ROAD)  $\pm 1.1$  MILES TO THE INTERSECTION WITH COUNTY ROAD 309 (RULISON PARACHUTE ROAD), PROCEED LEFT IN AN EASTERLY DIRECTION  $\pm 2.3$  MILES TO THE INTERSECTION WITH COUNTY ROAD 320 (RIFLE RULISON ROAD), PROCEED RIGHT IN AN EASTERLY DIRECTION  $\pm 1.0$  MILES TO THE INTERSECTION WITH COUNTY ROAD 329 (SPRUCE CREEK ROAD), PROCEED RIGHT IN A SOUTHERLY DIRECTION  $\pm 1.8$  MILES TO AN INTERSECTION WITH A DIRT/GRAVEL ROAD, PROCEED RIGHT IN A WESTERLY DIRECTION TO THE 14-4-794 PRODUCTION PIT LOCATION, AS SHOWN HEREON.

*Access Map & TOAD*

Construction Plan Prepared for:

**Williams** Williams Production, RMT

Production Pit 14-4-794 - Plat 5  
ACCESS ROAD MAP

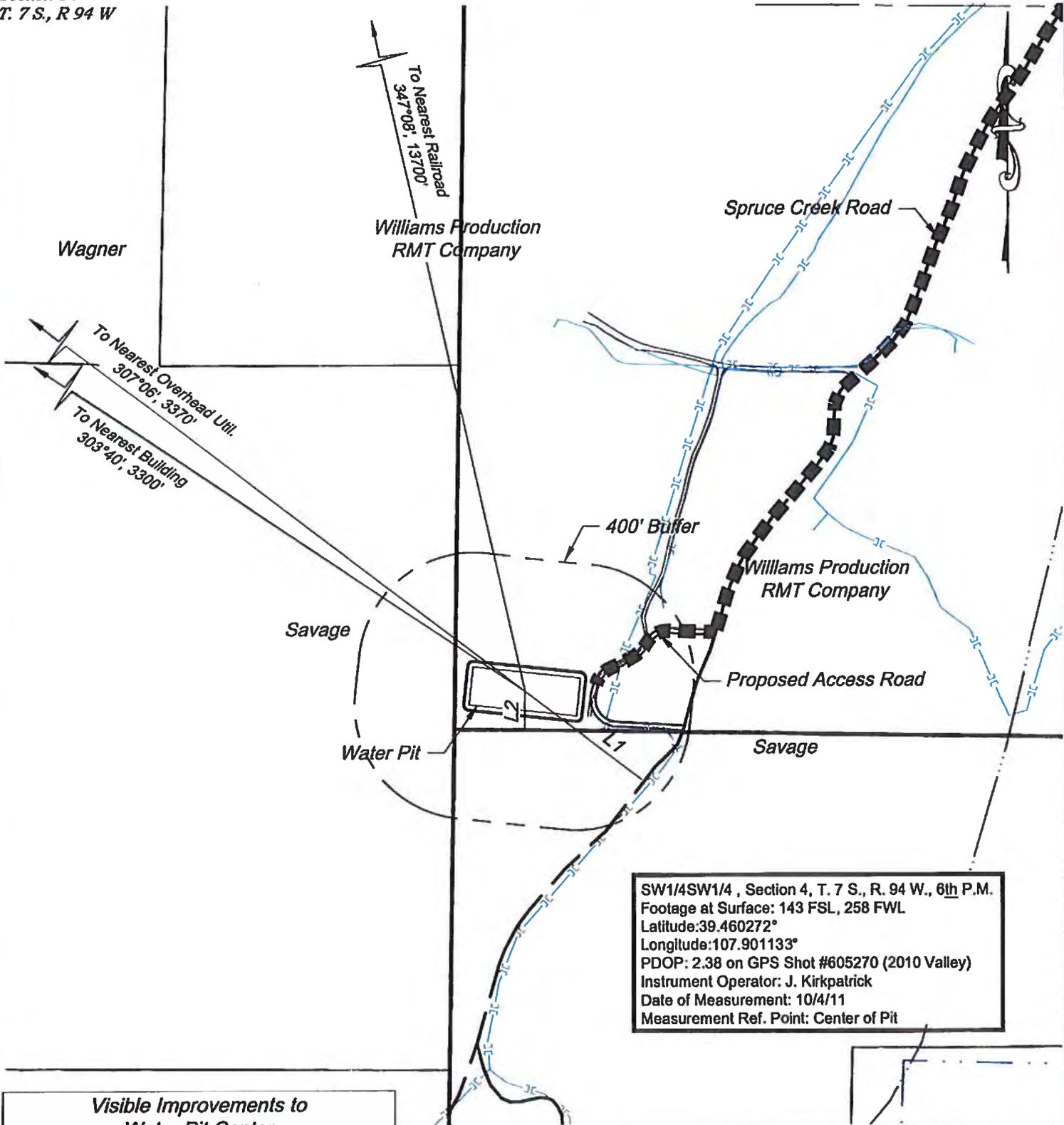
SCALE:	1" = 2000'
DATE:	11/22/11
PLAT:	3 of 4
PROJECT:	Williams Valley
DFT:	cws

136 East Third Street  
Rifle, Colorado 81650  
Ph. (970) 625-2720  
Fax (970) 625-2773



**BOOKCLIFF**  
Survey Services, Inc.

Section 14  
T. 7 S., R 94 W



SW1/4SW1/4, Section 4, T. 7 S., R. 94 W., 6th P.M.  
 Footage at Surface: 143 FSL, 258 FWL  
 Latitude: 39.460272°  
 Longitude: 107.901133°  
 PDOP: 2.38 on GPS Shot #605270 (2010 Valley)  
 Instrument Operator: J. Kirkpatrick  
 Date of Measurement: 10/4/11  
 Measurement Ref. Point: Center of Pit

Visible Improvements to Water Pit Center

	Desc.	Bearing	Distance (ft)
	Building	303°40'	3300
L1	Public Road	306°57'	542
	Above Grnd Util.	307°06'	3370
	Railroad	347°08'	13700
L2	Property Line	180°52'	143

CURRENT LAND USE		
<input checked="" type="checkbox"/> CROP LAND	<input type="checkbox"/> NON-CROP LAND	<input type="checkbox"/> SUBDIVIDED
<input checked="" type="checkbox"/> IRRIGATED	<input type="checkbox"/> RANGELAND	<input type="checkbox"/> INDUSTRIAL
<input type="checkbox"/> DRY LAND	<input type="checkbox"/> TIMBER	<input type="checkbox"/> COMMERCIAL
<input type="checkbox"/> IMPROVED PASTURE	<input type="checkbox"/> RECREATIONAL	<input type="checkbox"/> RESIDENTIAL
<input type="checkbox"/> HAY MEADOW	<input type="checkbox"/> OTHER (describe):	
<input type="checkbox"/> CRP		

Construction Plan Prepared for:  
**Williams** Williams Production, RMT  
 Production Pit 14-4-794 - Plat 6  
 LOCATION

136 East Third Street  
 Rifle, Colorado 81650  
 Ph. (970) 625-3770  
 Fax (970) 625-2773

**BOOKCLIFF**  
Survey Services, Inc.

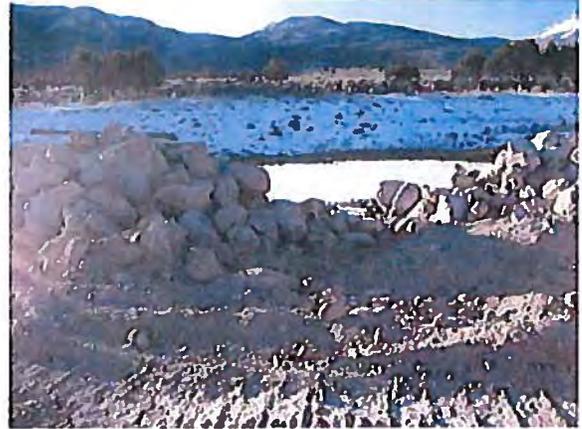
SCALE: 1" = 500'  
 DATE: 11/22/11  
 PLAT: 4 of 4  
 PROJECT: Williams Valley  
 DFT: cws

Let title this  
"Spruce Creek  
Production Pit  
14-4-694

# RWF 14-4-794 PRODUCED WATER PIT



PAD LOCATION LOOKING NORTH



PAD LOCATION LOOKING SOUTH



PAD LOCATION LOOKING WEST



PAD LOCATION LOOKING EAST



PAD OVERALL LOOKING SOUTHERLY



PAD ACCESS LOOKING NORTHEASTERLY

136 East Third Street  
BSteam, Colorado 81650  
Ph. (970) 625-2720  
Fax (970) 625-2773



**BOOKCLIFF**  
Survey Services, Inc.

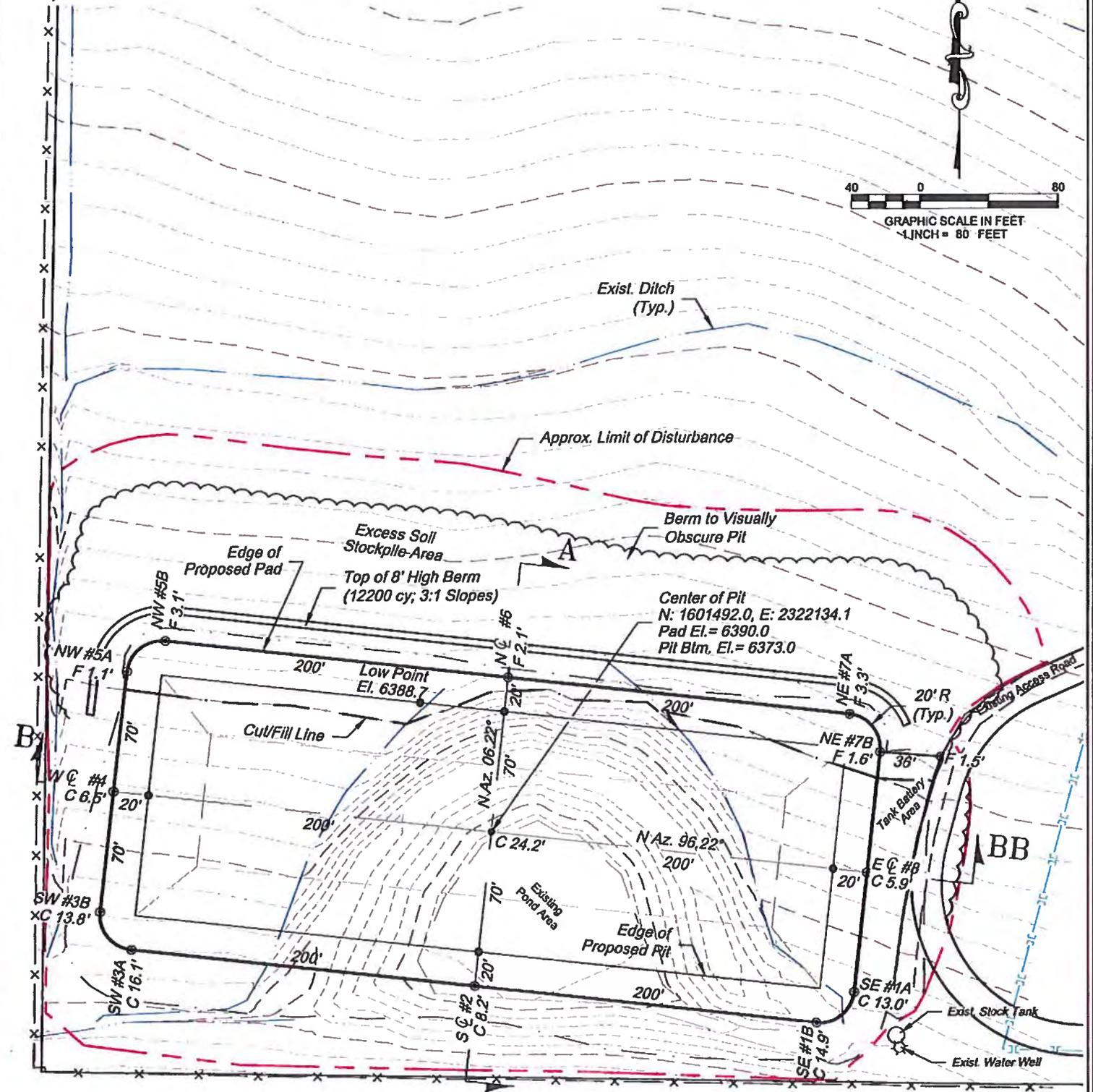
PHOTO DATE: 1/4/12  
TAKEN BY: cws  
DRAWN BY: cws  
SHEET: 1 of 1  
PROJECT: Williams Valley

WELL LOCATION PLAT Prepared for:

**Williams**. Williams Production, RMT

SECTION 4, T. 7 S., R. 94 W. of the 6th. P.M.  
GARFIELD COUNTY, COLORADO

Section 14  
T. 7 S., R 94 W



ESTIMATED EARTHWORK QUANTITIES (cy)

ITEM	CUT	FILL	TOPSOIL	EXCESS
PAD	32400	12873	3500	16027
PIT	27255			27255
TOTALS	59655	12873	3500	43282

\*NOTE:

- 1.) Topsoil Volume Based on 12" Soil Depth.
- 2.) Swell Factor of 15% Applied to All Earthwork Cut Volumes.
- 3.) 8' Berm Volume Included in Quantities.

TOTAL DISTURBANCE PAD : ±4.17 ac.  
TOTAL DISTURBANCE ROAD : ±0.46 ac.  
INTERIM RECLAIMED PAD : ±0.0 ac.

REVISED: 1/4/12

SCALE: 1" = 80'  
DATE: 11/22/11  
PLAT: 1 of 4  
PROJECT: Williams Valley  
DFT: cws

Construction Plan Prepared for:

**Williams** Williams Production, RMT

Production Pit 14-4-794  
CONSTRUCTION LAYOUT

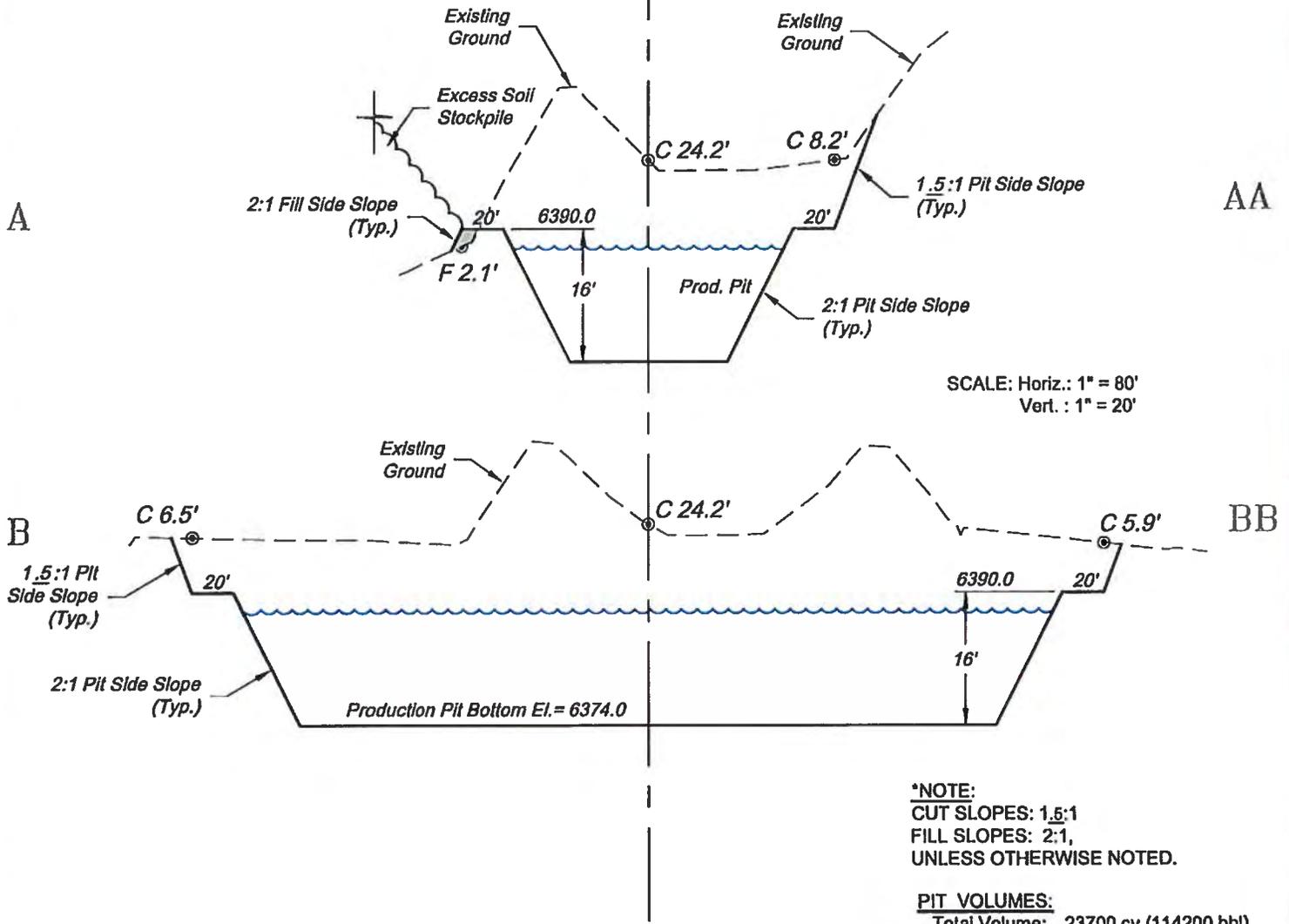
136 East Third Street  
Rifle, Colorado 81650  
Ph. (970) 635-2720  
Fax (970) 625-2773



**BOOKCLIFF**  
Survey Services, Inc.

Section 14  
T. 7 S., R 94 W

PRODUCTION PIT



SCALE: Horiz.: 1" = 80'  
Vert.: 1" = 20'

\*NOTE:  
CUT SLOPES: 1.5:1  
FILL SLOPES: 2:1,  
UNLESS OTHERWISE NOTED.

