API Well Number: 43013515420000

STATE OF UTAH
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

FORM 3
AMENDED REPORT ☑

APPLICATION FOR PERMIT TO DRILL

1. WELL NAME and NUMBER Ute Tribal 7-12-3-4W	
2. TYPE OF WORK DRILL NEW WELL ◉ REENTER P&A WELL ○ DEEPEN WELL ○	**3. FIELD OR WILDCAT** UNDESIGNATED
4. TYPE OF WELL Oil Well Coalbed Methane Well: NO	**5. UNIT or COMMUNITIZATION AGREEMENT NAME**
6. NAME OF OPERATOR NEWFIELD PRODUCTION COMPANY	**7. OPERATOR PHONE** 435 646-4825
8. ADDRESS OF OPERATOR Rt 3 Box 3630 , Myton, UT, 84052	**9. OPERATOR E-MAIL** mcrozier@newfield.com
10. MINERAL LEASE NUMBER (FEDERAL, INDIAN, OR STATE) 14-20-H62-6388	**11. MINERAL OWNERSHIP** FEDERAL ○ INDIAN ◉ STATE ○ FEE ○
12. SURFACE OWNERSHIP FEDERAL ○ INDIAN ○ STATE ○ FEE ◉	
13. NAME OF SURFACE OWNER (if box 12 = 'fee') Newfield RMI LLC	**14. SURFACE OWNER PHONE (if box 12 = 'fee')** 303-893-0102
15. ADDRESS OF SURFACE OWNER (if box 12 = 'fee') 1001 17th Street, Suite 2000, ,	**16. SURFACE OWNER E-MAIL (if box 12 = 'fee')**
17. INDIAN ALLOTTEE OR TRIBE NAME (if box 12 = 'INDIAN')	**18. INTEND TO COMMINGLE PRODUCTION FROM MULTIPLE FORMATIONS** YES ○ (Submit Commingling Application) NO ◉
19. SLANT VERTICAL ◉ DIRECTIONAL ○ HORIZONTAL ○	

20. LOCATION OF WELL	FOOTAGES	QTR-QTR	SECTION	TOWNSHIP	RANGE	MERIDIAN
LOCATION AT SURFACE	1816 FNL 1861 FEL	SWNE	12	3.0 S	4.0 W	U
Top of Uppermost Producing Zone	1816 FNL 1861 FEL	SWNE	12	3.0 S	4.0 W	U
At Total Depth	1816 FNL 1861 FEL	SWNE	12	3.0 S	4.0 W	U

21. COUNTY DUCHESNE	**22. DISTANCE TO NEAREST LEASE LINE (Feet)** 1816	**23. NUMBER OF ACRES IN DRILLING UNIT** 40
	25. DISTANCE TO NEAREST WELL IN SAME POOL (Applied For Drilling or Completed) 3120	**26. PROPOSED DEPTH** MD: 11100 TVD: 11100
27. ELEVATION - GROUND LEVEL 5590	**28. BOND NUMBER** RLB00100473	**29. SOURCE OF DRILLING WATER / WATER RIGHTS APPROVAL NUMBER IF APPLICABLE** 437478

Hole, Casing, and Cement Information

String	Hole Size	Casing Size	Length	Weight	Grade & Thread	Max Mud Wt.	Cement	Sacks	Yield	Weight
COND	17.5	14	0 - 60	37.0	H-40 ST&C	0.0	Class G	35	1.17	15.8
SURF	12.25	9.625	0 - 1000	36.0	J-55 ST&C	8.3	Premium Lite High Strength	51	3.53	11.0
							Class G	154	1.17	15.8
I1	8.75	7	0 - 8945	26.0	P-110 LT&C	9.5	Premium Lite High Strength	297	3.53	11.0
							50/50 Poz	263	1.24	14.3
PROD	6.125	4.5	8745 - 11100	11.6	P-110 LT&C	11.5	50/50 Poz	206	1.24	14.3

ATTACHMENTS

VERIFY THE FOLLOWING ARE ATTACHED IN ACCORDANCE WITH THE UTAH OIL AND GAS CONSERVATION GENERAL RULES

☑ WELL PLAT OR MAP PREPARED BY LICENSED SURVEYOR OR ENGINEER	☑ COMPLETE DRILLING PLAN
☑ AFFIDAVIT OF STATUS OF SURFACE OWNER AGREEMENT (IF FEE SURFACE)	☐ FORM 5. IF OPERATOR IS OTHER THAN THE LEASE OWNER
☐ DIRECTIONAL SURVEY PLAN (IF DIRECTIONALLY OR HORIZONTALLY DRILLED)	☑ TOPOGRAPHICAL MAP

NAME Don Hamilton	**TITLE** Permitting Agent	**PHONE** 435 719-2018
SIGNATURE	**DATE** 06/29/2012	**EMAIL** starpoint@etv.net

API NUMBER ASSIGNED
43013515420000

APPROVAL

Permit Manager

RECEIVED: August 02, 2012

Newfield Production Company
Ute Tribal 7-12-3-4W
SW/NE Section 12, T3S, R4W
Duchesne County, UT

Drilling Program

1. Formation Tops

Uinta	surface
Green River	4,120'
Garden Gulch member	7,060'
Wasatch	9,605'
TD	11,100'

2. Depth to Oil, Gas, Water, or Minerals

Base of moderately saline	1,506'	(water)
Green River	7,060' - 9,605'	(oil)
Wasatch	9,605' - TD	(oil)

3. Pressure Control

Section	BOP Description
Surface	12-1/4" diverter
Interm/Prod	The BOP and related equipment shall meet the minimum requirements of Onshore Oil and Gas Order No. 2 for equipment and testing requirements, procedures, etc for a 5M system. A 5M BOP system will consist of 2 ram preventers (double or two singles) and an annular preventer (see attached diagram). A choke manifold rated to at least 5,000 psi will be used.

4. Casing

Description	Interval		Weight (ppf)	Grade	Coup	Pore Press @ Shoe	MW @ Shoe	Frac Grad @ Shoe	Safety Factors		
	Top	Bottom							Burst	Collapse	Tension
Conductor	0'	60'	37	H-40	Weld	--	--	--	--	--	--
14									--	--	--
Surface	0'	1,000'	36	J-55	STC	8.33	8.33	12	3,520	2,020	394,000
9 5/8									6.27	6.35	10.94
Intermediate	0'	8,945'	26	P-110	LTC	9	9.5	15	9,960	6,210	693,000
7									2.36	1.76	2.98
Production	8,745'	11,100'	11.6	P-110	LTC	11	11.5	--	10,690	7,560	279,000
4 1/2									2.04	1.37	2.17

Assumptions:

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Surface casing MASP = (frac gradient + 1.0 ppg) - (gas gradient)
Intermediate casing MASP = (reservoir pressure) - (gas gradient)
Production casing MASP = (reservoir pressure) - (gas gradient)
All collapse calculations assume fully evacuated casing with a gas gradient
All tension calculations assume air weight of casing
Gas gradient = 0.1 psi/ft

All casing shall be new.
All casing strings shall have a minimum of 1 centralizer on each of the bottom 3 joints.

5. Cement

Job	Hole Size	Fill	Slurry Description	ft^3 / sacks	OH excess	Weight (ppg)	Yield (ft^3/sk)
Conductor	17 1/2	60'	Class G w/ 2% KCl + 0.25 lbs/sk Cello Flake	41 / 35	15%	15.8	1.17
Surface Lead	12 1/4	500'	Premium Lite II w/ 3% KCl + 10% bentonite	180 / 51	15%	11.0	3.53
Surface Tail	12 1/4	500'	Class G w/ 2% KCl + 0.25 lbs/sk Cello Flake	190 / 154	15%	15.8	1.17
Intermediate Lead	8 3/4	6,060'	Premium Lite II w/ 3% KCl + 10% bentonite	1048 / 297	15%	11.0	3.53
Intermediate Tail	8 3/4	1,885'	50/50 Poz/Class G w/ 3% KCl + 2% bentonite	326 / 263	15%	14.3	1.24
Production Tail	6 1/8	2,355'	50/50 Poz/Class G w/ 3% KCl + 2% bentonite	255 / 206	15%	14.3	1.24

The surface casing will be cemented to surface. In the event that cement does not reach surface during the primary cement job, a remedial job will be performed.

Actual cement volumes for the intermediate and production casing strings will be calculated from an open hole caliper log, plus 15% excess.

6. Type and Characteristics of Proposed Circulating Medium

Interval	Description
Surface - 1,000'	An air and/or fresh water system will be utilized. If an air rig is used, the blooie line discharge may be less than 100' from the wellbore in order to minimize location size. The blooie line is not equipped with an automatic igniter. The air compressor may be located less than 100' from the well bore due to the low possibility of combustion with the air/dust mixture. Water will be on location to be used as kill fluid, if necessary.
1,000' - TD	A water based mud system will be utilized. Hole stability may be improved with additions of KCl or a similar inhibitive substance. In order to control formation pressure the system will be weighted with additions of bentonite, and if conditions warrant, with barite.

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Anticipated maximum mud weight is 11.5 ppg.

7. Logging, Coring, and Testing

Logging: A dual induction, gamma ray, and caliper log will be run from TD to the base of the surface casing. A compensated neutron/formation density log will be run from TD to the top of the Garden Gulch formation. A cement bond log will be run from PBTD to the cement top behind the production casing.

Cores: As deemed necessary.

DST: There are no DST's planned for this well.

8. Anticipated Abnormal Pressure or Temperature

Maximum anticipated bottomhole pressure will be approximately equal to total depth (feet) multiplied by a 0.57 psi/ft gradient.

11,100' x 0.57 psi/ft = 6349 psi

No abnormal temperature is expected. No H_2S is expected.