PIT VOLUMES:  
Total Volume: 23700 cy (114200 bbl)  
2' Free Board: 19700 cy (95000 bbl)

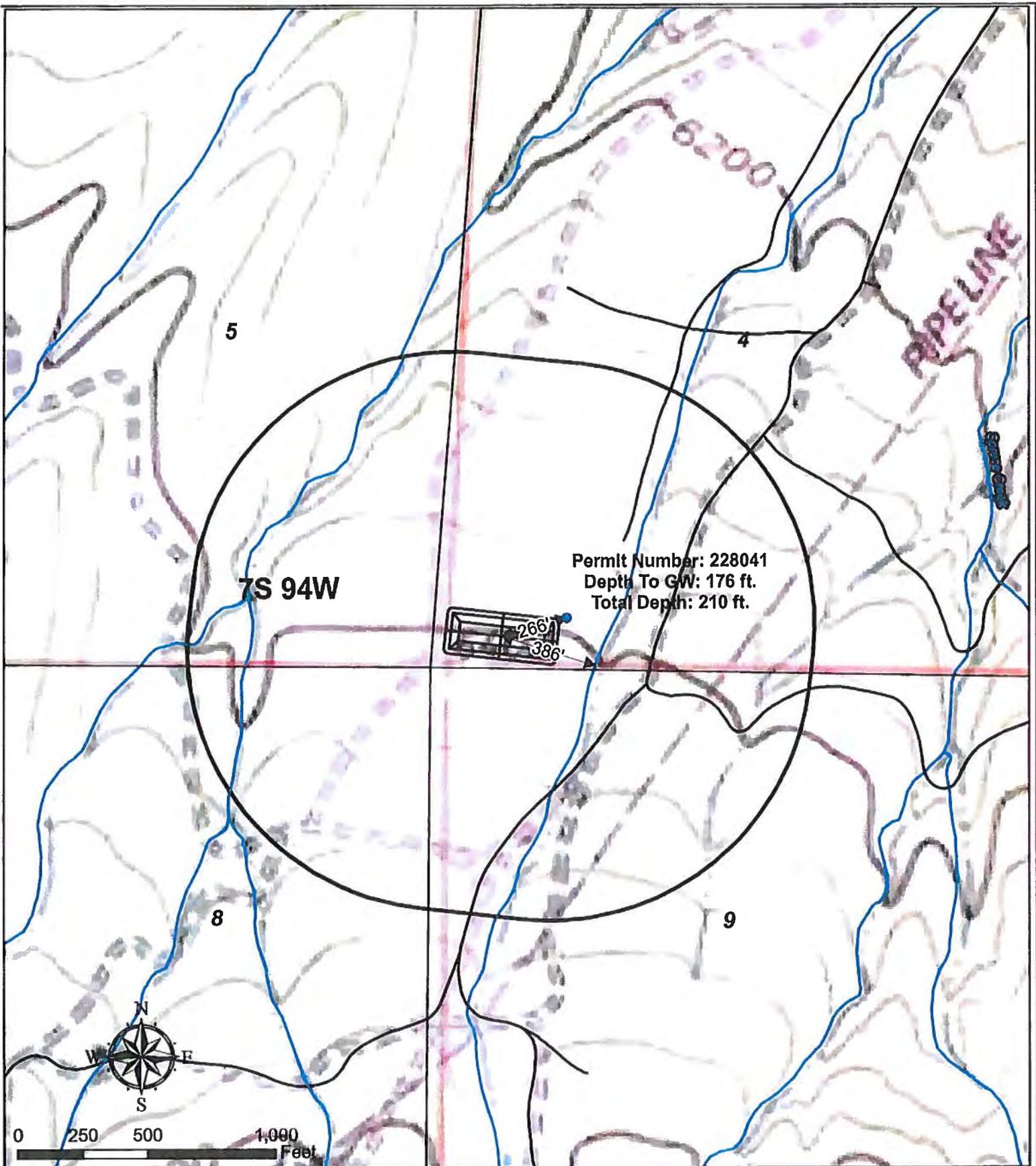
EXIST. STOCK POND VOLUME:  
Total Volume: 3610 cy (17300 bbl)

136 East Third Street  
Rt. 6, Colorado 81650  
Ph. (970) 625-2720  
Fax (970) 625-2773



SCALE: As Noted  
DATE: 11/22/11  
PLAT: 2 of 4  
PROJECT: Williams Valley  
DFT: cws

Construction Plan Prepared for:  
**Williams.** Williams Production, RMT  
*Production Pit 14-4-794*  
**CONSTRUCTION LAYOUT**  
**CROSS SECTIONS**



**Legend**

- Water Well
- Pad
- Stream
- 1000' Buffer

Williams Production RMT

Plat 5C  
 Spruce Creek Production Pit 14-4-794  
 Hydrology Map

T7S R94W, Section 4



# Map Unit Description

Rifle Area, Colorado, Parts of Garfield and Mesa Counties

**69**      **Vale silt loam, 6 to 12 percent slopes**

## Setting

Elevation: 5000 to 7200 feet

## Composition

Vale and similar soils: 90 percent

## Description of Vale

### Setting

Landform: Alluvial fans, benches, mesas  
Down-slope shape: Convex, linear  
Across-slope shape: Convex, linear  
Parent material: Calcareous eolian deposits

### Properties and Qualities

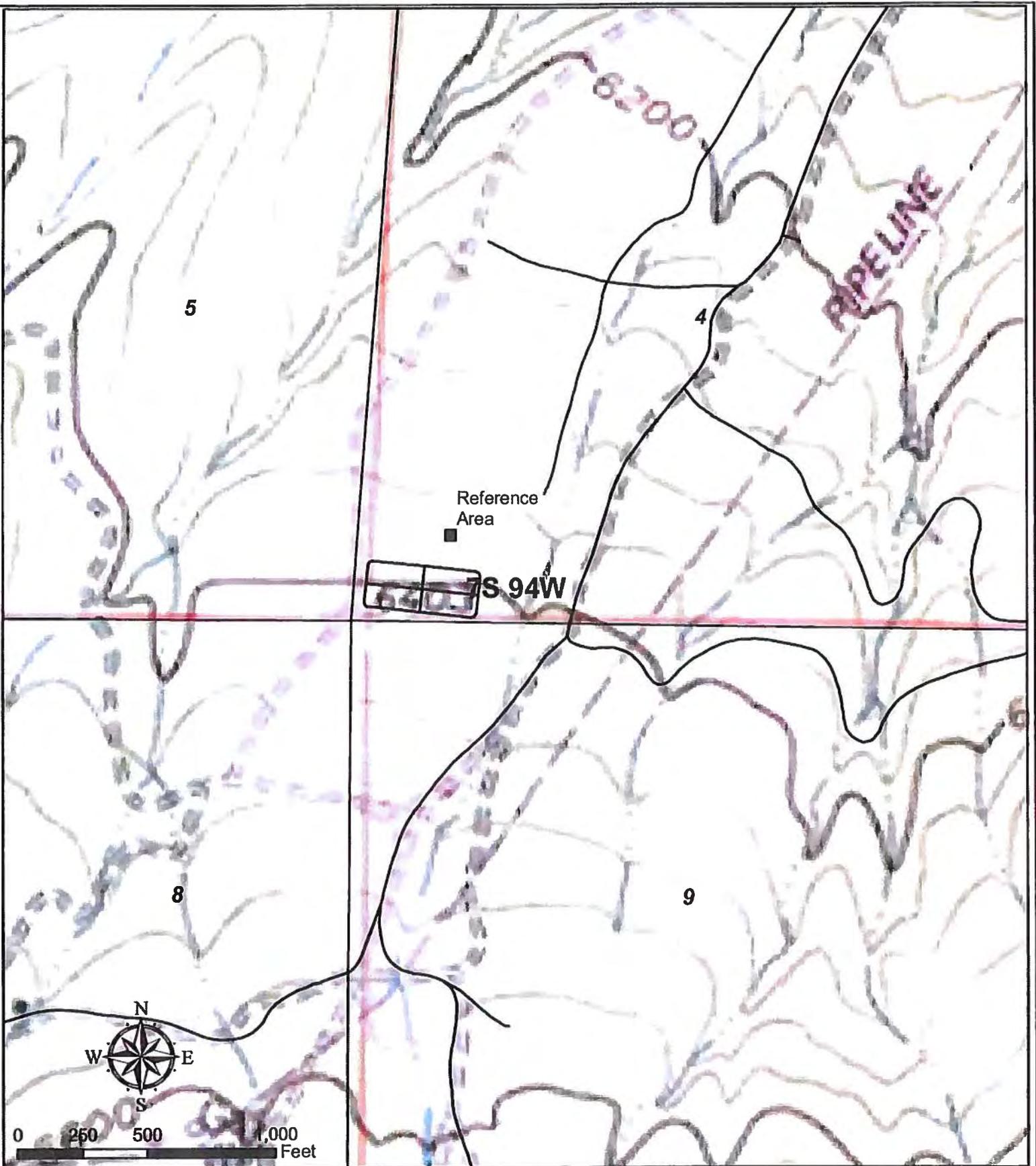
Slope: 6 to 12 percent  
Drainage class: Well drained  
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)  
Frequency of flooding: None  
Frequency of ponding: None  
Calcium carbonate maximum: 15 percent  
Gypsum maximum: 0 percent  
Available water capacity: High (about 10.5 inches)

### Interpretive Groups

Land capability classification (irrigated): 4e  
Land capability (non irrigated): 4e  
Ecological site: Deep Loam (R048AY292CO)

### Typical Profile

0 to 7 inches: silt loam  
7 to 11 inches: silt loam  
11 to 26 inches: silty clay loam  
26 to 60 inches: silt loam



# Legend

— Pad

Williams Production RMT

Plat 5D  
 Spruce Creek Production Pit 14-4-794  
 Reference Area Map

T7S R94W, Section 4



## Sensitive Area Determination Checklist

Williams Production RMT Company		
<b>Person(s) Conducting Field Inspection</b>	Jennifer Belcastro <i>Environmental Scientist</i>	12/02/11
<b>Site Information</b>		
Location:	Spruce Creek	Time: 1300
Type of Facility:	Proposed Production Pit	
<b>Environmental Conditions</b>	Overcast with frozen ground conditions.	
Temperature (°F)	41°	

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

Yes       No

### SURFACE WATER

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

Yes       No

If yes, list type of surface water feature(s), i.e. rivers, creeks, streams, seeps, springs, wetlands: Three (3) unnamed USGS identified intermittent drainages.

If yes, describe location relative to facility: One unnamed USGS identified intermittent drainage is located 911 feet northwest and two USGS identified intermittent drainages are located 395 and 1,000 feet respectively to the east southeast of the of the proposed facility.

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

Yes       No

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

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

Low       High

WVH-013

**GROUNDWATER**

1. Will the proposed/new or existing facility have any pits which will contain hydrocarbons and chlorides or other E&P wastes?  
 Yes       No  
If yes, List the pit type(s): Production Pit

2. Is the site of the proposed facility underlain by an unconfined aquifer or recharge zone?  
 Yes       No

3. Is the hydraulic conductivity of the underlying soil or geologic material  $\leq 1.0 \times 10^{-7}$  cm/sec?  
 Yes       No

4. Is the proposed facility located within 1/8 mile of a domestic water well or 1/4 mile of a public water supply well which would use the same aquifer?  
 Yes       No

5. Is the proposed facility located within a 100 year floodplain?  
 Yes (*Sensitive Area*)       No (*If no, proceed to question #6.*)

6. Is the depth to groundwater known?  
 Yes (*If yes, follow instructions provided in 6(a) of this section.*)  
 No (*If no, follow instructions provided in 6(b) of this section.*)

(a) If yes, could a potential release from the proposed facility reach groundwater?  
 Yes       No

If yes, explain:

- (b) If no:
- (i) Evaluate surrounding soils, topography, and vegetation which may suggest the presence of shallow groundwater.
  - (ii) Gather information from surrounding well data in order to determine a depth to groundwater, i.e. State Engineers Office.

7. Is the potential to impact ground water from the facility in the event of a release high or low?  
 High       Low

**Additional Comments:**

As stated in the surface water section of this sensitive area determination, there are three USGS identified unnamed intermittent drainages within a quarter (1/4) mile of the proposed facility. The greatest potential for impact to surface water features is to the unnamed intermittent drainage located 395 feet to the east southeast of the proposed facility. By COGCC decision this would classify the facility as being in a sensitive area. However, the facility as it is currently proposed, limits the direction of a potential release to the northern side. If a release were to migrate off the facility it would tend to flow to the north northeast following the natural contours of the area. Flow would tend to be parallel to the unnamed intermittent drainage. In addition, the drainage itself has a poorly defined channel and has a fairly heavily vegetated bottom indicating it does not flow a majority of the time. It is not anticipated that the drainage to the northwest would be impacted by a potential release from the facility. As stated above, flow would be parallel to the drainage and a majority of impact would be limited to the open field to the north. The second unnamed intermittent drainage to the east southeast of the proposed facility would not be impacted by any potential release. A ridgeline separates this drainage from the facility thus preventing any potential release from impacting it. It is strongly recommended that Best Management Practices (BMPs) be installed along the fill slope edges of the proposed facility. BMPs in the form of an earthen perimeter berm should be installed along the edge of the proposed facility and a diversion ditch should be constructed along the toe of the fill slope to contain any fluids that could potentially migrate off site. These should be monitored and maintained to ensure sight containment in the event of a potential release.

The State Engineers office and USGS records were reviewed and it was revealed that there is one (1) permitted water well located 263 feet northeast of the facility. Based on its location, it appears the well is utilized for providing water to livestock. The depth to groundwater in the well is 176 feet. The vegetative cover in the immediate vicinity of the proposed facility did not suggest the presence of shallow groundwater. No seeps or springs were identified during the site investigation.

Based on the information collected during the site investigation and desktop review, the potential to impact surface water features has been deemed low. Although the permitted water well is located 263 to the northeast of the proposed facility, the depth to groundwater is fairly deep and it is not anticipated that it will be impacted by the proposed facility. An overland release would not impact the well due to the short duration of time involved and the fact it would tend to spread out over a large area based on the topography of the area. The greatest potential for impact to the well would be from a release that occurred over a longer period of time such as a leaking pit. Therefore, the proposed pit on this location should be constructed and lined as outlined in COGCC rule 904. The pit should also be hydro tested for a minimum of 72 hours before any production liquids are placed into it. It would also be recommended that a baseline water quality sample be collected from the well prior to filling the pit. In addition, periodic monitoring of the well should be conducted to ensure that no fluids from the proposed facility are impacting



groundwater. With the potential to impact both surface and groundwater deemed to be low, and if the above recommendations are implemented, the facility can be designated as being located in a non-sensitive area.

Inspector Signature(s): Mark E. Mumby Date: 12/05/2011

Mark E. Mumby, *Project Manager/RPG*  
HRL Compliance Solutions, Inc.

Jennifer Belcastro Date: 12/02/2011

Jennifer Belcastro, *Environmental Scientist*  
HRL Compliance Solutions, Inc.

## Liner Specifications

# **14-4-794 Multi-Well Pit Earthen Pit Construction and Synthetic Lining Plans and Specifications**



*Prepared for:*

**Williams Production RMT  
1058 County Road 215  
Parachute, Colorado 81635**



*Date: May 2010*

*Prepared By:*

**Fox Engineering Solutions**

670 Canyon Creek Drive  
Grand Junction, CO 81507  
Ph: (970) 250-5505 / Fax: (626) 784-0667  
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**Special Provisions**

These plans and specifications have been compiled to comply with production, drilling, multi-well and centralized E&P waste management earthen pit regulations and policies of the Colorado Oil and Gas Conservation Commission (COGCC), Colorado Department of Natural Resources. Specifically included are the 900 Series Rules adopted in 2009; COGCC policy entitled "Notice to Operators Drilling Wells Within ¼ Mile of the Rim of the Roan Plateau in Garfield County, Pit Design, Construction and Monitoring Requirements", dated June 12, 2008; and COGCC email correspondence entitled "New Pit Requirements in the Piceance Basin", dated September 8, 2008. The specifications detail pit construction; and liner material, details and installation practices which are to be followed and employed by Williams Production RMT Company and their contractors.

Under current COGCC rules and policies, all earthen pits constructed on fill material and/or requiring the construction of embankments above natural or pre-construction grades will require design and certification by a registered professional engineer. Documented inspections, construction observation, compaction testing and hydrostatic monitoring may be performed by the professional engineer or their designee as outlined in the specifications. Within the scope of the work, the contractor(s) shall provide a minimum of 48 hours notice to the engineers for critical construction observations, testing and inspections.

A specific earthen pit location map on a USGS base map, site survey plats, and cross sections are provided in the figures as part of the plans and specifications. Synthetic liner system specification details and drawings are also included in this plan set. If required by the COGCC, a leak detection system shall be installed as specified per the drawings. Changes to the plan set may be made by the professional engineer as warranted to ensure compliance with COGCC regulations and policies. Changes will be conveyed to the contractor in the form of a Notice of Change correspondence.

No work shall commence by the contractor until a Notice to Proceed has been issued by Williams Production RMT Company. The contractor shall be responsible for locating all underground utilities as prescribed by Colorado law. All work shall be conducted within the limits of disturbance, unless approved by the Williams or professional engineer. Earthen pits shall be constructed within the boundary locations shown on the site survey plats and to the depths and side slopes noted, unless otherwise changed by the professional engineer. No changes to the plans and specifications will be permitted by the contractor without the approval of the professional engineer or their designee.

Williams Production RMT Company shall be responsible for providing as-built drawings, if any, including earthen pit plan and cross sections to the professional engineer. The as-built drawings and changes to the specifications shall be noted by the professional engineer as part of their certification and final construction report.

### **SECTION 1010 - SCOPE OF WORK**

The primary work items to be performed under these plans and specifications involves the construction of earthen pits and installation of a synthetic lining systems regulated by the Colorado Oil and Gas Conservation Commission. Portions of well pad construction shall be included within this scope of work for pits influencing well pad cut and/or fill areas. The contractor shall be responsible for verifying and/or obtaining all field measurements necessary for liner sizing and fit. Pits shall not be constructed on known intermittent or perennial springs, seeps, or other surface water features. If groundwater is encountered during pit construction activities, the contract shall immediately cease construction and notify the Owner and the professional engineer. The water source may be mitigated and/or pit relocated at the direction of the Owner and/or professional engineer.

### **SECTION 1300 - CONSTRUCTION SEQUENCE**

The Contractor will follow the general pit construction sequence outlined. Changes to the sequences may be made by the professional engineer as warranted by field or other conditions.

- 1.) Stake pit boundaries and edge of disturbed area including bank above freeboard and anchor trench for liner. Ensure that the edge of all pits maintain a minimum 10 feet setback from the edge well pad boundaries or fill slopes.
- 2.) Excavate the pit bottom and pit slopes per the plan set. Scarify soil in bottom and sides.
- 3.) Excavate pit top perimeter and anchor trench per the plan set.
- 4.) Compact pit bottom and slopes as specified.
- 5.) Compact pit top perimeter and anchor trenches as specified.
- 6.) Install underlayment; leak detection system, if required; and liner system as specified.
- 7.) Backfill and compact anchor trenches as specified.

### **SECTION 1400 - CONSTRUCTION OBSERVATION NOTIFICATION**

The project professional engineer shall provide the Owner with a list of construction observations for each pit that must be witnessed or observed by the professional engineer or their designee. These observations may include, but are not limited to;

1. Construction of fills/embankments.
2. Subgrade completion of pit excavation and liner anchor trench.
3. Placement of underlayment; leak detection system, if required; and liners.
4. Embankment/fill compaction testing by the professional engineer.

The Owner or contractor shall provide the professional engineer with a 48-hour advance notice of the construction events requiring their presence.

The Owner shall provide the professional engineer with a set of surveyed as-built pit plan view and cross sections indicating natural and post construction grades. A copy of the hydrostatic test, if applicable, shall also be provided.

## SECTION 2200 - EXCAVATION / EMBANKMENT

### PART I - GENERAL

#### DESCRIPTION OF WORK

The primary work defined by this Section will be all excavation, embankment, and earthwork associated with the project including but not limited to the production pits, reserve pits, and cuttings pits. Well pad construction shall be included in this Section for pits constructed on or in well pad cut/fill areas.