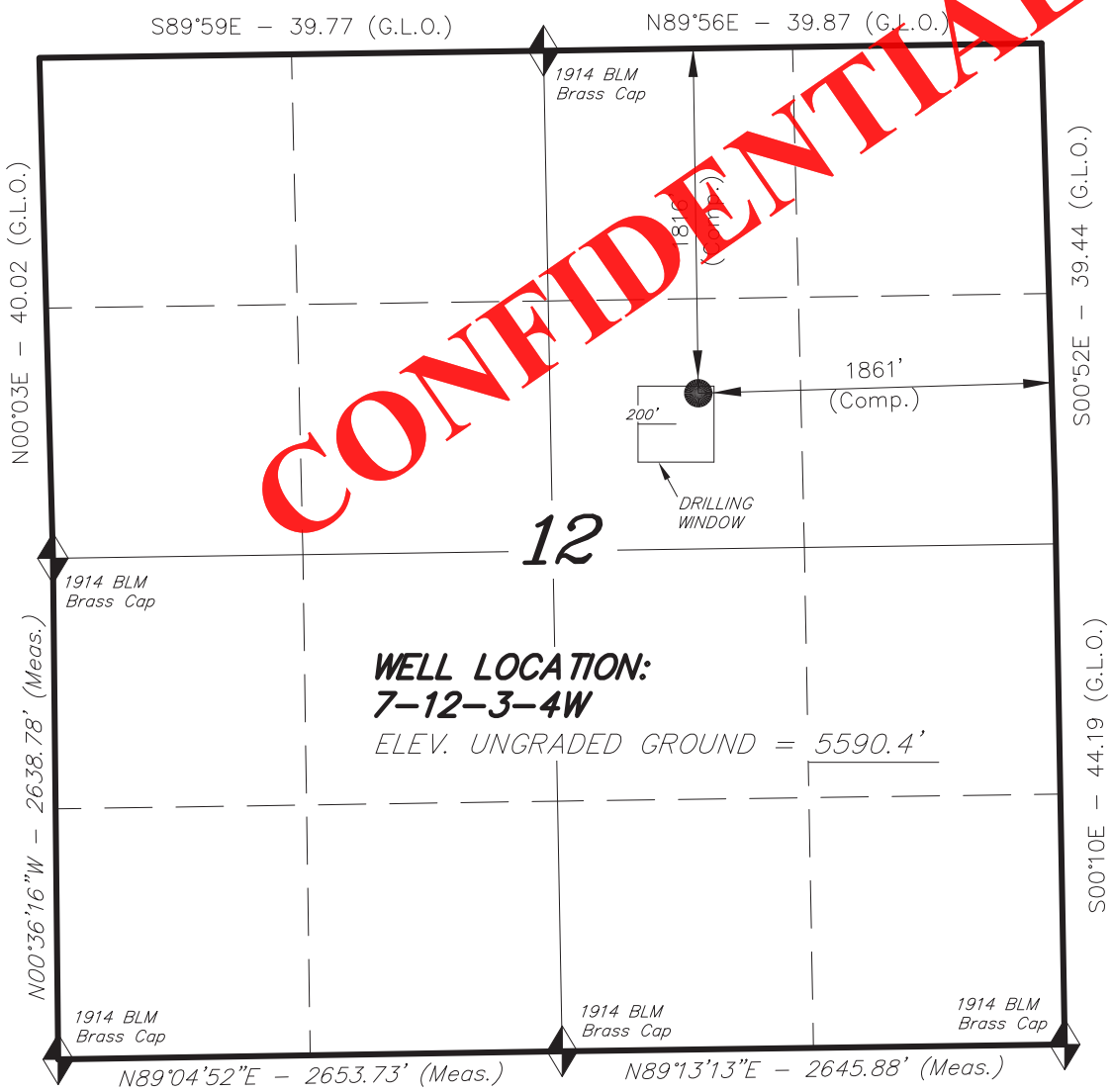
9. Other Aspects

This is planned as a vertical well.

RECEIVED: June 29, 2012

API Well Number: 43013515420000

T3S, R4W, U.S.B.&M.



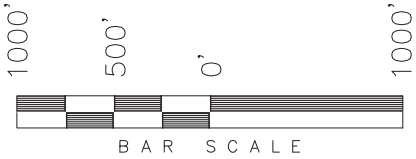
◆ = SECTION CORNERS LOCATED

BASIS OF ELEV; Elevations are based on an N.G.S. OPUS Correction. LOCATION: LAT. 40°04'09.56" LONG. 110°00'43.28" (Tristate Aluminum Cap) Elev. 5281.57'

7–12–3–4W
(Surface Location) *NAD 83*
LATITUDE = 40° 14' 15.67"
LONGITUDE = 110° 16' 53.79"

NEWFIELD EXPLORATION COMPANY

WELL LOCATION, 7–12–3–4W, LOCATED AS SHOWN IN THE SW 1/4 NE 1/4 OF SECTION 12, T3S, R4W, U.S.B.&M. DUCHESNE COUNTY, UTAH.



NOTES:
1. *Well footages are measured at right angles to the Section Lines.*
2. *Bearings are based on Global Positioning Satellite observations.*
3. *The Proposed Well head bears S24°18'55"E 1979.13' from the North 1/4 Corner of Section.*

THIS IS TO CERTIFY THAT THE ABOVE PLAT WAS PREPARED FROM FIELD NOTES OF ACTUAL SURVEYS MADE BY ME OR UNDER MY SUPERVISION AND THAT THE SAME ARE TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF.

REGISTERED LAND SURVEYOR No.189377 12-02-11 STACY W. STEWART STATE OF UTAH

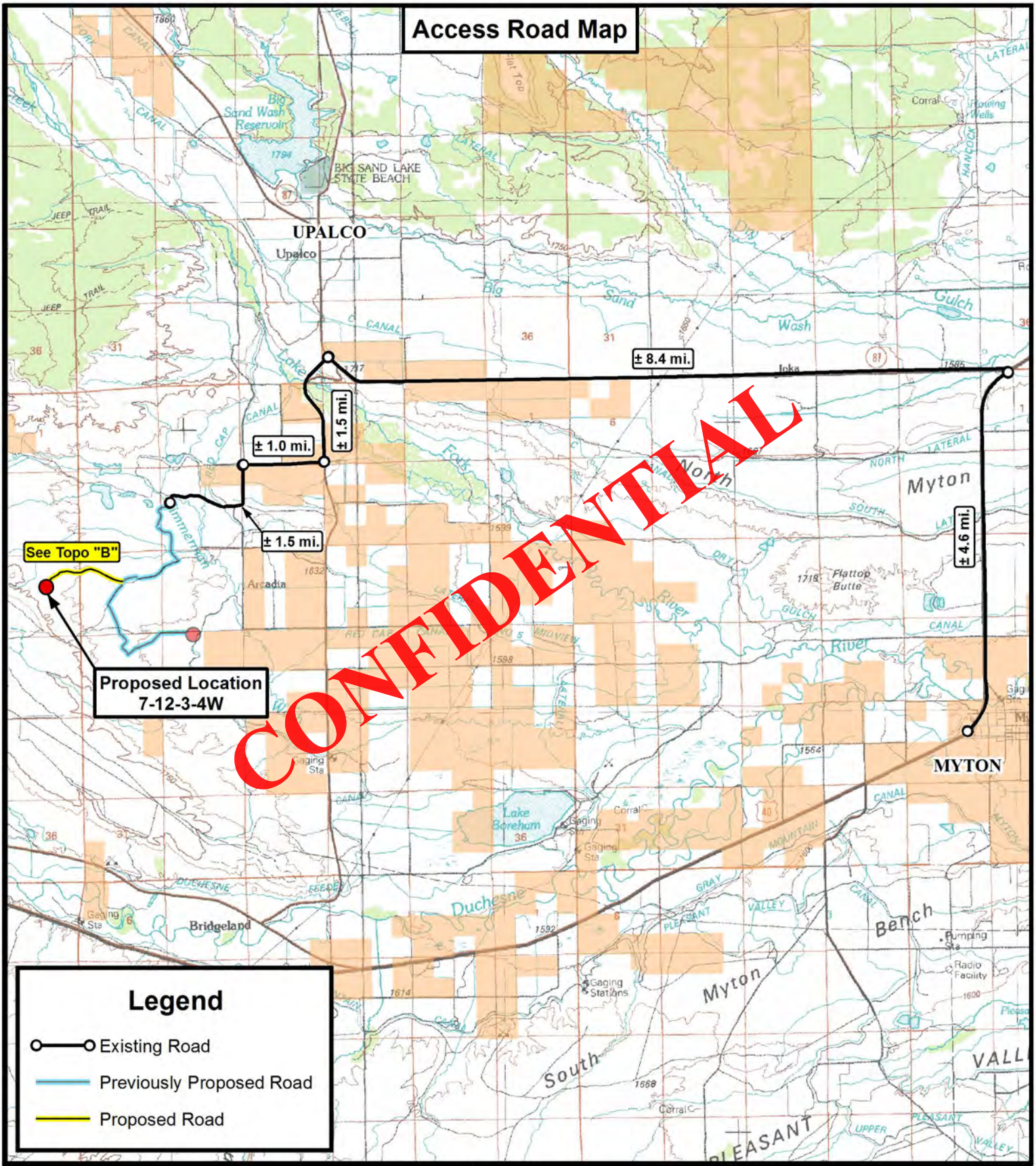
REGISTERED LAND SURVEYOR
REGISTRATION No.
STATE OF UTAH

TRI STATE LAND SURVEYING & CONSULTING
180 NORTH VERNAL AVE. – VERNAL, UTAH 84078
(435) 781–2501

DATE SURVEYED: 11–20–11	SURVEYED BY: S.H.	VERSION:
DATE DRAWN: 12–01–11	DRAWN BY: M.W.	V1
REVISED:	SCALE: 1" = 1000'	

RECEIVED: June 29, 2012

API Well Number: 43013515420000



Tri State Land Surveying, Inc.
180 NORTH VERNAL AVE. VERNAL, UTAH 84078
P: (435) 781-2501
F: (435) 781-2518