#### RELATED WORK SPECIFIED ELSEWHERE

Section 2260 –Synthetic Lining and Underlayment System

#### SITE INFORMATION

The Contractor will be held to have examined the site(s), and to have detected the conditions under which the work is to be done. The drawings show the physical dimensions and general topography of the site, but do not show the extent of all obstructions and subsurface conditions. The Contractor, at his option and without additional cost to the Owner, may take borings and other exploratory actions to determine conditions of the site and to provide for the construction specified herein.

#### MEASUREMENTS AND LEVELS

Verify all drawing measurements and levels in relation to existing elevations, grades and adjacent structures, and determine conditions and requirements for excavations, fill, and protection of the premises. Carefully and accurately lay out all lines and grades of the new construction as indicated on the plans before proceeding with any work.

#### PROTECTION

Shoring - If applicable, provide and maintain all sheeting, shoring and bracing required to retain earth banks properly, protect adjoining grades and structures from caving, sliding, erosion, or other damage, all according to applicable codes and current OSHA requirements. Remove shoring and related items as excavations are backfilled unless approval has been requested in writing and granted by the Owner to leave in place.

Drainage - Maintain excavations and construction site free from water throughout work. Drain surface water or seepage by gravity, sumps, or temporary pumps and discharge lines as necessary for this purpose, complying with the Owner's Storm Water Management Plan. Use drainage methods that will prevent softening of foundation bottoms, undercutting of footings, or other conditions detrimental to proper construction procedures. Contractor shall keep an erosion control plan and best management practices consistent with the Owner's Storm Water Management Plan.

Utilities - Protect from damage existing utility lines and piping shown on drawings or locations of which are made known to the Contractor prior to work, and utility lines constructed during construction operations of the project. Before commencing work, the Contractor shall obtain necessary information concerning location, type, and extent of existing utilities on the site and adjacent properties. The

Contractor shall contact the Utility Notification Center of Colorado at phone (800) 922-1987 and have all utilities located prior to commencing construction activities. Notify the Owner and utility company immediately in the event of damage to utility lines. The Contractor will repair damages to utilities at no additional cost to the Owner.

## **PART II - PRODUCTS**

A. **Embankment (Fill)** - Embankment, shall consist of approved material acquired from excavations, hauled and placed in embankments in reasonably close conformity with the lines, grades, thicknesses and typical cross sections shown on the drawings or as established in the field by the Owner. All embankment material shall be approved by the geotechnical engineer prior to placement. When the source of the embankment material is not designated on the drawings, approval of the source will be contingent on the material having a resistance value necessary for the construction in which it is used. Only approved materials shall be used in the construction of embankments.

B. **Suitable Materials for Structural Fill and Backfill** - On-site soil material obtained from excavation and free of debris, roots, organic or frozen materials, and stones or rubble with a maximum dimension smaller than 12 inches and less than 25% courser than 3/4-inches are acceptable. Imported material will be nonexpansive soil, or may be pit-run or bank-run sand and gravel capable of being compacted as specified hereafter. All fill and backfill material must be approved by the geotechnical engineer before fill or backfill work is started.

C. **Unsuitable Materials** - Expansive materials or materials that contain debris, roots, organic or frozen materials, stone, or concrete having a maximum dimension larger than 12 inches, or materials determined by the geotechnical engineer as unsuitable for providing stable slopes, fill, backfill, foundation or subgrade material for structures or pavements. Material that is unsuitable due to excess moisture content will not be classified as unsuitable if it can be dried by manipulation, aeration, or blending with other materials satisfactorily as determined by the geotechnical engineer.

## **PART III - EXECUTION**

A. **Excavation: General** - Excavation includes removal and disposition of all materials excavated, despite the nature of materials encountered. Excavations shall be finished to a smooth and uniform surface. Variation from the subgrade plane shall not be more than .25 ft. in soil nor more than .08 ft. above or .50 ft. below in rock. Excavation operations shall be conducted so that material outside the limits of construction shall not be disturbed. Prior to beginning grading operations in any area, all necessary clearing and grubbing in that area shall have been performed. Place suitable excavated materials in fill areas within the limits of work or stockpile as directed by the Owner. Report to the Owner any unsuitable materials or unforeseen obstructions encountered during excavation for proper disposition. Materials shall not be wasted without permission of the Owner.

Unless otherwise specified, rock shall be excavated to a minimum depth of 0.5 ft. below subgrade, within the limits of construction and the excavation backfilled with material designated on the drawings or approved. When rock has been excavated greater than 0.5 ft. below subgrade, within the limits for construction, the excavation shall be backfilled within at least 0.5 ft. below subgrade with material shown on the drawings or as approved. Rock excavation shall not be considered or paid for as extra work.

B. **Embankments/Fills** - Construct all embankments to the lines and grades shown on the drawings. Immediately before placing fill material, scarify the entire area upon which fill is to be placed to a depth of 12-inches. Remove all frozen material, roots, debris, large stones, or other objectionable materials.

Place approved excavated or imported fill material in successive horizontal layers of 8-inch loose depth for full width of cross section, bring to optimum moisture content for compaction, and compact each layer to the required density. If required compaction cannot be obtained with the existing material, the area will be over-excavated to a depth of 18 inches and filled and compacted with suitable material.

Where fills are placed on natural slopes, within the influence of water pits, as determined by the professional engineer, benches shall be cut into the native material of not less than 42 inches. Material shall be replaced in 10 inch lifts, brought to proper moisture content, (within 1 % below and 3% above) and compacted to not less than 95% of maximum dry density as determined by the professional engineer.

As determined by the professional engineer, a toe drain shall be installed along the toe of the pad slope. Toe key location shall be determined by the professional engineer at the time of construction. Drain shall be encased in free draining aggregate of at least 3 cubic feet per linear foot of drain. Aggregate and pipe shall be wrapped with pipe filter wrap. Drain pipe shall day light as directed by the professional engineer.

Constructed embankments shall be finished to a smooth and uniform surface. Variation from the subgrade plane shall not be more than 0.25 ft. Free running water shall be drained from embankment materials prior to placement. When embankments are to be constructed against existing embankment or hillsides, constructed slopes that are steeper than 4:1 shall be brought up in layers keyed and benched into the existing materials. Where embankments encroach on stream channels or lakes, the largest available rock produced by excavation operations shall be placed at the toes of slopes to protect the embankments against erosion. The professional engineer reserves the right to modify the angle of slope on embankments during the construction process.

C. Pit Bottom Soils – Pit bottom is to be entirely in cut slopes from native and undisturbed material. Pit shall be scarified to a depth of 12” below nominal bottom elevation, and shall be disked or bladed until it is free from large clasts, brought to the proper moisture content (within 1% below to 3% above optimum) and compacted to not less than 95% of maximum dry density as determined in accordance with ASTM D696 standard Proctor. If soft/yielding subgrade conditions are encountered, stabilization may be required as determined by the professional engineer.

Where pit bottoms or portions of pit bottom must be constructed on fill materials, the professional engineer shall examine and approve the fill material; provide over-excavation, benching, compaction and testing requirements; and provide construction observation as necessary.

D. Pit Slope and Bank Soils – Pit slopes and bank or perimeter areas may be constructed from approved fill materials. These materials include, but are not limited to, reworked cuttings, native cut and imported materials. Pit slopes and areas on the top of bank shall be disked or rolled with a sheep’s foot or similar equipment until they are free from any protruding sharp clasts larger than 6 inches and with no clasts protruding more than 3 inches above the plane of the slope or bank. If soft/yielding subgrade conditions are encountered, stabilization may be required as determined by the professional engineer.

E. Anchor Trench Soils – An anchor trench shall be excavated as shown and the slopes of the trench shall be disked, raked and/or bladed until it is free from large clods and sharp clasts. Anchor trench backfill material shall be disked, raked, and/or bladed until it is free from clods or clasts over 6 inches diameter, and stockpiled until needed.

F. Anchor Trench Backfill – After installation of synthetic liner system as specified in this plan set, the edge of the liner is to be anchored as shown and covered with anchor trench backfill material as noted. Backfill is to be brought to proper moisture content (within 2% above or below optimum), and compacted

to not less than 95% of maximum dry density as determined in accordance with ASTM D698 – standard Proctor or as specified by the professional engineer.

G. Compaction - Perform all compaction with approved equipment well suited to location and material being compacted. Use heavy vibratory rollers for fill work and where heavy equipment is appropriate. In areas where a small amount of fill is necessary, a hand-operated compactor (whacker), will be required. Compact all site fills and embankments to 95% of standard Proctor density for all soil types unless directed otherwise by the professional engineer.

**END OF SECTION**

## SECTION 2260 –SYNTHETIC LINING AND UNDERLAYMENT SYSTEM

### PART I - GENERAL

#### Description of Work

This section covers the synthetic pit lining system and leak detection system, if required, and includes installation; liner and underlayment materials; anchor trench details, leak detection system; per manufacturer's installation guidelines, and warranty.

### RELATED WORK SPECIFIED ELSEWHERE

Section 2200 – Excavation / Embankment

### PART II - PRODUCTS

A. Polyethylene Liners – The liner material shall the mil thickness as indicated on the drawings and shall be high density polyethylene, black in color, denoted as GSE Smooth GeoMembrane as manufactured by GSE Lining Technology, Inc., or approved equal. The liner shall be manufactured from virgin resin specifically compounded for use as a hydraulic containment member.

B. Geosynthetic Clay Liner – shall be a factory manufactured hydraulic barrier consisting of granular sodium bentonite clay, sandwiched between, supported and encapsulated by two geotextiles, held together by needle punching, denoted as BentoLiner NSL Bentonite Lliner as manufactured by GSE Lining Technology, Inc., or approved equal.

C. Drain Rock Collection Wrap - shall be a porous woven synthetic fabric denoted as Mirafi N160 as manufactured by TenCate Geosynthetics or approved equal.

D. HyperNet – interstitial water conveyance material shall be 200 mil HyperNet Geonet drain mat as manufactured by GSE Lining Technology, Inc. or approved equal.

E. Perforated Drain and Riser Pipe shall be 4 inch diameter PVC meeting ASTM D 3034 & D 2729, or approved equal.

F. Leak Detection Collection Rock – shall be washed rounded ¾" to 1.5 inch diameter rock.

### PART III - EXECUTION

A. Layout - The lining system shall be sized and fitted to the as-built constructed pit excavation as detailed in Section 2200 and per the manufacturer's installation guidelines contained in Appendix A of this plan set. Where practical, all liner seams shall be factory welded.

B. HyperNet Geonet - The geonet shall be installed per the configuration shown in Figure 4. The area to be lined shall be graded evenly and be free of loose or sharp protruding material from the pit floor, slopes or top bank. The geonet shall be installed per the manufacturer's installation guidelines.

GeoNet overlap shall be attached with 50 lbs. plastic zip ties as per the manufacturer's guidelines included in Appendix A or as specified by the professional engineer.

C. HDPE Liners – The liners shall be installed per the configuration shown in Figure 4 and per the manufacturer's guidelines included in Appendix A. The liners are to be laid perpendicular to the slope of the pit in contact with the underlayment and/or liner. If the liner is not entirely factory-seamed, field seams are to be staggered a minimum of 12 inches from underlayment or other liner seams. The contractor shall implement seaming or welding safeguards to ensure the no tears or burns affect the underlayment or adjacent liner materials. Field seams shall be observed by the professional engineer and tested per the manufacturer's guidelines.

D. Geosynthetic Clay Liners - The liners shall be installed per the configuration shown in Figure 4 and per the manufacturer's guidelines included in Appendix A with the exception of overlap distance. For this project, the clay liners shall overlap a minimum of 12 inches.

D. Leak Detection System – install per the drawings as required by the COGCC or Williams Production RMT Company. Carefully place drain rock and pipe to prevent damage to liner system.

## END OF SECTION

### SECTION 2280 –HYDROSTATIC TESTING

#### PART I - GENERAL

##### Description of Work

This section covers the hydrostatic integrity testing of the pit lining system and test reporting for pits geographically delineated in the COGCC's policy entitled "Notice to Operators Drilling Wells Within ¼ Mile of the Rim of the Roan Plateau in Garfield County, Pit Design, Construction and Monitoring Requirements", dated June 12, 2008; and COGCC email correspondence entitled "New Pit Requirements in the Piceance Basin", dated September 8, 2008.

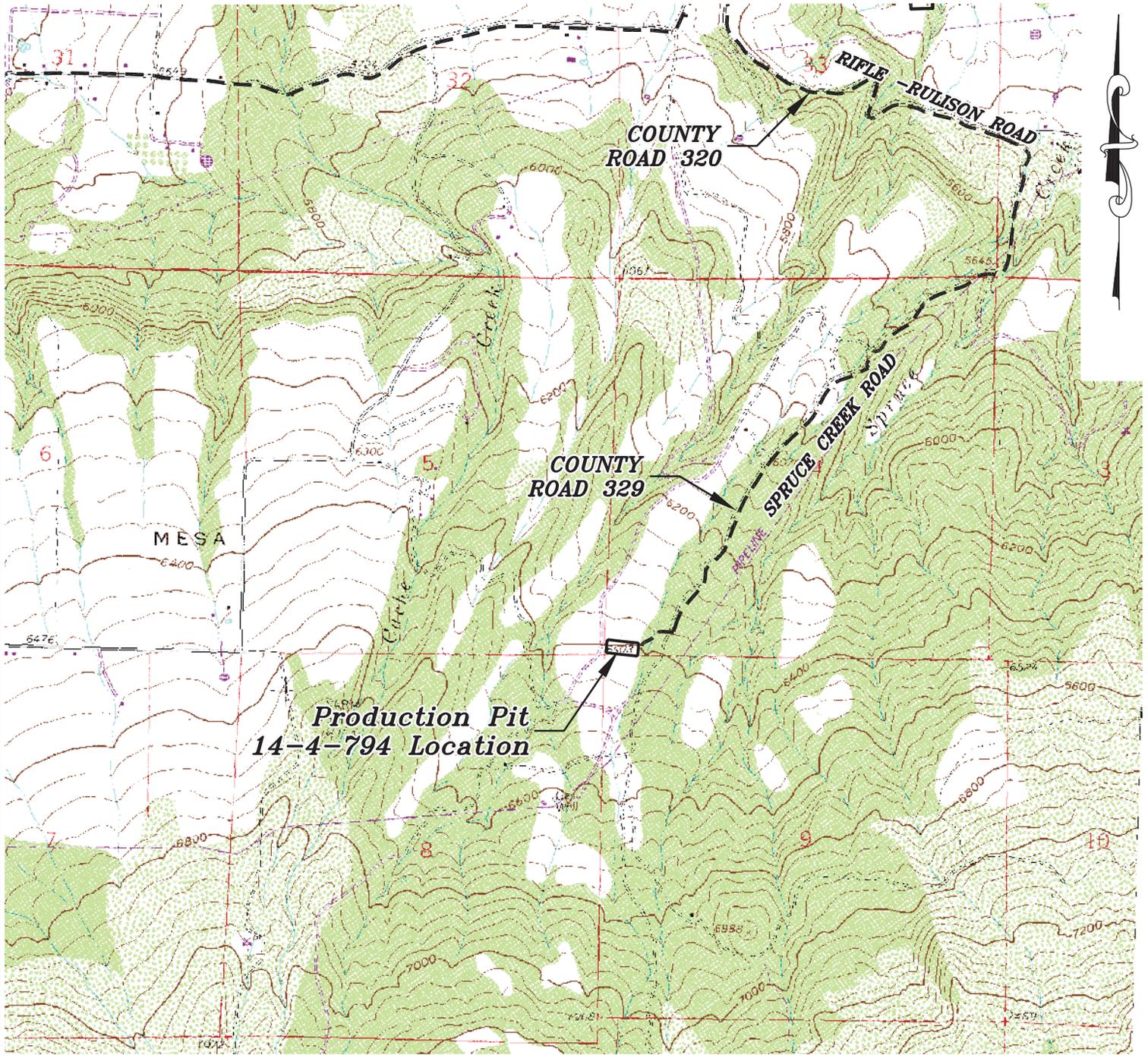
#### PART II - PRODUCTS

- A. Fresh Water – Untreated fresh water obtained from a legal water source and approved by the professional engineer shall be utilized for the hydrostatic integrity testing. Produced water may be used for the test subject to approval by the owner and the COGCC.

#### PART III - EXECUTION

- A. Hydrotesting – After complete installation of the liner system and prior to starting pit operations, the pit shall be filled with at least 4 feet, or 8 ft if required, of fresh or produced water, measured from the base of the pit and not to encroach into the 2 ft. freeboard. The owner or contractor shall monitor the pit for leaks for a period of 72 hours prior to draining the pit and commencing operations. Hydrostatic testing results shall be maintained by the Owner for the life of the pit and provide to the Colorado Oil and Gas Conservation Commission upon request.

Figure 1



GRAPHIC SCALE IN FEET  
1 INCH = 2000 FEET

**ACCESS DESCRIPTION:**

FROM THE INTERSECTION OF STATE HIGHWAY 6 AND COUNTY ROAD 323 (RULISON ROAD) NORTH OF RULISON, PROCEED SOUTHERLY ALONG COUNTY ROAD 323 (RULISON ROAD)  $\pm 1.1$  MILES TO THE INTERSECTION WITH COUNTY ROAD 309 (RULISON PARACHUTE ROAD), PROCEED LEFT IN AN EASTERLY DIRECTION  $\pm 2.3$  MILES TO THE INTERSECTION WITH COUNTY ROAD 320 (RIFLE RULISON ROAD), PROCEED RIGHT IN AN EASTERLY DIRECTION  $\pm 1.0$  MILES TO THE INTERSECTION WITH COUNTY ROAD 329 (SPRUCE CREEK ROAD), PROCEED RIGHT IN A SOUTHERLY DIRECTION  $\pm 1.8$  MILES TO AN INTERSECTION WITH A DIRT/GRAVEL ROAD, PROCEED RIGHT IN A WESTERLY DIRECTION TO THE 14-4-794 PRODUCTION PIT LOCATION, AS SHOWN HEREON.