N

NEWFIELD EXPLORATION COMPANY

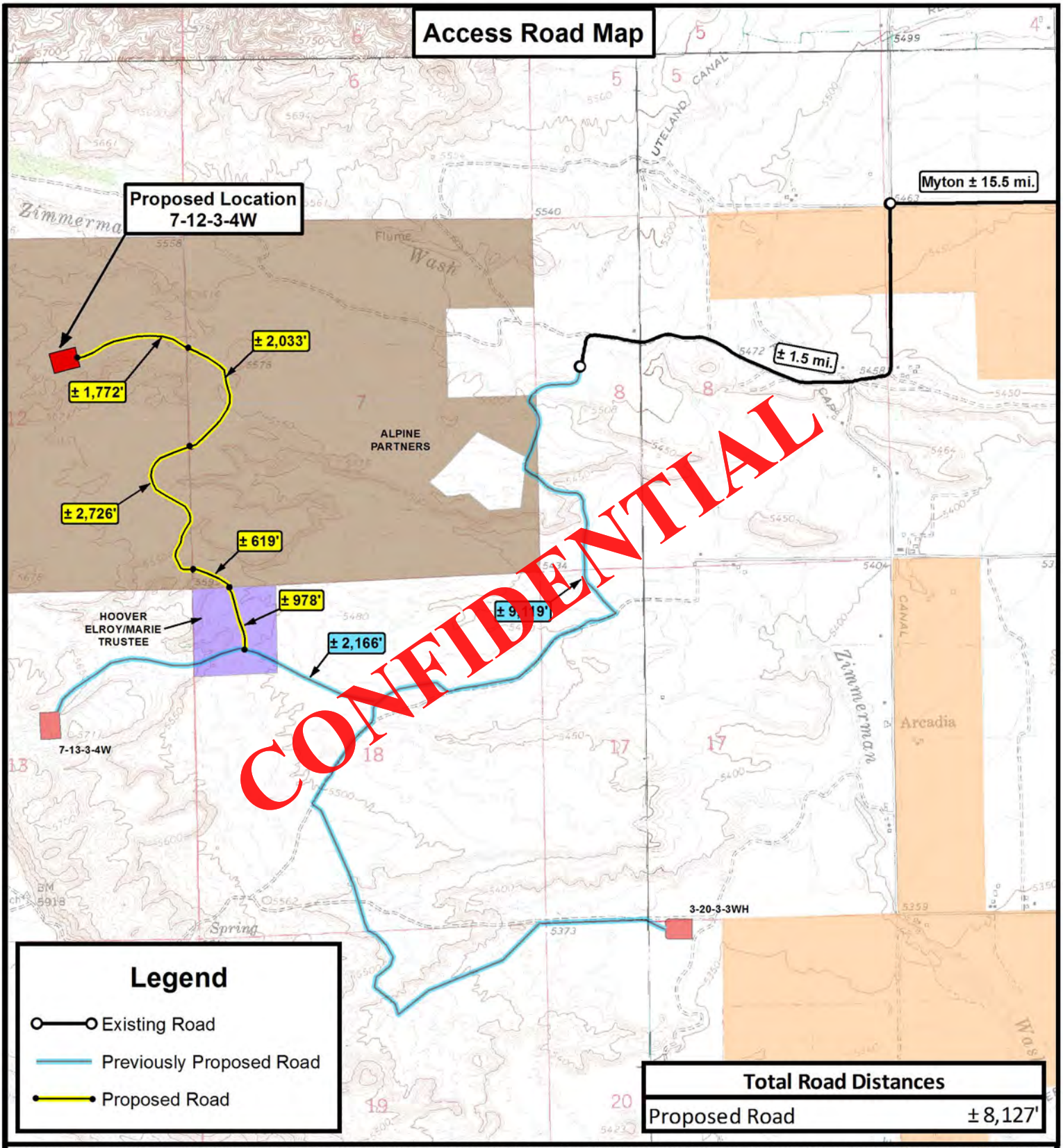
7-12-3-4W
SEC. 12, T3S, R4W, U.S.B.&M.
Duchesne County, UT.

DRAWN BY:	A.P.C.	REVISED: 06-04-12 A.P.C.	VERSION:
DATE:	12-02-2011		V1
SCALE:	1:100,000		

TOPOGRAPHIC MAP

SHEET A

API Well Number: 43013515420000



THE PARCEL INFORMATION SHOWN HAS NOT BEEN SURVEYED BY TRI-STATE LAND SURVEYING, INC. - TRI-STATE DOES NOT WARRANTY PROPERTY PARCEL DATA OR ANY ASSOCIATED INFORMATION. A PROPERTY SURVEY IS REQUIRED TO DETERMINE THE ACTUAL LOCATION OF PROPERTY LINES AND SHOW ACCURATE DISTANCES ACROSS PARCELS.

Tri State Land Surveying, Inc.
180 NORTH VERNAL AVE. VERNAL, UTAH 84078
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N