K:\2010\Williams Valley\Prod.Pit. 14-4-794\Production Pit.dwg, 11/22/2011, 2:11:34 PM

136 East Third Street  
Rifle, Colorado 81650  
Ph. (970) 625-2720  
Fax (970) 625-2773



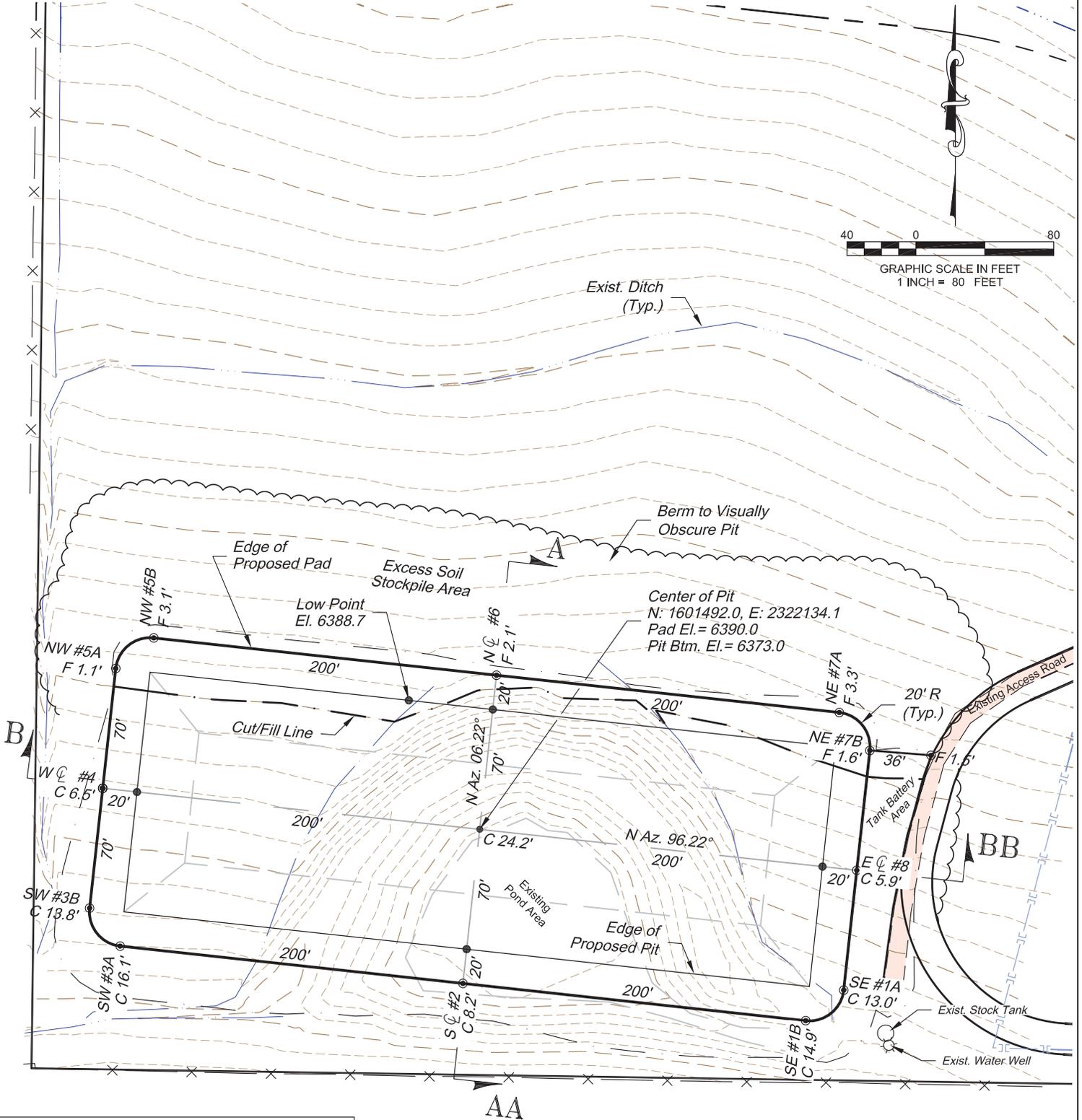
SCALE: 1" = 2000'  
DATE: 11/22/11  
PLAT: 3 of 4  
PROJECT: Williams Valley  
DFT: cws

Construction Plan Prepared for:  
**Williams** Williams Production, RMT

Production Pit 14-4-794 - Plat 5  
ACCESS ROAD MAP

Figure 2

Section 14  
T. 7 S., R 94 W



ITEM	CUT	FILL	TOPSOIL	EXCESS
PAD	32400	653	3500	28247
PIT	27255			27255
TOTALS	59655	653	3500	55502

\*NOTE:  
1.) Topsoil Volume Based on 12" Soil Depth.  
2.) Swell Factor of 15% Applied to All Earthwork Cut Volumes.

136 East Third Street  
Rifle, Colorado 81650  
Ph. (970) 625-2720  
Fax: (970) 625-2773

**BOOKCLIFF**  
Survey Services, Inc.

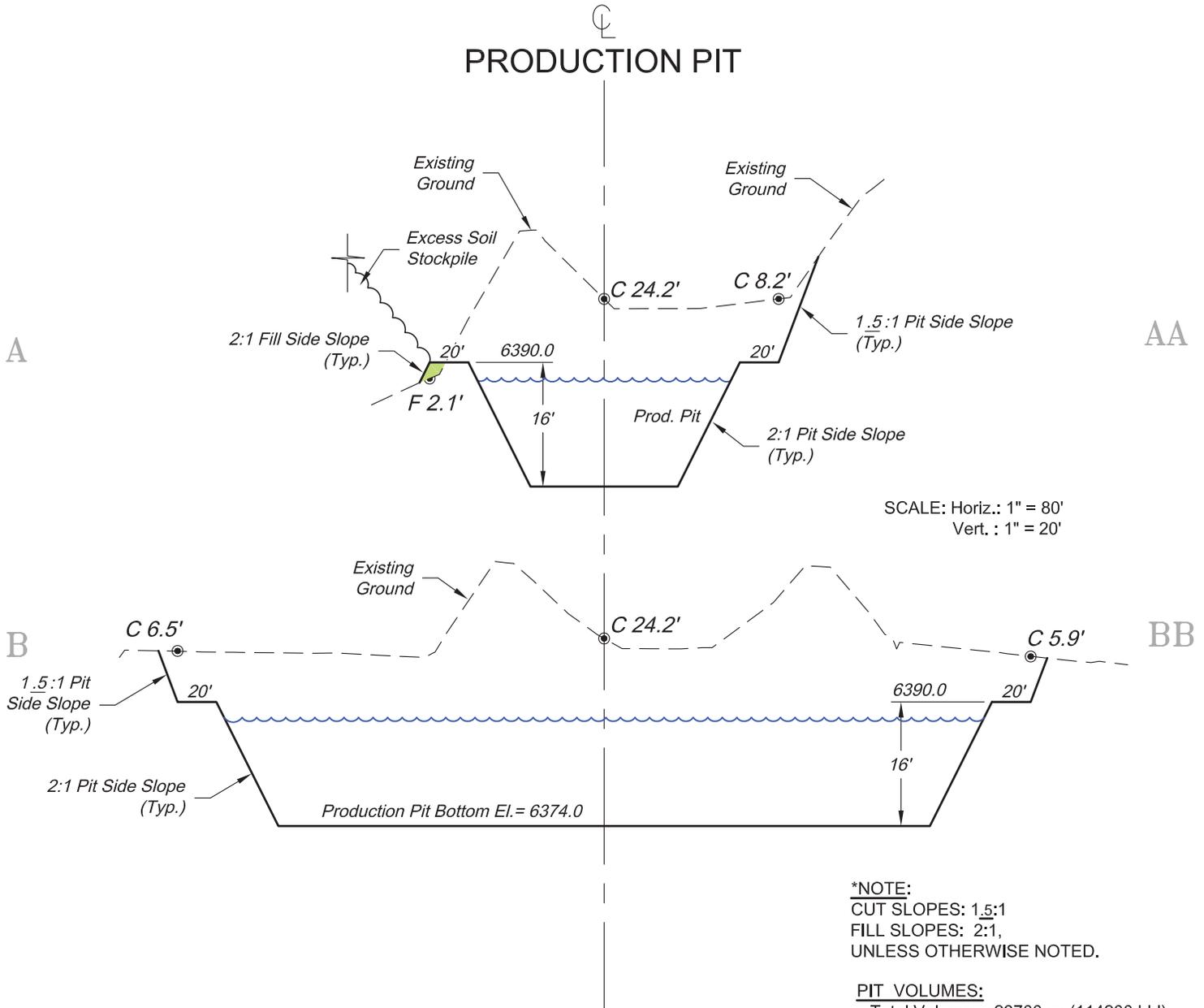
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DATE: 11/22/11  
PLAT: 1 of 4  
PROJECT: Williams Valley  
DFT: cws

Construction Plan Prepared for:  
**Williams** Williams Production, RMT

Production Pit 14-4-794  
CONSTRUCTION LAYOUT

Figure 3

# PRODUCTION PIT



**\*NOTE:**  
CUT SLOPES: 1.5:1  
FILL SLOPES: 2:1,  
UNLESS OTHERWISE NOTED.

**PIT VOLUMES:**  
Total Volume: 23700 cy (114200 bbl)  
2' Free Board: 19700 cy (95000 bbl)

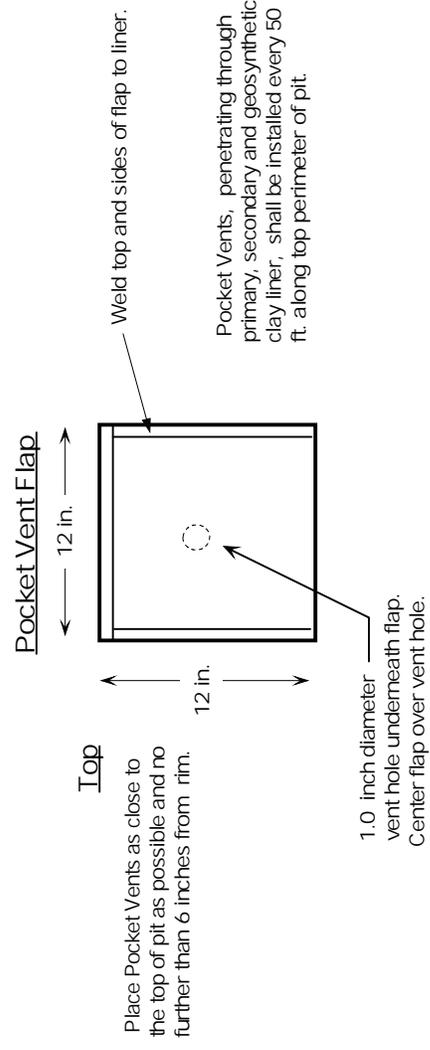
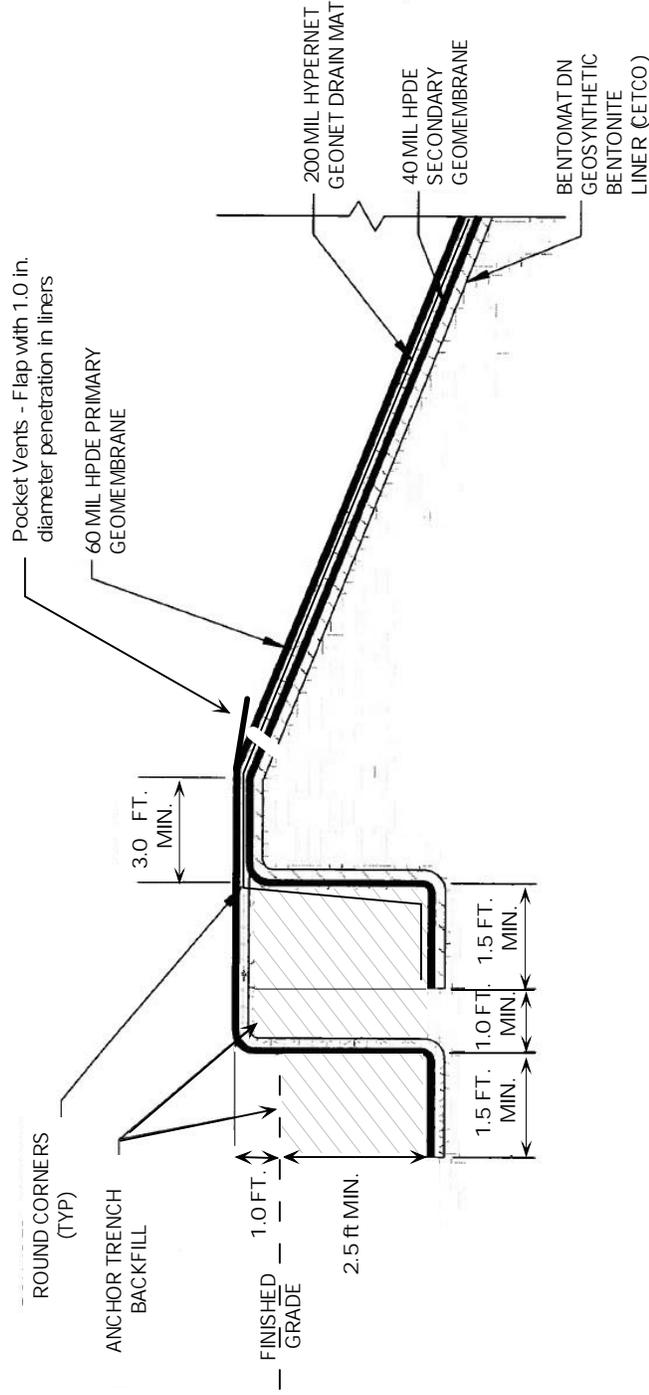
**EXIST. STOCK POND VOLUME:**  
Total Volume: 3610 cy (17300 bbl)

SCALE: As Noted  
DATE: 11/22/11  
PLAT: 2 of 4  
PROJECT: Williams Valley  
DFT: cws

Construction Plan Prepared for:  
**Williams** Williams Production, RMT  
*Production Pit 14-4-794  
CONSTRUCTION LAYOUT  
CROSS SECTIONS*

Figure 4

# Anchor Trench Details\*



Top

Place Pocket Vents as close to the top of pit as possible and no further than 6 inches from rim.

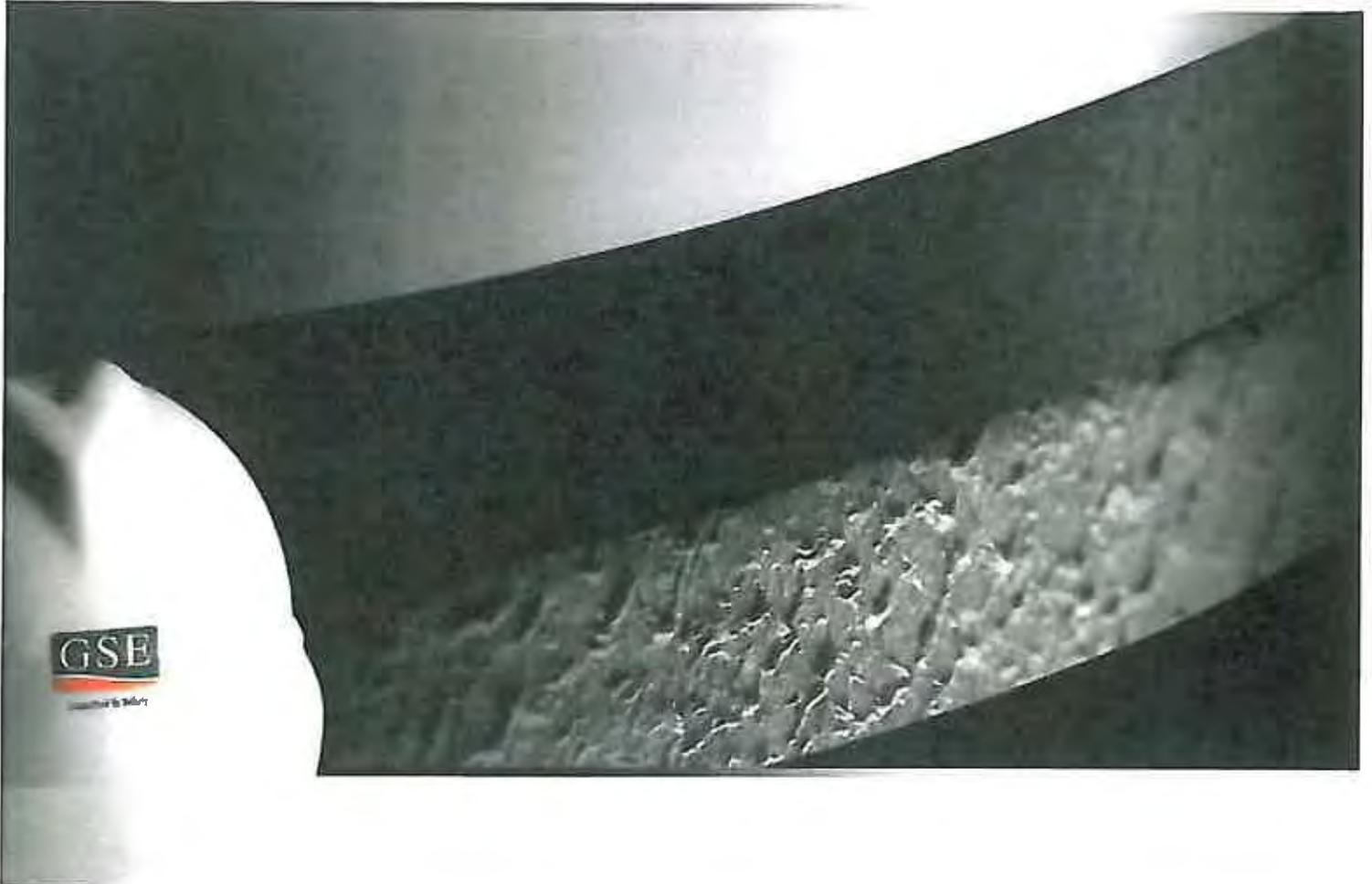
\* Subject to modification by liner manufacturer's installation instructions

Figure 5



Exhibit A

## Installation Quality Assurance Manual



# Geomembrane Products





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## 1.0 INTRODUCTION

This manual provides an overview of the GSE Installation Quality Assurance procedures consistent with industry accepted practices to ensure that the geomembrane products installed will perform for its intended purpose. In addition, all installation work will be performed in strict accordance per the customer's specifications. Please read the procedures below completely before you begin. If you need further clarification, contact the GSE Installation Department for assistance. Remember safety first and use safe practices always on every project.

## 2.0 STANDARD TEST METHODS

ASTM D 6392: Standard Test Methods For Determining The Integrity Of Non-Reinforced Geomembrane Seams Produced Using Thermo Fusion Methods

ASTM D 5820: Standard Practice For Pressurized Air Channel Evaluation of Dual Seamed Geomembranes

ASTM D 5641: Standard Practice For Geomembrane Seam Evaluation By Vacuum Chamber

ASTM D 6497: Standard Guide For Mechanical Attachment of Geomembrane to Penetrations or Structures

ASTM D 7240: Standard Practice for Leak Location using Geomembranes with an Insulating Layer in Intimate Contact with a Conductive Layer via Electrical Capacitance Technique (Conductive Geomembrane Spark Test)

GRI Standard GM13: Test Properties, Testing Frequency and Recommended Warranty for High Density Polyethylene (HDPE) Smooth and Textured Geomembranes

GRI Standard GM14: Selecting Variable Intervals for Taking Geomembrane Destructive Seam Samples Using the Method of Attributes

GRI Standard GM17: Test Properties, Testing Frequency and Recommended Warranty for Linear Low Density Polyethylene (LLDPE) Smooth and Textured Geomembranes

GRI Standard GM19: Standard Specification for Seam Strength and Related Properties of Thermally Bonded Polyolefin Geomembranes

## 3.0 MATERIAL DELIVERY

- A. Upon arrival on site, the GSE QA personnel will inventory all materials on the job site.
- B. Roll numbers of geomembrane will be logged on the Inventory Check List (Appendix A) and cross-referenced with the Bill of Lading for materials supplied by GSE.
- C. Copies of the Inventory Check List and signed Bill of Lading should be sent to the GSE's corporate headquarters while the QA personnel retains the original copies.



- D. Any visible damage to roll materials should be noted on the roll and Inventory Check List.

#### 4.0 EARTHWORK

- A. The general contractor is responsible for preparing and maintaining the subgrade. The subgrade should be prepared and maintained per the job specifications.
- B. The GSE site manager shall be responsible for assuring that the subgrade surface has been properly prepared for deployment of geosynthetics. After each day's deployment the Subgrade Surface Acceptance form (Appendix B) will be signed by all parties.

#### 5.0 PANEL PLACEMENT

- A. Each panel will be assigned a number as described below.
  - 1. When there is one layer, panels may be designated with only a number, i.e... 1, 2, 3, 4 etc.
  - 2. When two or more layers are required, use a letter and number, i.e....
    - Primary Liner P1, P2, P3, P4 etc...
    - Secondary Liner S1, S2, S3, S4 etc...
    - Tertiary Liner T1, T2, T3, T4 etc...
- B. This numbering system should be used whenever possible. Agreement to a panel numbering system should be made at the pre-construction meeting. However, it is essential that GSE and the owner representative and third party QA inspector agree.
- C. Panel numbers shall be written in large block letters in the center of each deployed panel. The roll number, date of deployment and length (gross) should be noted below the panel number. All notes should be made, so that they are easily visible from a distance. On long panels it is beneficial to write information on both ends.
- D. Panel numbers shall be logged on the GSE Panel Placement Log (Appendix C) along with the roll number and other information necessary to complete the form.
- E. If there is a partial roll left after deployment, it is important to write the last four digits of the roll number in several locations on the roll along with the estimated length for future identification.
- F. Deployment of geomembrane panels shall be performed in a manner that will comply with the following guidelines:
  - 1. Unroll geomembrane using methods that will not damage geomembrane and will protect underlying surface from damage. GSE Conductive should be installed with Conductive layer facing down.
  - 2. Place temporary ballast, such as sandbags, on geomembrane that will not damage the geomembrane and to prevent wind uplift.
  - 3. Personnel walking on geomembrane shall not engage in activities or wear shoes that could

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damage it. Smoking is not permitted on the geomembrane.

4. Do not allow heavy vehicular traffic directly on geomembrane. Rubber tired and tracked ATV's and equipment are acceptable if contact pressure is less than 8 psi.
  - a. Protect geomembrane in areas of heavy traffic by placing protective cover over the geomembrane.
  - b. Prior to driving on any geomembrane layer, please check for sharp edges, embedded rocks, or other foreign objects that may protrude in the tires and tracks.
  - c. Path driven on geomembranes shall be as straight as possible with no sharp turns, sudden stops or quick starts.
  - d. Areas where driving occurs shall be continuously and thoroughly inspected throughout the deployment process by the contractor and the third party CQA.

## 6.0 TRIAL WELDS

- A. Seaming apparatus shall be allowed to warm up a minimum of 10 minutes before performing trial welds.
- B. Each seaming apparatus along with GSE welding technician will pass a trial weld prior to use. Trial welds to be performed in the morning and afternoon, as a minimum, as well as whenever there is a power shutdown.
- C. Fusion or wedge welds will always be performed or conducted on samples at least 6.0 ft long. Extrusion welds will be done on samples at least 3.0 ft long.

*Note: Always perform trial welds in the same conditions that exist on the job. Run the trial welds on the ground, not the installed liner. Do not use a wind break unless you are using one on the job.*

- D. Operating temperatures should be monitored while welding. The welding technician should verify that the equipment is capable of maintaining temperature while welding.
- E. Sampling Procedure
  1. Cut five 1.0 in wide specimens from the trial weld sample. Specimens will always be cut using a 1.0 in die cutter, so the peel values may be used for qualitative analysis.
  2. When cutting coupons from the trial weld samples, the inside and outside tracks on the coupon should be identified to assist in troubleshooting problems in case the weld fails. The outside track will be defined as the track, which would be peeled if pulling the overlap exposed in a typical installation, or the seam that is closest to the edge of the top sheet. The inside track is the seam closest to the edge of the bottom sheet.

**F. Cutter**

1. Only cut one sample at a time to avoid damaging the die cutter.
2. Samples should be free of sand and grit prior to cutting sample.
3. Inspect the die edge weekly for nicks, dents or signs of dullness. Dullness of the cutting edge may damage the units.
4. Remove die when edge has been dulled and lightly reshape it with a medium hand file. When wear is excessive return it for a replacement die.
5. When the cutting board becomes deeply scored and/or interferes with coupon cutting it should be replaced.
6. To adjust the depth of the die cut into the cutting board, after replacing the cutting board or sharpening the die, 0.015 in washer shims can be added or removed between the cutting ram and the ram extension. Only add shims when cutting is difficult due to lack of depth of cut.

**G. Trial Weld Testing**

1. Allow coupons to cool prior to testing. Avoid separating the coupons while hot as failure of the sheet may be initiated and false readings indicated.
2. In extreme heat the coupons may need to be cooled, using water or an insulated cooler prior to peel testing. Lab conditions specify 70 degrees (plus or minus 4 degrees) Fahrenheit. Coupon temperatures greater than 70 degrees may result in lowered strengths.
3. Visually inspect the coupons for squeeze-out, footprint, pressure and general appearance.
4. Each of the five coupons will be tested in peel on the field tensiometer at a separation rate of 2 in per minute (for HDPE). Shear tests, in addition to the peel tests, will be performed.

**H. Pass/Fail Criteria**

1. Criteria for passing trial welds will be as follows:
  - a. Seam must exhibit film tear bond (FTB). Trial welds should have no incursion into the weld.
  - b. Peel and shear values shall meet or exceed the values as listed in Appendix D, Table 1 for HDPE smooth or textured sheet (@ 2 in/min).
  - c. Peel and shear values shall meet or exceed the values as listed in Appendix D, Table 2 for LLDPE smooth or textured sheet (@ 20 in/min).
  - d. Both tracks of fusion welded samples must pass for the trial weld to be considered acceptable. If any of the five coupons fail due to seam incursion (no FTB) or low strength values, the trial weld must be performed again.

- e. The GSE QA personnel will give approval to proceed with welding after observing and recording all trial welds.
2. All trial weld data will be logged on the GSE Trial Weld Log (Appendix E).
3. When logging fusion welded peel values on the GSE Trial Weld Log indicate the values for the outside track first, followed by the inside track.
4. Speed and temperature settings will be recorded for each machine trial weld as appropriate.

## 7.0 GEOMEMBRANE FIELD SEAMING

- A. The seam number takes the identity of the panels on each side. The seam between panels 1 & 2 becomes seam 1/2.
- B. Welding technicians will record their initials, machine number, date and time at the start of every seam and on the GSE Seam Log (Appendix F). The technician should also periodically mark temperatures along the seam and at the end of the seam.
- C. Approved processes for field seaming and repairing are fusion welding and extrusion welding. All welding equipment shall have accurate temperature monitoring devices installed and working to ensure proper measurement.
- D. Fusion welding shall be used for seaming panels together and is not used for patching or detail work. The GSE site manager shall verify that:
  1. The equipment used is functioning properly.
  2. All work is performed on clean surfaces and done in a professional manner. No seaming will be performed in adverse weather conditions.
- E. Extrusion welding shall be used primarily for repairs, patching and special detail fabricating and may be used for seaming. The GSE site manager shall verify that:
  1. Equipment used is functioning properly.
  2. Welding personnel are purging the extrusion welders of heat degraded extrudate prior to actual use.
  3. All work is performed on clean surfaces and done in a professional manner. No seaming will be performed in adverse weather conditions.
- F. For seam preparation, the welding technician shall verify that:
  1. Prior to seaming, the seaming area is free of moisture, dust, dirt, sand or debris of any nature.
  2. The seam is overlapped properly for fusion welding.
  3. The seam is overlapped or extended beyond damaged areas at least 4.0 in when extrusion welding.



4. The seam is properly heat tacked and abraded prior to extrusion welding.
  5. Seams are welded with fewest number of unmatched wrinkles or "fishmouths".
- G. No seaming will be performed in ambient air temperatures or adverse weather conditions that would jeopardize the integrity of the liner installation.

## 8.0 FIELD DESTRUCTIVE TESTING

- A. Destructive seam tests shall be performed to evaluate bonded seam strength. The frequency of sample removal shall be one sample per 500 ft of seam, unless site specifications differ. Location of the destructive samples will be selected and marked by the QA technician or third party QA inspector. Field testing should take place as soon as possible after seam is completed.
- B. Samples should be labeled in numerical order, i.e. DS-1, DS-2 etc....This should carry thru any layer and or multiple ponds, do not start numbering from 1 again. The size of samples and distribution should be approximately 12 in x 39 in (Size may vary depending on job requirements) and distributed as follows:
1. 12 in x 12 in piece given to QA technician for field testing.
  2. 12 in x 12 in piece sent to the GSE's corporate headquarters for testing, if required.
  3. 12 in x 12 in piece given to third party for independent testing or to archive.

*NOTE: All samples will be labeled showing test number, seam number, machine number, job number, date welded and welding tech number.*

- C. The sample given to the QA technician in the field shall have ten coupons cut and be tested with a tensiometer adjusted to a pull rate as shown below. The strength of four out of five specimens should meet or exceed the values below, and the fifth specimen must meet or exceed 80% of the value below.
1. Seam must exhibit film tear bond (FTB). Welds should have  $\leq 25\%$  incursion into the weld.
  2. Peel and shear values shall meet or exceed the values as listed in Appendix D, Table 1 for HDPE smooth or textured sheet (@ 2 in/min).
  3. Peel and shear values shall meet or exceed the values as listed in Appendix D, Table 2 for LLDPE smooth or textured sheet (@ 20 in/min).
- D. All weld destructive test data will be logged on the GSE Destructive Test Log (Appendix G).
- E. When logging fusion welded peel values on the GSE Destructive Test Log, indicate the values for the outside track first, followed by the inside track.
- F. Test results will be noted in the GSE Destructive Test Log as Pass (P) or Fail (F).

- G. If a test fails, additional samples will be cut, approximately 10 ft on each side of the failed test, and retested. These will be labeled A (After) & B (Before). This procedure will repeat itself until a sample passes. Then the area of failed seam between the two tests that pass will be capped or reconstructed.

## 9.0 NON-DESTRUCTIVE TESTING

- A. GSE shall non-destructively test all seams their full length using an air pressure or vacuum test. The purpose of this test is to check the continuity of the seam.
  - B. For air pressure testing, the following procedures are applicable to those seams welded with a double seam fusion welder.
    - 1. The equipment used shall consist of an air tank or pump capable of producing a minimum 35 psi and a sharp needle with a pressure gauge attached to insert into the air chamber.
    - 2. Seal both ends of the seam by heating and squeezing them together. Insert the needle with the gauge into the air channel. Pressurize the air channel to 30 psi. Note time test starts and wait a minimum of 5 minutes to check. If pressure after five minutes has dropped less than 2 psi then the test is successful (Thickness of material may cause variance).
    - 3. Cut opposite seam end and listen for pressure release to verify full seam has been tested.
    - 4. If the test fails, follow these procedures.
      - a. While channel is under pressure walk the length of the seam listening for a leak.
      - b. While channel is under pressure apply a soapy solution to the seam edge and look for bubbles formed by air escaping.
      - c. Re-test the seam in smaller increments until the leak is found.
    - 5. Once the leak is found using one of the procedures above, cut out the area and retest the portions of the seams between the leak areas per 4a to 4b above. Continue this procedure until all sections of the seam pass the pressure test.
    - 6. Repair the leak with a patch and vacuum test.
  - C. For vacuum testing, the following procedures are applicable to those seams welded with an extrusion welder.
    - 1. The equipment used shall consist of a vacuum pumping device, a vacuum box and a foaming agent in solution.
    - 2. Wet a section with the foaming agent, place vacuum box over wetted area. Evacuate air from the vacuum box to a pressure suitable to affect a seal between the box and geomembrane. Observe the seam through the viewing window for the presence of soap bubbles emitting from the seam.
    - 3. If no bubbles are observed, move box to the next area for testing. If bubbles are observed, mark the area of the leak for repair per section 11.0 and re-test per section 9.0.



*Note: If vacuum testing fusion welded seams, the overlap flap must be cut off to perform the tests*

4. All non-destructive tests will be noted in the GSE Non-Destructive Logs (Appendixes H-I).
- D. For spark testing GSE Conductive geomembranes, ASTM D 7240 will be the procedure, unless otherwise instructed by the engineer client.

## 10.0 DEFECTS & REPAIRS

- A. All seams and non-seam areas of the geomembrane lining system shall be examined for defects.
- B. Identification of the defect should be made using the following procedures:
  1. For any defect in the seam or sheet that is an actual breach (hole) in the liner, installation personnel shall circle the defect and mark with the letter P along side the circle. The letter P indicates a patch is required.
  2. For any defect that is not an actual hole, installation personnel shall circle the defect indicating that the repair method may be only an extruded bead and that a patch is not required.
  3. Each suspect area that has been identified as repair shall be repaired in accordance with section 11.0 and in the non-destructively testing per section 9.0. After all work is completed, the GSE site manager will conduct a final walk-through to confirm all repairs have been completed and debris removed. Only after this final evaluation by the GSE site manager, the owner, and the agent shall any material be placed over the installed liner.

## 11.0 REPAIR PROCEDURES

- A. Any portion of the geomembrane lining system exhibiting a defect that has been marked for repair may be repaired with any one or combination of the following procedures:
  1. Patching - used to repair holes, tears, undispersed raw materials in the sheet.
  2. Grind and Reweld - used to repair small sections of extrusion welded seams.
  3. Spot Welding - Used to repair small minor, localized flaws.
  4. Flap Welding - Used to extrusion weld the flap of a fusion weld in lieu of a full cap.
  5. Capping - Used to repair failed seams.
- B. The following conditions shall apply to the above methods:
  1. Surfaces of the geomembrane which are to be repaired shall be prepared according to this section.
  2. All surfaces must be clean and dry at the time of the repair.
  3. All seaming equipment used in repairing procedures shall be qualified.

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4. All patches and caps shall extend at least 4 in beyond the edge of the defect, and all patches must have rounded corners.
  5. All cut out holes in liner must have rounded corners of 3.0 in minimum radius.
- C. Patches should be labeled in numerical order, i.e. RP-1, RP-2, etc... This should carry through any layer and/or multiple ponds, and do not start with the number 1 again.

## 12.0 AS-BUILT DRAWINGS

As-built drawings are available per these items:

- A. As-built drawings will be provided at the completion of the project.
- B. AutoCad as-built drawings will be provided in either a printed version or by email in a PDF file.
- C. As-built drawings will include geomembrane panels and panel numbers with the last four digits of the roll number.
- D. Panel numbers and the full roll numbers will correspond with the GSE Panel Placement Log.
- E. All destructive testing and repair locations will be placed on the as-built drawings.

If you require further information, please contact the GSE Installation Department directly.





### Appendix B: Subgrade Surface Acceptance

#### Subgrade Surface Acceptance

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

Project: \_\_\_\_\_ Site Manager: \_\_\_\_\_

Project #: \_\_\_\_\_

Location: \_\_\_\_\_ Partial: \_\_\_\_\_ Final: \_\_\_\_\_

*This document only applies to the acceptability of surface conditions for installation of geosynthetic products. GSE does not accept responsibility for compaction, elevation or moisture content, nor for the surface maintenance during deployment. Structural integrity of the subgrade and maintenance of these conditions are the responsibility of the owner or earthwork contractor.*

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

For GSE Lining Technology, LLC:

For Owner / Contractor

\_\_\_\_\_  
\_\_\_\_\_

Acceptance Number: \_\_\_\_\_ Area Accepted: \_\_\_\_\_ s.f. Total Area Accepted to date: \_\_\_\_\_ s.f.



## Appendix D: HDPE & LLDPE Seam Strength Properties

**Table 1. HDPE Seam Strength Properties**

Material (Mil)	Shear Strength (PPI)	Fusion Peel (PPI)	Extrusion Peel (PPI)
40	81	65	52
60	121	98	78
80	162	130	104
100	203	162	130

**Table 2. LLDPE Seam Strength Properties**

Material (Mil)	Shear Strength (PPI)	Fusion Peel (PPI)	Extrusion Peel (PPI)
40	60	50	48
60	90	75	72
80	120	100	96
100	150	125	120













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# Installation Quality Assurance Manual

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## **GSE BentoLiner** Fabric Encased Geosynthetic Clay Liner Products





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## 1.0 INTRODUCTION

This manual provides an overview of the GSE Installation Quality Assurance procedures consistent with industry accepted practices to ensure that the GSE BentoLiner GCL products installed will best perform for its intended purpose. In addition, all installation work will be performed in strict accordance per the customer's specifications. Please read the procedures below completely before you begin. If you need further clarification, contact the GSE Installation Department for assistance or please refer to ASTM D 6102, Standard Guide for Installation of Geosynthetic Clay Liners and ASTM D 5888, Standard Guide for Storage and Handling of Geosynthetic Clay Liners. Remember safety first and use safe practices always on every project.

## 2.0 UNLOADING PROCEDURES

As with all lifting or unloading operations, appropriate equipment and experienced personnel should be employed along with proper safe handling methods. The party responsible for unloading the GSE BentoLiner should contact GSE prior to shipment to determine the correct unloading methods and equipment if different from the pre-approved and specified methods as described below.

Lifting GCL rolls can typically be accomplished with by using a 2.5 in - 3.0 in (63 mm - 75 mm) outside diameter (O.D.) steel pipe (preferably solid), with a wall thickness capable of providing sufficient beam strength to support the weight of the roll, which average less than 3,000 lb (1,364 kg) and the length is approximately 18 ft (5.5 m). This core pipe is inserted through the hollow center of the GCL cardboard core. Heavy-duty slings or chains, which are approximately 10 ft (3.1 m) long, each are attached to each end of the pipe, which are then fastened to a I-beam spreader bar or a GSE approved alternative. Care should be taken to ensure that lifting chains or straps do not rub, chafe, or otherwise damage the GCL. A crane, backhoe, front-end loader or another suitable piece of construction equipment can then lift the entire assembly.

An all-terrain, extendable boom forklift, such as a Lull or Caterpillar Telehandler, can be fitted with a special, solid steel "carpet pole" or stinger, typically 14.0 ft (4.3 m) in length having an outside diameter of no more than 3.38 in (8.6 mm). The carpet pole can be inserted into the hollow cardboard core of the GCL roll.

The roll should not be fully suspended until the pole extends through the entire length of the core tube or you run the risk that the core may break creating additional handling and unloading difficulties

A properly structured and supported pole can be used to unload GCL rolls onsite. As an alternative, straps that are appropriately rated can be used as a GSE approved lifting method to unload GCL rolls. Lifting straps are supplied on every roll. Each GCL roll label contains roll weight information that should be consulted in determining appropriate lifting equipment and factors of safety.

The CQA inspector or owner's representative should verify that only appropriate handling equipment is utilized, i.e. equipment that does not pose any danger to personnel or undue risk of damage or deformation to the liner material.

All roll numbers should be recorded during the unloading operations and compared to shipping papers to ensure receipt of only project compliant materials. Furthermore, rolls should be visually inspected for damage and suspect rolls marked, recorded, and set aside for further investigation by CQA personnel.

### 3.0 STORAGE

While stored GCL needs to be kept dry and away from potential flooding or high storm runoff. On the job site storage methods include; storing the rolls tarped on pallets; storing the rolls under roof in a clean, dry protected area; and storing the rolls on a flat, dry, stable surface suitably covered with protective waterproof tarps. Rolls can be stacked as long as it is done in a manner that prevents them from rolling, shifting, or spontaneously moving. Maximum roll height should be determined by CQA personnel, but never more than can be safely managed considering site conditions, equipment and personnel.