NEWFIELD EXPLORATION COMPANY

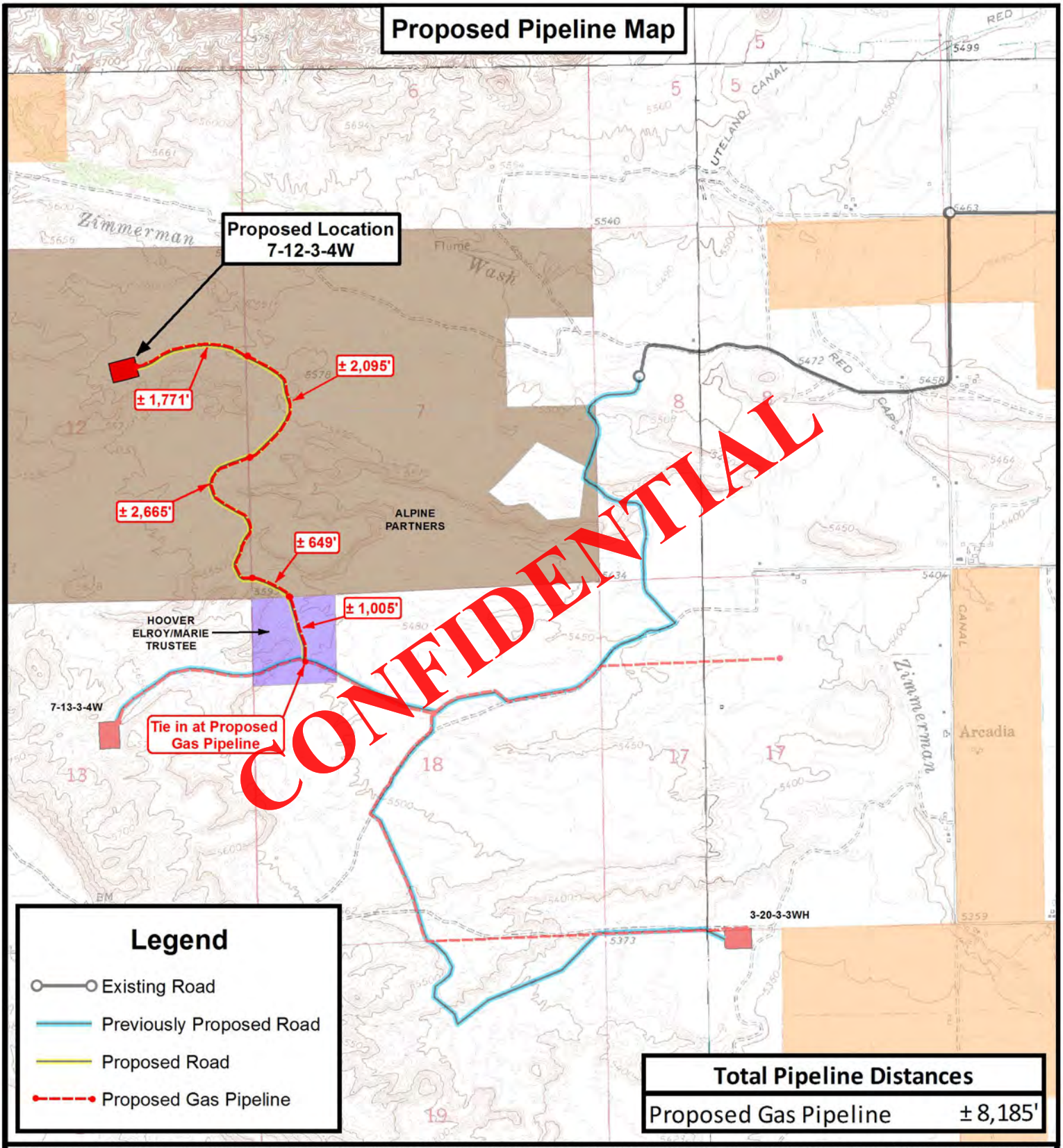
7-12-3-4W
SEC. 12, T3S, R4W, U.S.B.&M.
Duchesne County, UT.

DRAWN BY:	A.P.C.	REVISED: 06-04-12 A.P.C.	VERSION:
DATE:	12-02-2011		V1
SCALE:	1 " = 2,000 '		

TOPOGRAPHIC MAP

SHEET B

API Well Number: 43013515420000



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Tri State Land Surveying, Inc.