Stored rolls should be tarped and remain in their original, unopened plastic shipping sleeves to prevent damage and undue prehydration prior to installation. Any rolls that come in contact with water should be examined by CQA or an owner's representative prior to installation. Prehydrated or physically damaged rolls should be set aside for further examination to determine the plausibility of repair or need to replace.

### 4.0 SUBGRADE PREPARATION

The surface upon which the GSE BentoLiner is installed should be smooth and free of wheel ruts, debris, roots, sticks, and rocks larger than 1.0 in (25 mm). Site specific compaction requirements should be followed in accordance with the project plans and specifications. At a minimum, the site should be smooth rolled the level of compaction such that installation equipment and other construction vehicles traffic does not cause rutting greater than 1.0 in (25 mm) deep. Furthermore, all protrusions extending more than 0.5 in (12 mm) from the subgrade shall be removed, crushed, or pushed into the subgrade.

In applications where the product is the sole barrier, subgrade surfaces consisting of gravel or granular soils may not be acceptable due to their large void content. For these applications, the subgrade shall be greater than 80% fines and contain no particles larger than 1 in (25 mm). In all high head, water containment applications, i.e. maximum water depth greater than 1 ft (30.5 cm), GSE recommends the use of a coated or laminated GCL such as GSE BentoLiner CNSL.

Immediately prior to deployment of the GCL, the subgrade shall be final compacted to fill in any remaining voids or desiccation cracks and to ensure that no sharp irregularities or abrupt elevation changes exist greater than 1.0 in (25 mm). The surfaces to be lined shall be maintained in this condition and free of standing water. GCL can be deployed on a frozen subgrade, if the subgrade would meet all the conditions as previously outlined if unfrozen.

The subgrade surface and preparation should be inspected and certified by the CQA inspector prior to GSE BentoLiner placement. Upon approval by the CQA inspector, it is the geosynthetic installer's responsibility to communicate to the engineer of any changes in the condition of the subgrade that might render it out of compliance, with any of the requirements of the project specification or ASTM



Standard D 6102.

## 5.0 DEPLOYMENT

As rolls are selected for deployment, the labels should be removed and recorded by the installer, along with any other pertinent information. The rolls should only be transported from the storage area using approved lifting equipment as described in section 2.0. The roll is supported during deployment, so that the fabric designated as the upper surface faces out, away from the installation vehicle. The free end of the roll can then be secured, while the vehicle supporting the roll slowly backs away, deploying the GCL as it moves. Alternatively, the free end can be manually pulled across an area to be lined by the installation crew while the equipment simply suspends the roll. Equipment traveling directly on GCL for deployment of overlying geosynthetics should be limited to lightweight ATVs maximum bearing capacity of 8.0 psi (34.5 kPa) or equivalent.

Successive panels are overlapped according to project specifications and/or within the overlap lines stenciled on the upper surface of each panel. Wherever possible, installation of GSE BentoLiner should begin at high elevation and proceed to low elevation. This allows any precipitation to accumulate and drain quickly without adversely affecting the GCL. The edges of exposed GCL should be weighted down with sandbags or equivalent ballast to prevent uplift in the event of substantially strong winds.

Only as much GSE BentoLiner as can be fully covered by the end of the day should be deployed or such amount that can be covered in a reasonably short time in the event of heavy precipitation. When GCL is being installed under a geomembrane, the leading edge should be folded back under the membrane at the end of the construction day. Temporary ballasting, such as sandbags, to prevent uplift and the infiltration of runoff water should secure the leading edge of the membrane.

GSE BentoLiner panels should be installed in a relaxed condition, free of wrinkles and folds. When fitting the product into small areas or around construction details, use a sharp utility or hook blade knife to cut the liner to the appropriate dimensions. Adjacent panels should overlap at the edges as described in section 6.0 below.

## 6.0 OVERLAPS & SEAMS

Unless specified differently adjacent lengthwise (longitudinal) seams should be overlapped a minimum of 6.0 in (150 mm). Granular bentonite should be used to augment all overlapped seams. Loose granular bentonite is placed between adjoining panels into the overlap area at a rate of 0.25 lb per linear foot (350 g per linear meter) of seam. Widthwise overlaps at the butt ends of rolls should be a minimum 12.0 in (300 mm). Seams should be shingled in a down slope direction, so that water flows across the seam from upslope sheet to the down slope sheet.

When the liner is cut to fit in small areas, i.e. into corners or around structures, adjacent panels should overlap a minimum of 1.0 ft (300 mm), adding abundant loose granular bentonite into the overlapped areas.

## 7.0 ATTACHMENT DETAILS

The product should be installed around penetrations, structures, pipes, structures and other appurte-

nances according to the contract drawings. GSE BentoLiner may be secured to appurtenances by use of a stainless steel batten or clamps, mechanical fasteners, or other appropriate device if necessary to minimizing movement. The use of additional granular bentonite or bentonite paste is recommended to maximize the seal around structures or protuberances.

## 8.0 ANCHORING

GSE BentoLiner is typically anchored in a trench around the perimeter of the lined area, which provides the required pullout resistance. In most cases, GCL can be anchored in the same trench as any adjacent geosynthetic liner components (if used). Dimensions and locations of the trench should be provided in the project drawings. Alternately, the material may be anchored by deploying additional run out of material, a minimum of 3.0 ft (1.0 m), past the slope crest and toe. Typically GCL should not be deployed in tension. The force holding the GCL in place should be provided by friction between the GCL and adjacent materials.

Steps should be taken to ensure that precipitation does not accumulate in the trench prior to backfilling. The GCL should only cover the front face and bottom of the anchor trench. The trench should be back filled and properly compacted prior to placing cover soil on the slopes.

## 9.0 REPAIRS

In the event an area of GSE BentoLiner becomes damaged, torn, or punctured during installation, the affected area should be repaired. On relatively level surfaces, the damaged area should be covered with a separate piece of GSE BentoLiner extending at least 12.0 in (300 mm) beyond the damaged area in every direction. Granular bentonite should be used to augment the patch overlays as is required for all other seams. Patches on side slopes can be temporarily secured with construction adhesive such as Liquid Nails or tape.

Areas that are exposed to standing water or excess precipitation with resulting bentonite hydration, typically as defined as greater than 30% moisture, prior to soil covering, should be examined for bentonite displacement and damage by subsequent activities. If it is determined that the GCL has been hydrated and damaged, the GCL should be covered with new material over the affected area or removed and replaced. All GSE BentoLiner material exposed to hydrocarbon fuels, chemicals, pesticides, non-compatible leachates, or other harmful liquids during the installation should be removed and replaced with non-affected material.

## 10.0 INSPECTION

Prior to soil covering the panels, penetrations and any other details should be visually inspected to ensure full coverage and proper orientation. Once the installed GSE BentoLiner material has been approved the next layer of geosynthetics or soil covering may be applied.

## 11.0 COVER MATERIAL

Only the amount of GSE BentoLiner GCL that can be anchored, inspected, and covered the same day should be installed. In cases where the GSE BentoLiner GCL is the sole hydraulic barrier, the GCL should be covered with the specified thickness of cover soil (a minimum 1.0 ft (300 mm)) immediately

following deployment. Where GSE BentoLiner GCL is used in conjunction with other membrane components, it should be covered with the geomembrane after placement, as soon as possible to protect it from the climatic elements.

When a geomembrane is being installed over the GCL, the leading edge of the GSE BentoLiner should be folded back under the geomembrane so that the geomembrane extends beyond the GCL a minimum of 2.0 ft (600 mm). The leading edge of the membrane should subsequently be weighted with sand bags or suitable ballast to safeguard against wind uplift and to prevent runoff water from undermining the liner.

When GSE BentoLiner is used with no overlying geomembrane, the soil cover should be placed within 2.5 ft (800 mm) of the leading edge of the GCL. The leading edge can then be covered with plastic sheeting that is folded under the exposed edge approximately 12.0 in (300 mm). Sand bags or suitable ballast should be placed on the liner to hold the plastic in place and to partially confine the GCL. The next morning the ballast and the plastic can be removed and subsequent rolls of GCL placed as described in section 5.0.

Cover soil placed directly on GCL should have a gradation to not damage or puncture the GCL. Cover soil should be free of all rocks greater than 0.75 in (18 mm) diameter, sharp or angular objects, sticks, roots or debris. Appropriate placement methods should be used at all times to protect the GCL. Compatibility of GSE BentoLiner GCL with the soil should be verified. Cover material should be pushed across the seams from top to bottom to prevent the cover material from lodging between the overlapped panel seams.

## 12.0 HYDRATION & ACTIVATION

In applications where the product is used as the sole hydraulic barrier, such as secondary containment, the GCL must first be hydrated with fresh water. Non-aqueous chemicals will not activate the bentonite. Therefore, bentonite hydration via rainwater or sprinkler and irrigation is necessary. When hydrated, the GSE BentoLiner is an excellent barrier to hydrocarbon fuels, fertilizers, and other such chemicals.

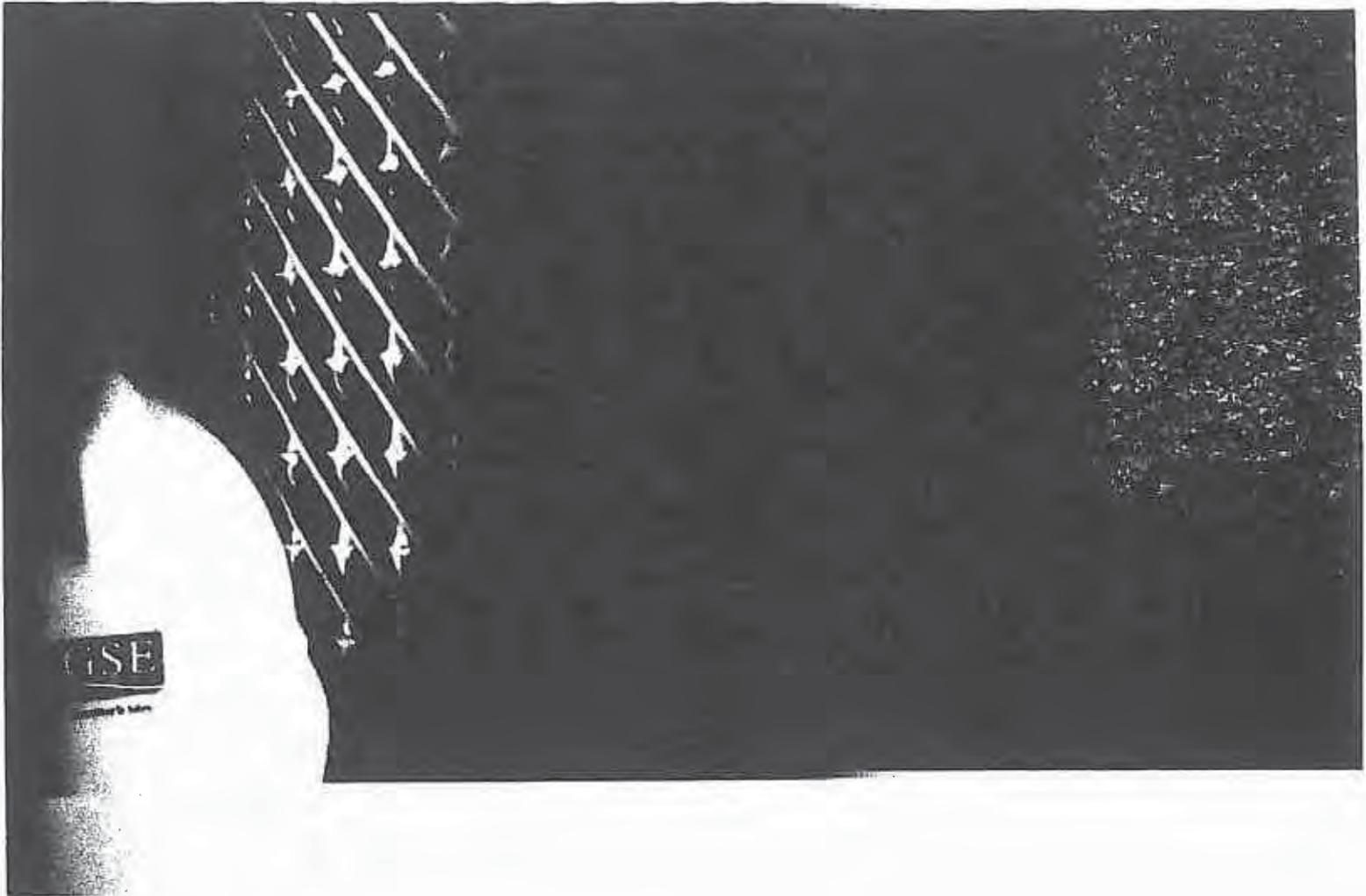
Only after the cover material has been placed should the GSE BentoLiner be allowed to hydrate. Once hydration has occurred no vehicles should be allowed to traffic the area directly above the GCL, unless minimum 1.0 ft (300 mm) separation exists between the GCL and the vehicle to adequately distribute the vehicle load. This should be increased to a minimum of 2.0 ft (600 mm) in high traffic areas such as roadways.

Periodic inspection of the liner to ensure proper coverage and adequate moisture content is recommended when GSE BentoLiner is used alone under a minimum 1.0 ft (300 mm) depth of cover soil. In arid regions, it may be necessary to irrigate the containment area, at a predetermined interval and/or a laminated or coated GCL used and deployed with the plastic component up in order to minimize desiccation and wet – dry cycling.



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# Installation Quality Assurance Manual



## Geonet & Geocomposite Products





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## 1.0 INTRODUCTION

This manual provides an overview of the GSE Installation Quality Assurance procedures consistent with industry accepted practices to ensure that the geonet and geocomposite products installed will best perform for its intended purpose. In addition, all installation work will be performed in strict accordance per the customer's specifications. Please read the procedures below completely before you begin. If you need further clarification, contact the GSE Installation Department for assistance. Remember safety first and use safe practices always on every project.

## 2.0 ROLL PACKAGING

GSE geocomposite rolls shall be shipped from the factory in an opaque protective covering to prevent damage and UV degradation. However, GSE geonets do not need to be further protected from UV degradation during shipping or storage.

## 3.0 MATERIAL DELIVERY

- A. Upon arrival on site, QA personnel will inventory all materials on-site.
- B. Roll numbers of the geonet or geocomposite will be logged on the Inventory Check List (Appendix A) and cross-referenced with the Bill of Lading.
- C. Copies of the Inventory Check List and signed Bill of Lading should be sent to GSE corporate headquarters while the on-site QA personnel retains the original copies.
- D. Any visible damage to roll materials should be noted on the roll and Inventory Check List.

## 4.0 UNLOADING & STORAGE PROCEDURES

- A. Rolls of material shall be unloaded with equipment that will not damage the geonet or geocomposite.
- B. Fabric-straps, spreader bars, stinger bars, or other approved equipment shall be used for handling rolls of geonet and geocomposite.
- C. Materials should be stored in a flat, dry and well drained area.
- D. The surface shall be free of sharp rocks or other objects that could damage the materials.

## 5.0 SUBGRADE PREPARATION

The subgrade shall be free of sharp rocks or other objects that could otherwise cause damage to the materials.

## 6.0 DEPLOYMENT

Geonet and geocomposite shall be handled in a careful manner to ensure that it is not damaged in anyway.

- A. On slopes, the material shall be anchored in the anchor trench and then rolled down the slope in such a manner as to continually keep the material under tension.

- B. In the presence of wind, the leading edge of the material shall be weighted with temporary ballasting, such as sandbags until the final cover is placed.
- C. Care shall be taken to assure that any underlying layers are not damaged during placement. Low ground pressure machines, such as ATV's to facilitate deployment over the geosynthetic layers is allowed. Low ground pressure machines are machines with a ground pressure less than 8 psi when carrying a driver weighing approximately 150 lbs.
- D. Care shall be taken to avoid entrapment of stones, mud and other materials during placement operations.

## 7.0 OVERLAPS & SEAMS

- A. The recommended geonet overlap in the machine direction is 3.0 in to 5.0 in. The recommended overlap in the transverse direction is 6.0 in to 12.0 in.
- B. On slopes the ends of the materials shall be shingled down in the direction of the slope.
- C. A plastic cable tie should be placed once per every five linear feet in the machine direction and once per every linear foot in the transverse direction.
- D. If the product is a geocomposite, the geotextile on the bottom shall be overlapped and the geotextile on top shall be overlapped, sewn or heat bonded. The exact seaming method or overlap is typically specified in project construction documents.

## 8.0 COVER SOIL PLACEMENT

- A. Prior to placement of cover soil, a Certificate of Acceptance (Appendix B) must be signed by a responsible party and an installer's representative.
- B. Any cover material, such as soil, that is placed over the drainage material shall be placed with care to assure the material is not damaged.
- C. Care shall be taken to minimize any movement of the geonet or geocomposite and to assure that no tensile stress is induced in the material.
- D. Cover soils deployed over the geonet or geocomposite should be free of all sharp objects, sharp rocks and sticks.
- E. Wide track equipment should be used to distribute cover soil over the geocomposite.
- F. A minimum of 12.0 in of cover soil is required to separate the equipment from the geocomposite to prevent damage.





### Appendix B: Certificate of Acceptance

**GSE Lining Technology, LLC**  
19103 Gundle Road  
Houston Texas 77073  
800-435-2008  
281-443-8564  
281-875-6010 Fax

Job No.: \_\_\_\_\_  
Project: \_\_\_\_\_  
Client: \_\_\_\_\_  
Bill To: \_\_\_\_\_  
\_\_\_\_\_

Job Description: \_\_\_\_\_  
% Complete of Total Job: \_\_\_\_\_

### Certificate of Acceptance

Material	Estimated Square Feet	Final Quantity/Description

I, the undersigned, duly representative of:

Do hereby take over and accept the work described above from the date hereof and confirm to the best of my knowledge the work has been completed in accordance with specifications and the terms and conditions of the contract.

Name	Signature	Title	Date
------	-----------	-------	------

Certificate accepted by GSE Lining Technology, LLC Representative.

Name	Signature	Title	Date
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01/15/11 10:00 AM



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Form 26  
Source of Produced Water

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**

OGCC Operator Number: <u>96850</u>	Contact Name and Telephone: <u>Karolina Blaney</u>
Name of Operator: <u>Williams Production RMT Co.</u>	No: <u>(970) 683-2295</u>
Address: <u>1058 County Road 215</u>	Fax: <u>(970) 285-9573</u>
City: <u>Parachute</u> State: <u>CO</u> Zip: <u>81635</u>	

	Oper	OGCC
Chemical Analysis of fluid	✓	

OGCC Disposal Facility Number: \_\_\_\_\_

Operator's Disposal Facility Name: 14-4-794 multi-well pit Operator's Disposal Facility Number: \_\_\_\_\_

Location (QtrQtr, Sec, Twp, Rng, Meridian): SWSW S4 T7S R94W 6pm

Address: \_\_\_\_\_

City: \_\_\_\_\_ State: CO Zip: \_\_\_\_\_ County: Garfield

If more space is required, attach additional sheet.

**Add Source:** OGCC Lease No: \_\_\_\_\_ API No: \_\_\_\_\_ Well Name & No: \_\_\_\_\_

Operator Name: See attached list of wells Operator No: \_\_\_\_\_

**Delete Source:** Location: QtrQtr: \_\_\_\_\_ Section: \_\_\_\_\_ Township: \_\_\_\_\_ Range: \_\_\_\_\_ Producing Formation: \_\_\_\_\_

Analysis Attached?  Yes  No Transported to disposal site via:  Pipeline  Truck TDS: \_\_\_\_\_

**Add Source:** OGCC Lease No: \_\_\_\_\_ API No: \_\_\_\_\_ Well Name & No: \_\_\_\_\_

Operator Name: \_\_\_\_\_ Operator No: \_\_\_\_\_

**Delete Source:** Location: QtrQtr: \_\_\_\_\_ Section: \_\_\_\_\_ Township: \_\_\_\_\_ Range: \_\_\_\_\_ Producing Formation: \_\_\_\_\_

Analysis Attached?  Yes  No Transported to disposal site via:  Pipeline  Truck TDS: \_\_\_\_\_

**Add Source:** OGCC Lease No: \_\_\_\_\_ API No: \_\_\_\_\_ Well Name & No: \_\_\_\_\_

Operator Name: \_\_\_\_\_ Operator No: \_\_\_\_\_

**Delete Source:** Location: QtrQtr: \_\_\_\_\_ Section: \_\_\_\_\_ Township: \_\_\_\_\_ Range: \_\_\_\_\_ Producing Formation: \_\_\_\_\_

Analysis Attached?  Yes  No Transported to disposal site via:  Pipeline  Truck TDS: \_\_\_\_\_

**Add Source:** OGCC Lease No: \_\_\_\_\_ API No: \_\_\_\_\_ Well Name & No: \_\_\_\_\_

Operator Name: \_\_\_\_\_ Operator No: \_\_\_\_\_

**Delete Source:** Location: QtrQtr: \_\_\_\_\_ Section: \_\_\_\_\_ Township: \_\_\_\_\_ Range: \_\_\_\_\_ Producing Formation: \_\_\_\_\_

Analysis Attached?  Yes  No Transported to disposal site via:  Pipeline  Truck TDS: \_\_\_\_\_

**Add Source:** OGCC Lease No: \_\_\_\_\_ API No: \_\_\_\_\_ Well Name & No: \_\_\_\_\_

Operator Name: \_\_\_\_\_ Operator No: \_\_\_\_\_

**Delete Source:** Location: QtrQtr: \_\_\_\_\_ Section: \_\_\_\_\_ Township: \_\_\_\_\_ Range: \_\_\_\_\_ Producing Formation: \_\_\_\_\_

Analysis Attached?  Yes  No Transported to disposal site via:  Pipeline  Truck TDS: \_\_\_\_\_

**Add Source:** OGCC Lease No: \_\_\_\_\_ API No: \_\_\_\_\_ Well Name & No: \_\_\_\_\_

Operator Name: \_\_\_\_\_ Operator No: \_\_\_\_\_

**Delete Source:** 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: Karolina Blaney Signed: Karolina Blaney

Title: Environmental Specialist Date: 12/6/2011

OGCC Approved: \_\_\_\_\_ Title: \_\_\_\_\_ Date: \_\_\_\_\_

**CONDITIONS OF APPROVAL, IF ANY:**

## **Attachment A**

### Chemical Analysis of Recycled Water

Sample Results

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Report of Analysis

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## Report of Analysis

<b>Client Sample ID:</b>	RWF 24-4	<b>Date Sampled:</b>	04/21/11
<b>Lab Sample ID:</b>	T74162-1	<b>Date Received:</b>	04/22/11
<b>Matrix:</b>	AQ - Water	<b>Percent Solids:</b>	n/a
<b>Method:</b>	SW846 8260B		
<b>Project:</b>	RWF 24-4 Pit		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	E0006299.D	1	04/29/11	JL	n/a	n/a	VE334
Run #2	E0006314.D	50	04/29/11	JL	n/a	n/a	VE334
Run #3	E0006313.D	200	04/29/11	JL	n/a	n/a	VE334

	Purge Volume
Run #1	5.0 ml
Run #2	5.0 ml
Run #3	5.0 ml

## VOA 8260 List

CAS No.	Compound	Result	RL	MDL	Units	Q
67-64-1	Acetone	75000 <sup>a</sup>	10000	940	ug/l	
71-43-2	Benzene	2990 <sup>b</sup>	100	25	ug/l	
108-86-1	Bromobenzene	ND	2.0	0.82	ug/l	
74-97-5	Bromochloromethane	ND	2.0	1.6	ug/l	
75-27-4	Bromodichloromethane	ND	2.0	0.49	ug/l	
75-25-2	Bromoform	ND	2.0	1.4	ug/l	
104-51-8	n-Butylbenzene	ND	2.0	0.63	ug/l	
135-98-8	sec-Butylbenzene	ND	2.0	0.52	ug/l	
98-06-6	tert-Butylbenzene	ND	2.0	1.3	ug/l	
108-90-7	Chlorobenzene	ND	2.0	0.56	ug/l	
75-00-3	Chloroethane	ND	2.0	0.92	ug/l	
67-66-3	Chloroform	ND	2.0	0.64	ug/l	
95-49-8	o-Chlorotoluene	ND	2.0	0.70	ug/l	
106-43-4	p-Chlorotoluene	ND	2.0	0.56	ug/l	
75-15-0	Carbon disulfide	ND	2.0	0.53	ug/l	
56-23-5	Carbon tetrachloride	ND	2.0	0.66	ug/l	
75-34-3	1,1-Dichloroethane	ND	2.0	0.52	ug/l	
75-35-4	1,1-Dichloroethylene	ND	2.0	0.50	ug/l	
563-58-6	1,1-Dichloropropene	ND	2.0	0.78	ug/l	
96-12-8	1,2-Dibromo-3-chloropropane	ND	2.0	1.9	ug/l	
106-93-4	1,2-Dibromoethane	ND	2.0	0.55	ug/l	
107-06-2	1,2-Dichloroethane	ND	2.0	0.62	ug/l	
78-87-5	1,2-Dichloropropane	ND	2.0	0.62	ug/l	
142-28-9	1,3-Dichloropropane	ND	2.0	0.54	ug/l	
594-20-7	2,2-Dichloropropane	ND	2.0	0.62	ug/l	
124-48-1	Dibromochloromethane	ND	2.0	0.61	ug/l	
75-71-8	Dichlorodifluoromethane	ND	2.0	1.1	ug/l	
156-59-2	cis-1,2-Dichloroethylene	ND	2.0	0.56	ug/l	
10061-01-5	cis-1,3-Dichloropropene	ND	2.0	0.48	ug/l	
541-73-1	m-Dichlorobenzene	ND	2.0	1.0	ug/l	

ND = Not detected MDL - Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

N = Indicates presumptive evidence of a compound

## Report of Analysis

<b>Client Sample ID:</b>	RWF 24-4	<b>Date Sampled:</b>	04/21/11
<b>Lab Sample ID:</b>	T74162-1	<b>Date Received:</b>	04/22/11
<b>Matrix:</b>	AQ - Water	<b>Percent Solids:</b>	n/a
<b>Method:</b>	SW846 8260B		
<b>Project:</b>	RWF 24-4 Pit		

## VOA 8260 List

CAS No.	Compound	Result	RL	MDL	Units	Q
95-50-1	o-Dichlorobenzene	ND	2.0	0.69	ug/l	
106-46-7	p-Dichlorobenzene	ND	2.0	1.0	ug/l	
156-60-5	trans-1,2-Dichloroethylene	ND	2.0	0.45	ug/l	
10061-02-6	trans-1,3-Dichloropropene	ND	2.0	0.68	ug/l	
100-41-4	Ethylbenzene	130	2.0	0.55	ug/l	
591-78-6	2-Hexanone	12.8	10	3.2	ug/l	
87-68-3	Hexachlorobutadiene	ND	2.0	1.3	ug/l	
98-82-8	Isopropylbenzene	15.7	2.0	0.51	ug/l	
99-87-6	p-Isopropyltoluene	9.4	2.0	0.65	ug/l	
108-10-1	4-Methyl-2-pentanone	19.3	10	9.9	ug/l	
74-83-9	Methyl bromide	ND	2.0	0.94	ug/l	
74-87-3	Methyl chloride	ND	2.0	0.84	ug/l	
74-95-3	Methylene bromide	ND	2.0	0.65	ug/l	
75-09-2	Methylene chloride	1.7	5.0	0.41	ug/l	J
78-93-3	Methyl ethyl ketone	166	10	3.9	ug/l	
1634-04-4	Methyl Tert Butyl Ether	ND	2.0	0.73	ug/l	
91-20-3	Naphthalene	238 <sup>b</sup>	250	33	ug/l	J
103-65-1	n-Propylbenzene	18.3	2.0	0.57	ug/l	
100-42-5	Styrene	ND	2.0	0.56	ug/l	
630-20-6	1,1,1,2-Tetrachloroethane	ND	2.0	0.80	ug/l	
71-55-6	1,1,1-Trichloroethane	ND	2.0	0.62	ug/l	
79-34-5	1,1,2,2-Tetrachloroethane	4.2	2.0	1.2	ug/l	
79-00-5	1,1,2-Trichloroethane	ND	2.0	0.98	ug/l	
87-61-6	1,2,3-Trichlorobenzene	ND	2.0	1.1	ug/l	
96-18-4	1,2,3-Trichloropropane	ND	2.0	1.3	ug/l	
120-82-1	1,2,4-Trichlorobenzene	ND	2.0	0.82	ug/l	
95-63-6	1,2,4-Trimethylbenzene	295 <sup>b</sup>	100	33	ug/l	
108-67-8	1,3,5-Trimethylbenzene	234 <sup>b</sup>	100	35	ug/l	
127-18-4	Tetrachloroethylene	ND	2.0	0.91	ug/l	
108-88-3	Toluene	3810 <sup>b</sup>	100	22	ug/l	
79-01-6	Trichloroethylene	ND	2.0	0.52	ug/l	
75-69-4	Trichlorofluoromethane	ND	2.0	1.2	ug/l	
75-01-4	Vinyl chloride	ND	2.0	1.0	ug/l	
1330-20-7	Xylene (total)	2230 <sup>b</sup>	300	84	ug/l	
	m,p-Xylene	1890 <sup>b</sup>	200	57	ug/l	
95-47-6	o-Xylene	341 <sup>b</sup>	100	27	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Run# 3	Limits
1868-53-7	Dibromofluoromethane	98%	97%	99%	79-122%

ND = Not detected      MDL - Method Detection Limit  
 RL = Reporting Limit  
 E = Indicates value exceeds calibration range

J = Indicates an estimated value  
 B = Indicates analyte found in associated method blank  
 N = Indicates presumptive evidence of a compound

## Report of Analysis

<b>Client Sample ID:</b> RWF 24-4	<b>Date Sampled:</b> 04/21/11
<b>Lab Sample ID:</b> T74162-1	<b>Date Received:</b> 04/22/11
<b>Matrix:</b> AQ - Water	<b>Percent Solids:</b> n/a
<b>Method:</b> SW846 8260B	
<b>Project:</b> RWF 24-4 Pit	

### VOA 8260 List

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Run# 3	Limits
17060-07-0	1,2-Dichloroethane-D4	89%	85%	87%	75-121%
2037-26-5	Toluene-D8	107%	102%	102%	87-119%
460-00-4	4-Bromofluorobenzene	97%	96%	97%	80-133%

(a) Result is from Run# 3

(b) Result is from Run# 2

ND = Not detected      MDL - Method Detection Limit  
 RL = Reporting Limit  
 E = Indicates value exceeds calibration range

J = Indicates an estimated value  
 B = Indicates analyte found in associated method blank  
 N = Indicates presumptive evidence of a compound

## Report of Analysis

<b>Client Sample ID:</b>	RWF 24-4	<b>Date Sampled:</b>	04/21/11
<b>Lab Sample ID:</b>	T74162-1	<b>Date Received:</b>	04/22/11
<b>Matrix:</b>	AQ - Water	<b>Percent Solids:</b>	n/a
<b>Method:</b>	SW846 8270C SW846 3510C		
<b>Project:</b>	RWF 24-4 Pit		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1 <sup>a</sup>	P17636.D	10	04/30/11	GJ	04/27/11	OP18290	EP837
Run #2							

	Initial Volume	Final Volume
Run #1	990 ml	1.0 ml
Run #2		

## ABN Full List

CAS No.	Compound	Result	RL	MDL	Units	Q
65-85-0	Benzoic Acid	ND	100	50	ug/l	
95-57-8	2-Chlorophenol	ND	51	12	ug/l	
59-50-7	4-Chloro-3-methyl phenol	ND	51	12	ug/l	
120-83-2	2,4-Dichlorophenol	ND	51	22	ug/l	
105-67-9	2,4-Dimethylphenol	ND	51	13	ug/l	
51-28-5	2,4-Dinitrophenol	ND	250	150	ug/l	
534-52-1	4,6-Dinitro-o-cresol	ND	100	14	ug/l	
95-48-7	2-Methylphenol	23.9	51	8.4	ug/l	J
	3&4-Methylphenol	17.9	51	16	ug/l	J
88-75-5	2-Nitrophenol	ND	51	20	ug/l	
100-02-7	4-Nitrophenol	ND	250	67	ug/l	
87-86-5	Pentachlorophenol	ND	250	130	ug/l	
108-95-2	Phenol	32.9	51	7.6	ug/l	J
95-95-4	2,4,5-Trichlorophenol	ND	51	12	ug/l	
88-06-2	2,4,6-Trichlorophenol	ND	51	12	ug/l	
83-32-9	Acenaphthene	ND	51	16	ug/l	
208-96-8	Acenaphthylene	ND	51	12	ug/l	
62-53-3	Aniline	ND	51	46	ug/l	
120-12-7	Anthracene	ND	51	11	ug/l	
92-87-5	Benzidine	ND	250	60	ug/l	
56-55-3	Benzo(a)anthracene	ND	51	11	ug/l	
50-32-8	Benzo(a)pyrene	ND	51	11	ug/l	
205-99-2	Benzo(b)fluoranthene	ND	51	8.8	ug/l	
191-24-2	Benzo(g,h,i)perylene	ND	51	17	ug/l	
207-08-9	Benzo(k)fluoranthene	ND	51	11	ug/l	
101-55-3	4-Bromophenyl phenyl ether	ND	51	14	ug/l	
85-68-7	Butyl benzyl phthalate	ND	51	16	ug/l	
100-51-6	Benzyl Alcohol	ND	51	13	ug/l	
91-58-7	2-Chloronaphthalene	ND	51	14	ug/l	
106-47-8	4-Chloroaniline	ND	51	43	ug/l	
86-74-8	Carbazole	ND	51	15	ug/l	
218-01-9	Chrysene	ND	51	9.9	ug/l	

ND = Not detected MDL - Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

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N = Indicates presumptive evidence of a compound

## Report of Analysis

<b>Client Sample ID:</b>	RWF 24-4	<b>Date Sampled:</b>	04/21/11
<b>Lab Sample ID:</b>	T74162-1	<b>Date Received:</b>	04/22/11
<b>Matrix:</b>	AQ - Water	<b>Percent Solids:</b>	n/a
<b>Method:</b>	SW846 8270C SW846 3510C		
<b>Project:</b>	RWF 24-4 Pit		

## ABN Full List

CAS No.	Compound	Result	RL	MDL	Units	Q
111-91-1	bis(2-Chloroethoxy)methane	ND	51	13	ug/l	
111-44-4	bis(2-Chloroethyl)ether	ND	51	13	ug/l	
108-60-1	bis(2-Chloroisopropyl)ether	ND	51	20	ug/l	
7005-72-3	4-Chlorophenyl phenyl ether	ND	51	13	ug/l	
95-50-1	1,2-Dichlorobenzene	ND	51	13	ug/l	
122-66-7	1,2-Diphenylhydrazine	ND	51	14	ug/l	
541-73-1	1,3-Dichlorobenzene	ND	51	13	ug/l	
106-46-7	1,4-Dichlorobenzene	ND	51	13	ug/l	
121-14-2	2,4-Dinitrotoluene	ND	51	14	ug/l	
606-20-2	2,6-Dinitrotoluene	ND	51	13	ug/l	
91-94-1	3,3'-Dichlorobenzidine	ND	100	32	ug/l	
53-70-3	Dibenzo(a,h)anthracene	ND	51	16	ug/l	
132-64-9	Dibenzofuran	ND	51	13	ug/l	
84-74-2	Di-n-butyl phthalate	ND	51	10	ug/l	
117-84-0	Di-n-octyl phthalate	ND	51	13	ug/l	
84-66-2	Diethyl phthalate	ND	51	11	ug/l	
131-11-3	Dimethyl phthalate	ND	51	11	ug/l	
117-81-7	bis(2-Ethylhexyl)phthalate	ND	51	18	ug/l	
206-44-0	Fluoranthene	ND	51	9.8	ug/l	
86-73-7	Fluorene	ND	51	14	ug/l	
118-74-1	Hexachlorobenzene	ND	51	14	ug/l	
87-68-3	Hexachlorobutadiene	ND	51	11	ug/l	
77-47-4	Hexachlorocyclopentadiene	ND	100	52	ug/l	
67-72-1	Hexachloroethane	ND	51	9.8	ug/l	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	51	18	ug/l	
78-59-1	Isophorone	ND	51	12	ug/l	
90-12-0	1-Methylnaphthalene	81.3	51	11	ug/l	
91-57-6	2-Methylnaphthalene	212	51	13	ug/l	
88-74-4	2-Nitroaniline	ND	51	14	ug/l	
99-09-2	3-Nitroaniline	ND	51	34	ug/l	
100-01-6	4-Nitroaniline	ND	51	24	ug/l	
91-20-3	Naphthalene	192	51	11	ug/l	
98-95-3	Nitrobenzene	ND	51	17	ug/l	
62-75-9	n-Nitrosodimethylamine	ND	51	9.8	ug/l	
621-64-7	N-Nitroso-di-n-propylamine	ND	51	14	ug/l	
86-30-6	N-Nitrosodiphenylamine	ND	51	17	ug/l	
85-01-8	Phenanthrene	ND	51	9.8	ug/l	
129-00-0	Pyrene	ND	51	17	ug/l	
110-86-1	Pyridine	ND	51	10	ug/l	
120-82-1	1,2,4-Trichlorobenzene	ND	51	13	ug/l	

ND = Not detected      MDL - Method Detection Limit  
 RL = Reporting Limit  
 E = Indicates value exceeds calibration range

J = Indicates an estimated value  
 B = Indicates analyte found in associated method blank  
 N = Indicates presumptive evidence of a compound

## Report of Analysis

<b>Client Sample ID:</b>	RWF 24-4	<b>Date Sampled:</b>	04/21/11
<b>Lab Sample ID:</b>	T74162-1	<b>Date Received:</b>	04/22/11
<b>Matrix:</b>	AQ - Water	<b>Percent Solids:</b>	n/a
<b>Method:</b>	SW846 8270C SW846 3510C		
<b>Project:</b>	RWF 24-4 Pit		

## ABN Full List

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
367-12-4	2-Fluorophenol	14%		10-66%
4165-62-2	Phenol-d5	0% <sup>b</sup>		10-53%
118-79-6	2,4,6-Tribromophenol	7% <sup>b</sup>		32-128%
4165-60-0	Nitrobenzene-d5	14% <sup>b</sup>		29-115%
321-60-8	2-Fluorobiphenyl	9% <sup>b</sup>		34-113%
1718-51-0	Terphenyl-d14	5% <sup>b</sup>		12-145%

- (a) Elevated reporting limits due to matrix interference. High concentration of non-target compounds were detected in the sample.
- (b) Outside control limits due to dilution.