180 NORTH VERNAL AVE. VERNAL, UTAH 84078
P: (435) 781-2501
F: (435) 781-2518

N

NEWFIELD EXPLORATION COMPANY

7-12-3-4W
SEC. 12, T3S, R4W, U.S.B.&M.
Duchesne County, UT.

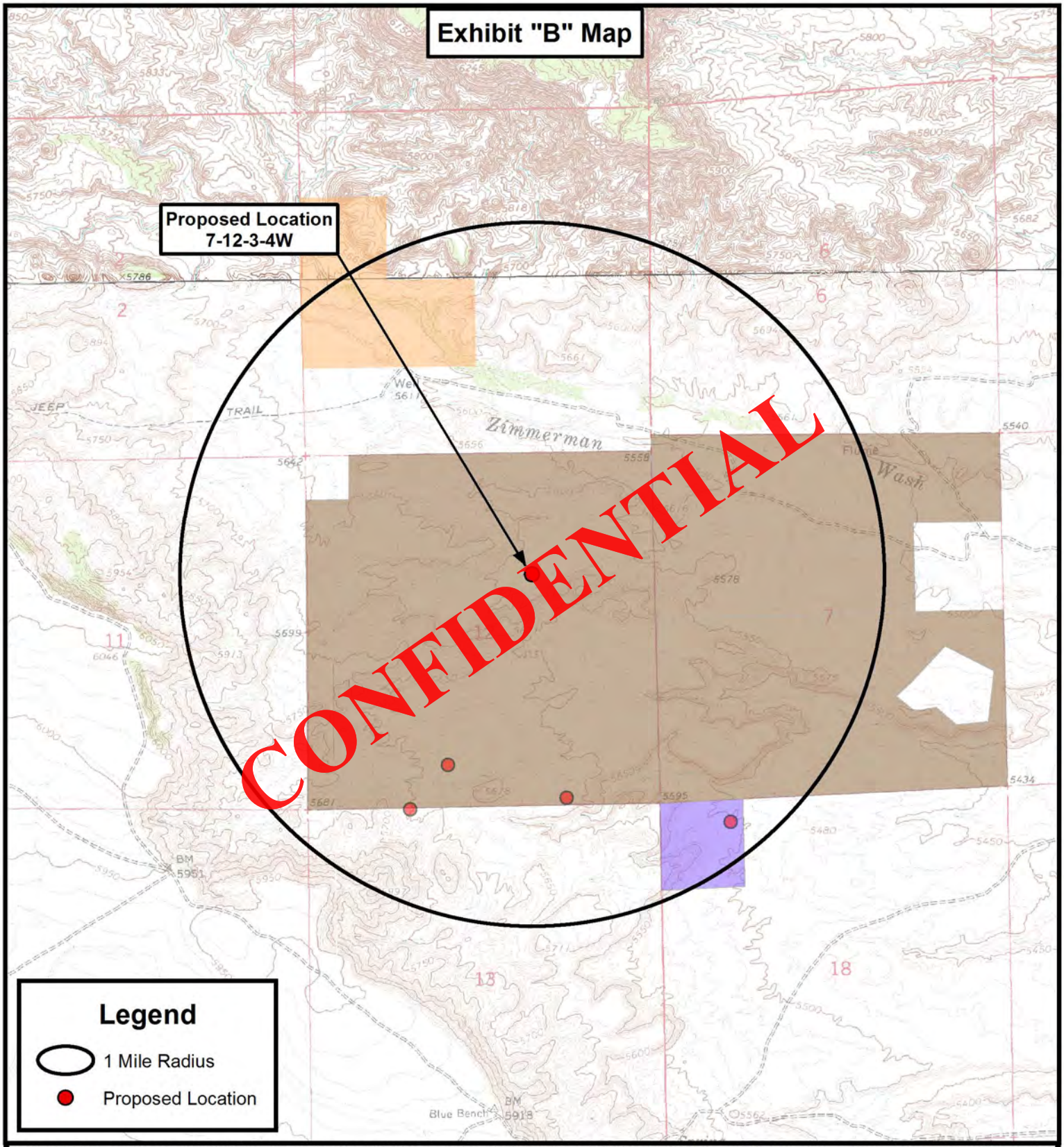
DRAWN BY:	A.P.C.	REVISED: 06-04-12 A.P.C.	VERSION:
DATE:	12-02-2011		V1
SCALE:	1 " = 2,000 '		