ND = Not detected      MDL - Method Detection Limit  
 RL = Reporting Limit  
 E = Indicates value exceeds calibration range

J = Indicates an estimated value  
 B = Indicates analyte found in associated method blank  
 N = Indicates presumptive evidence of a compound

## Report of Analysis

<b>Client Sample ID:</b> RWF 24-4	<b>Date Sampled:</b> 04/21/11
<b>Lab Sample ID:</b> T74162-1	<b>Date Received:</b> 04/22/11
<b>Matrix:</b> AQ - Water	<b>Percent Solids:</b> n/a
<b>Project:</b> RWF 24-4 Pit	

### General Chemistry

Analyte	Result	RL	MDL	Units	DF	Analyzed	By	Method
Alkalinity, Bicarbonate	524	5.0	0.66	mg/l	1	05/03/11	MC	SM 4500 CO2 D
Alkalinity, Carbonate	0.66 U	5.0	0.66	mg/l	1	05/03/11	MC	SM18 2320B
Alkalinity, Total as CaCO3	524	20	6.7	mg/l	1	05/02/11 13:00	MC	SM 2320B
Bromide	71.4	2.5	0.50	mg/l	5	05/03/11 19:06	BF	EPA 300/SW846 9056
Chloride	13100	500	190	mg/l	1000	05/04/11 14:59	BF	EPA 300/SW846 9056
Hydroxide Alkalinity	0.66 U	5.0	0.66	mg/l	1	05/03/11	MC	SM18 4500CO2D
Solids, Total Dissolved	26200	250	65	mg/l	1	04/28/11	BG	SM 2540C
Specific Conductivity	39100	1.0		umhos/cm	1	04/23/11 13:00	KD	EPA 120.1
Sulfate	0.15 U	0.50	0.15	mg/l	1	05/02/11 16:00	BF	EPA 300/SW846 9056
pH	6.50			su	1	04/22/11 14:00	KD	SM 4500H+ B/9040

RL = Reporting Limit  
MDL = Method Detection Limit

U = Indicates a result < MDL  
J = Indicates a result > = MDL but < RL

## Report of Analysis

<b>Client Sample ID:</b> RWF 24-4	<b>Date Sampled:</b> 04/21/11
<b>Lab Sample ID:</b> T74162-1F	<b>Date Received:</b> 04/22/11
<b>Matrix:</b> AQ - Water Filtered	<b>Percent Solids:</b> n/a
<b>Project:</b> RWF 24-4 Pit	

### Dissolved Metals Analysis

Analyte	Result	RL	MDL	Units	DF	Prep	Analyzed By	Method	Prep Method
Calcium	281000	5000	25	ug/l	1	04/23/11	04/25/11 TW	SW846 6010B <sup>1</sup>	SW846 3010A <sup>3</sup>
Iron	52300	100	23	ug/l	1	04/23/11	04/25/11 TW	SW846 6010B <sup>1</sup>	SW846 3010A <sup>3</sup>
Magnesium	43600	5000	7.9	ug/l	1	04/23/11	04/25/11 TW	SW846 6010B <sup>1</sup>	SW846 3010A <sup>3</sup>
Manganese	424	15	1.9	ug/l	1	04/23/11	04/25/11 TW	SW846 6010B <sup>1</sup>	SW846 3010A <sup>3</sup>
Potassium	89700	5000	45	ug/l	1	04/23/11	04/25/11 TW	SW846 6010B <sup>1</sup>	SW846 3010A <sup>3</sup>
Sodium	8170000	130000	2600	ug/l	25	04/23/11	04/26/11 TW	SW846 6010B <sup>2</sup>	SW846 3010A <sup>3</sup>

- (1) Instrument QC Batch: MA5667
- (2) Instrument QC Batch: MA5670
- (3) Prep QC Batch: MP14527

RL = Reporting Limit  
MDL = Method Detection Limit

U = Indicates a result < MDL  
J = Indicates a result > = MDL but < RL

## **Attachment B**

### List of Source Wells

List of Existing and Proposed Wells

Well Name	API Number	Reservoir	Location				Transport Method		
			Qtr/Qtr	Section	Town.	Range			
SR 534-9	0504520002	Mesaverde	NWSE	9	7	S	94	W	Pipeline
SR 433-9	0504520001	Mesaverde	NWSE	9	7	S	94	W	Pipeline
SR 333-9	0504520000	Mesaverde	NWSE	9	7	S	94	W	Pipeline
SR 444-9	0504519998	Mesaverde	NWSE	9	7	S	94	W	Pipeline
SR 344-9	0504519995	Mesaverde	NWSE	9	7	S	94	W	Pipeline
SR 44-9	0504519994	Mesaverde	NWSE	9	7	S	94	W	Pipeline
SR 443-9	0504519993	Mesaverde	NWSE	9	7	S	94	W	Pipeline
SR 34-9	0504519990	Mesaverde	NWSE	9	7	S	94	W	Pipeline
SR 544-9	0504519987	Mesaverde	NWSE	9	7	S	94	W	Pipeline
SR 543-9	0504519985	Mesaverde	NWSE	9	7	S	94	W	Pipeline
SR 334-9	0504519984	Mesaverde	NWSE	9	7	S	94	W	Pipeline
SR 434-9	0504519981	Mesaverde	NWSE	9	7	S	94	W	Pipeline
RWF 334-32	0504519370	Mesaverde	SESE	32	6	S	94	W	Pipeline
RWF 444-32	0504519367	Mesaverde	SESE	32	6	S	94	W	Pipeline
RWF 433-32	0504519366	Mesaverde	SESE	32	6	S	94	W	Pipeline
RWF 434-32	0504519365	Mesaverde	SESE	32	6	S	94	W	Pipeline
RWF 543-32	0504519363	Mesaverde	SESE	32	6	S	94	W	Pipeline
RWF 34-32	0504519362	Mesaverde	SESE	32	6	S	94	W	Pipeline
RWF 333-32	0504519359	Mesaverde	SESE	32	6	S	94	W	Pipeline
RWF 533-32	0504519358	Mesaverde	SESE	32	6	S	94	W	Pipeline
RWF 33-32	0504519357	Mesaverde	SESE	32	6	S	94	W	Pipeline
RWF 443-32	0504519355	Mesaverde	SESE	32	6	S	94	W	Pipeline
RWF 343-32	0504519354	Mesaverde	SESE	32	6	S	94	W	Pipeline
RWF 534-32	0504519353	Mesaverde	SESE	32	6	S	94	W	Pipeline
RWF 344-32	0504519352	Mesaverde	SESE	32	6	S	94	W	Pipeline
RWF 544-32	0504519351	Mesaverde	SESE	32	6	S	94	W	Pipeline
RWF 43-32	0504519349	Mesaverde	SESE	32	6	S	94	W	Pipeline
RWF 44-32	0504519346	Mesaverde	SESE	32	6	S	94	W	Pipeline
SR 14-9	0504518125	Mesaverde	SESW	9	7	S	94	W	Pipeline
SR 314-9	0504518124	Mesaverde	SESW	9	7	S	94	W	Pipeline
SR 414-9	0504518123	Mesaverde	SESW	9	7	S	94	W	Pipeline
SR 514-9	0504518122	Mesaverde	SESW	9	7	S	94	W	Pipeline
SR 24-9	0504518121	Mesaverde	SESW	9	7	S	94	W	Pipeline
SR 424-9	0504518120	Mesaverde	SESW	9	7	S	94	W	Pipeline

List of Existing and Proposed Wells

Well Name	API Number	Reservoir	Location				Transport Method		
			Qtr/Qtr	Section	Town.	Range			
SR 513-9	0504518119	Mesaverde	SESW	9	7	S	94	W	Pipeline
SR 324-9	0504518118	Mesaverde	SESW	9	7	S	94	W	Pipeline
SR 343-9	0504517103	Mesaverde	NWSE	9	7	S	94	W	Pipeline
SR 11-15	0504517102	Mesaverde	NWSE	9	7	S	94	W	Pipeline
SR 33-9	0504517101	Mesaverde	NWSE	9	7	S	94	W	Pipeline
SR 532-9	0504517100	Mesaverde	NWSE	9	7	S	94	W	Pipeline
SR 43-9	0504517099	Mesaverde	NWSE	9	7	S	94	W	Pipeline
SR 321-9	0504516884	Mesaverde	SWNW	9	7	S	94	W	Pipeline
SR 421-9	0504516883	Mesaverde	SWNW	9	7	S	94	W	Pipeline
SR 313-9	0504516882	Mesaverde	SWNW	9	7	S	94	W	Pipeline
SR 21-9	0504516881	Mesaverde	SWNW	9	7	S	94	W	Pipeline
SR 11-9	0504516880	Mesaverde	SWNW	9	7	S	94	W	Pipeline
SR 413-9	0504516879	Mesaverde	SWNW	9	7	S	94	W	Pipeline
SR 412-9	0504516878	Mesaverde	SWNW	9	7	S	94	W	Pipeline
SR 12-9	0504516877	Mesaverde	SWNW	9	7	S	94	W	Pipeline
SR 411-9	0504516876	Mesaverde	SWNW	9	7	S	94	W	Pipeline
SR 312-9	0504516875	Mesaverde	SWNW	9	7	S	94	W	Pipeline
SR 311-9	0504516874	Mesaverde	SWNW	9	7	S	94	W	Pipeline
SR 322-9	0504516873	Mesaverde	SWNW	9	7	S	94	W	Pipeline
SR 22-9	0504516872	Mesaverde	SWNW	9	7	S	94	W	Pipeline
SR 422-9	0504516871	Mesaverde	SWNW	9	7	S	94	W	Pipeline
SR 23-9	0504516870	Mesaverde	SWNW	9	7	S	94	W	Pipeline
RWF 343-4	0504516335	Mesaverde	SWSE	4	7	S	94	W	Pipeline
RWF 443-4	0504516334	Mesaverde	SWSE	4	7	S	94	W	Pipeline
RWF 433-4	0504516333	Mesaverde	SWSE	4	7	S	94	W	Pipeline
RWF 533-4	0504516332	Mesaverde	SWSE	4	7	S	94	W	Pipeline
RWF 44-4	0504516331	Mesaverde	SWSE	4	7	S	94	W	Pipeline
RWF 344-4	0504516330	Mesaverde	SWSE	4	7	S	94	W	Pipeline
RWF 444-4	0504516329	Mesaverde	SWSE	4	7	S	94	W	Pipeline
RWF 544-4	0504516328	Mesaverde	SWSE	4	7	S	94	W	Pipeline
RWF 43-4	0504516327	Mesaverde	SWSE	4	7	S	94	W	Pipeline
RWF 33-4	0504516326	Mesaverde	SWSE	4	7	S	94	W	Pipeline
RWF 333-4	0504516325	Mesaverde	SWSE	4	7	S	94	W	Pipeline
RWF 543-4	0504516324	Mesaverde	SWSE	4	7	S	94	W	Pipeline

List of Existing and Proposed Wells

Well Name	API Number	Reservoir	Location				Transport Method		
			Qtr/Qtr	Section	Town.	Range			
RWF 34-4	0504516323	Mesaverde	SWSE	4	7	S	94	W	Pipeline
RWF 334-4	0504516322	Mesaverde	SWSE	4	7	S	94	W	Pipeline
SR 423-9	0504516272	Mesaverde	SESW	9	7	S	94	W	Pipeline
SR 523-9	0504516271	Mesaverde	SESW	9	7	S	94	W	Pipeline
SR 13-9	0504516270	Mesaverde	SESW	9	7	S	94	W	Pipeline
SR 323-9	0504516269	Mesaverde	SESW	9	7	S	94	W	Pipeline
FEDERAL 7-94-S 0-4	0504506671	Mesaverde	SWSE	4	7	S	94	W	Pipeline
RWF 12-3		Mesaverde	SWNW	3	7	S	94	W	Pipeline
RWF 13-3		Mesaverde	SESW	3	7	S	94	W	Pipeline
RWF 14-3		Mesaverde	NWSE	3	7	S	94	W	Pipeline
RWF 21-3		Mesaverde	NENW	3	7	S	94	W	Pipeline
RWF 221-3		Mesaverde	NENW	3	7	S	94	W	Pipeline
RWF 22-3		Mesaverde	SESW	3	7	S	94	W	Pipeline
RWF 23-3		Mesaverde	SESW	3	7	S	94	W	Pipeline
RWF 24-3		Mesaverde	NWSE	3	7	S	94	W	Pipeline
RWF 311-3		Mesaverde	NWNW	3	7	S	94	W	Pipeline
RWF 312-3		Mesaverde	SWNW	3	7	S	94	W	Pipeline
RWF 313-3		Mesaverde	NWSW	3	7	S	94	W	Pipeline
RWF 314-3		Mesaverde	NWSE	3	7	S	94	W	Pipeline
RWF 321-3		Mesaverde	NENW	3	7	S	94	W	Pipeline
RWF 32-3		Mesaverde	SWSE	34	6	S	94	W	Pipeline
RWF 323-3		Mesaverde	SESW	3	7	S	94	W	Pipeline
RWF 324-3		Mesaverde	NWSE	3	7	S	94	W	Pipeline
RWF 33-3		Mesaverde	SWSE	3	7	S	94	W	Pipeline
RWF 333-3		Mesaverde	NWSE	3	7	S	94	W	Pipeline
RWF 334-3		Mesaverde	NWSE	3	7	S	94	W	Pipeline
RWF 34-3		Mesaverde	NWSE	3	7	S	94	W	Pipeline
RWF 343-3		Mesaverde	NWSE	3	7	S	94	W	Pipeline
RWF 344-3		Mesaverde	NWSE	3	7	S	94	W	Pipeline
RWF 411-3		Mesaverde	NWNW	3	7	S	94	W	Pipeline
RWF 412-3		Mesaverde	SWNW	3	7	S	94	W	Pipeline
RWF 413-3		Mesaverde	NWSW	3	7	S	94	W	Pipeline
RWF 414-3		Mesaverde	NWSE	3	7	S	94	W	Pipeline
RWF 421-3		Mesaverde	NENW	3	7	S	94	W	Pipeline

List of Existing and Proposed Wells

Well Name	API Number	Reservoir	Location				Transport Method		
			Qtr/Qtr	Section	Town.	Range			
RWF 422-3		Mesaverde	SESW	3	7	S	94	W	Pipeline
RWF 42-3		Mesaverde	NWSE	3	7	S	94	W	Pipeline
RWF 423-3		Mesaverde	NWSE	3	7	S	94	W	Pipeline
RWF 424-3		Mesaverde	NWSE	3	7	S	94	W	Pipeline
RWF 43-3		Mesaverde	NWSE	3	7	S	94	W	Pipeline
RWF 433-3		Mesaverde	NWSE	3	7	S	94	W	Pipeline
RWF 434-3		Mesaverde	NWSE	3	7	S	94	W	Pipeline
RWF 442-3		Mesaverde	NWSE	3	7	S	94	W	Pipeline
RWF 44-3		Mesaverde	NWSE	3	7	S	94	W	Pipeline
RWF 443-3		Mesaverde	NWSE	3	7	S	94	W	Pipeline
RWF 444-3		Mesaverde	NWSE	3	7	S	94	W	Pipeline
RWF 511-3		Mesaverde	NWNW	3	7	S	94	W	Pipeline
RWF 513-3		Mesaverde	NWSW	3	7	S	94	W	Pipeline
RWF 523-3		Mesaverde	SESW	3	7	S	94	W	Pipeline
RWF 524-3		Mesaverde	NWSE	3	7	S	94	W	Pipeline
RWF 532-3		Mesaverde	SWSE	34	6	S	94	W	Pipeline
RWF 533-3		Mesaverde	NWSE	3	7	S	94	W	Pipeline
RWF 542-3		Mesaverde	NWSE	3	7	S	94	W	Pipeline
RWF 544-3		Mesaverde	NWSE	3	7	S	94	W	Pipeline
RWF 611-3		Mesaverde	SWNW	3	7	S	94	W	Pipeline
SR 31-17		Mesaverde	NWNE	17	7	S	94	W	Pipeline
SR 31-9		Mesaverde	SENE	9	7	S	94	W	Pipeline
SR 32-9		Mesaverde	SENE	9	7	S	94	W	Pipeline
SR 331-9		Mesaverde	SENE	9	7	S	94	W	Pipeline
SR 332-9		Mesaverde	SENE	9	7	S	94	W	Pipeline
SR 333-8		Mesaverde	NWSE	8	7	S	94	W	Pipeline
SR 334-8		Mesaverde	SWSE	8	7	S	94	W	Pipeline
SR 33-8		Mesaverde	NWSE	8	7	S	94	W	Pipeline
SR 341-17		Mesaverde	NENE	17	7	S	94	W	Pipeline
SR 341-9		Mesaverde	SENE	9	7	S	94	W	Pipeline
SR 342-9		Mesaverde	SENE	9	7	S	94	W	Pipeline
SR 343-8		Mesaverde	NESE	8	7	S	94	W	Pipeline
SR 344-8		Mesaverde	SESE	8	7	S	94	W	Pipeline
SR 34-8		Mesaverde	SWSE	8	7	S	94	W	Pipeline

List of Existing and Proposed Wells

Well Name	API Number	Reservoir	Location				Transport Method		
			Qtr/Qtr	Section	Town.	Range			
SR 41-17		Mesaverde	NENE	17	7	S	94	W	Pipeline
SR 41-9		Mesaverde	SENE	9	7	S	94	W	Pipeline
SR 42-9		Mesaverde	SENE	9	7	S	94	W	Pipeline
SR 431-17		Mesaverde	NWNE	17	7	S	94	W	Pipeline
SR 431-9		Mesaverde	SENE	9	7	S	94	W	Pipeline
SR 432-9		Mesaverde	SENE	9	7	S	94	W	Pipeline
SR 433-8		Mesaverde	NWSE	8	7	S	94	W	Pipeline
SR 434-8		Mesaverde	SWSE	8	7	S	94	W	Pipeline
SR 43-8		Mesaverde	NESE	8	7	S	94	W	Pipeline
SR 441-9		Mesaverde	SENE	9	7	S	94	W	Pipeline
SR 442-9		Mesaverde	SENE	9	7	S	94	W	Pipeline
SR 443-8		Mesaverde	NESE	8	7	S	94	W	Pipeline
SR 444-8		Mesaverde	SESE	8	7	S	94	W	Pipeline
SR 44-8		Mesaverde	SESE	8	7	S	94	W	Pipeline
SR 531-9		Mesaverde	SENE	9	7	S	94	W	Pipeline
SR 533-8		Mesaverde	NWSE	8	7	S	94	W	Pipeline
SR 534-8		Mesaverde	SWSE	8	7	S	94	W	Pipeline
SR 543-8		Mesaverde	NESE	8	7	S	94	W	Pipeline
SR 544-8		Mesaverde	SESE	8	7	S	94	W	Pipeline