TOPOGRAPHIC MAP

SHEET C

API Well Number: 43013515420000

Exhibit "B" Map



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P: (435) 781-2501
F: (435) 781-2518

N

NEWFIELD EXPLORATION COMPANY
7-12-3-4W
SEC. 12, T3S, R4W, U.S.B.&M.
Duchesne County, UT.

DRAWN BY:	A.P.C.	REVISED: 06-04-12 A.P.C.	VERSION:
DATE:	12-02-2011		V1
SCALE:	1 " = 2,000 '		

TOPOGRAPHIC MAP

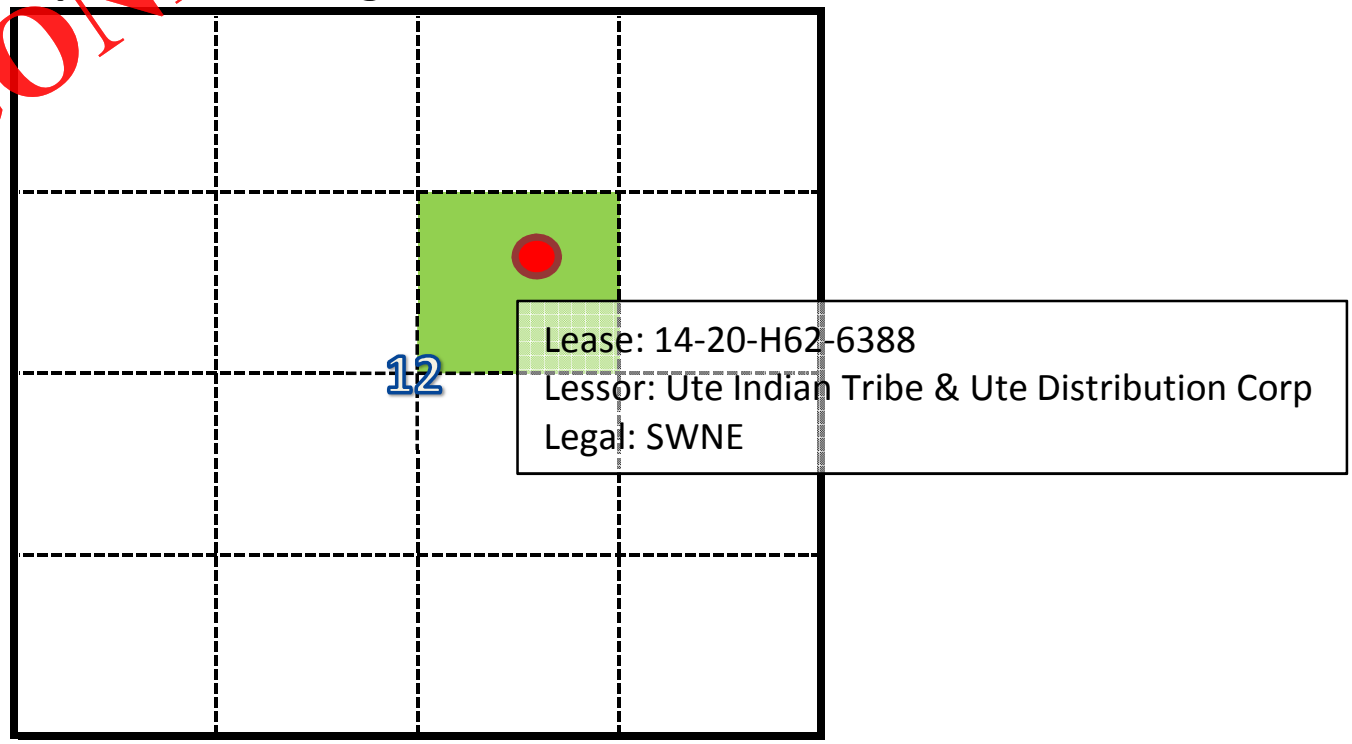
SHEET D

Ute Tribal 7-12-3-4W

SHL 1816' FNL & 1861' FEL

BHL 1816' FNL & 1861' FEL

Township 3 South, Range 4 West, Section 12: SWNE



RECEIVED: June 29, 2012

AFFIDAVIT OF SURFACE OWNERSHIP AND SURFACE USE

Laura Smith personally appeared before me, being duly sworn, deposes and with respect to State of Utah R649-3-34.7 says:

1. My name is Laura Smith. I am a Landman for Newfield RMI LLC ("Newfield RMI"), whose address is 1001 17th Street, Suite 2000, Denver, CO 80202.

2. Pursuant to that certain Special Warranty Deed dated June 20, 2012 from Alpine Partners, a Utah General Partnership, to Newfield RMI, recorded in Book A649, Page 533, and Document # 446789 of the official records of Duchesne County, Utah. Newfield RMI is the surface owner of the lands described on the attached Exhibit "B".

3. Newfield Production Company, whose address is 1001 17th Street, Suite 2000, Denver, CO 80202, is the Operator of the proposed wells listed on Exhibit "A".

4. Newfield Production Company has the right to construct and operate the necessary easements, rights-of-way, drillsites and wells that are located on the lands described on the attached Exhibit "B".

FURTHER AFFIANT SAYETH NOT.

Laura Smith, Landman

ACKNOWLEDGEMENT

STATE OF COLORADO §
CITY AND §
COUNTY OF DENVER §

Before me, a Notary Public, in and for the State, on this 27th day of June, 2012, personally appeared Laura Smith, to me known to be the identical person who executed the foregoing instrument, and acknowledged to me that she executed the same as her own free and voluntary act and deed for the uses and purposes therein set forth.

NOTARY PUBLIC

My Commission Expires:

PETER BURNS
NOTARY PUBLIC
STATE OF COLORADO
My Commission Expires 8/09/2015

Exhibit "A"

Attached to and made a part of that certain Affidavit of Surface Ownership and Surface Use dated this 27th day of June, 2012.

The Wells included in the Affidavit of Surface Ownership and Surface Use are further described as follows:

Legrand 14-32-2-3W
Drillsite located in the SESW of Section 32, Township 2 South, Range 3 West, Duchesne County, Utah.

Holgate 11-5-3-3W
Drillsite located in the NESW of Section 5, Township 3 South, Range 3 West, Duchesne County, Utah.

UT 1-13-3-4WH
Drillsite located in the SWSE of Section 12, Township 3 South, Range 4 West, with a wellbore point of entry in the NENE of Section 13, Township 3 South, Range 4 West and a bottom hole location in the SESE of Section 13, Township 3 South, Range 4 West, Duchesne County, Utah.

UT 2-5-3-3WH
Drillsite located in both the SWSE of Section 32, Township 2 South, Range 3 West and the NWNE of Section 5, Township 3 South, Range 3 West, with a bottom hole location in the SWSE of Section 5, Township 3 South, Range 3 West, Duchesne County, Utah.

UT 4-13-3-4WH
Drillsite located in both the SESW of Section 12, Township 3 South, Range 4 West and the NENW of Section 13, Township 3 South, Range 4 West, with a well bore point of entry in the NWNW of Section 13, Township 3 South, Range 4 West and a bottom hole location in the SWSW of Section 13, Township 3 South, Range 4 West, Duchesne County, Utah.

UT 7-12-3-4W
Drillsite located in the SWNE of Section 12, Township 3 South, Range 4 West, Duchesne County, Utah.

UT 7-13-3-4W
Drillsite located in the SWNE of Section 13, Township 3 South, Range 4 West, Duchesne County, Utah.

UT 7-18-3-3W
Drillsite located in the SWNE of Section 18, Township 3 South, Range 3 West, Duchesne County, Utah.

UT 14-12-3-4W
Drillsite located in the SESW of Section 12, Township 3 South, Range 4 West, Duchesne County, Utah.

UT 14-18-3-3W
Drillsite located in the SESW of Section 18, Township 3 South, Range 3 West, Duchesne County, Utah.

Exhibit "B"

Attached to and made a part of that certain Affidavit of Surface Ownership and Surface Use dated this 27th day of June, 2012.

The Lands included in the Affidavit of Surface Ownership are further described as follows:

The "Lands"

Township 2 South, Range 3 West (980.00 acres)
Section 29: S½SW, NESW
Section 31: S½, S½NE
Section 32: W½, SWNE, W½SE, S½SESE

Township 2 South, Range 4 West (740.00 acres)
Section 34: S½SESW, SE
Section 35: S½, NE
Section 36: S½SW

Township 3 South, Range 3 West (2,277.87 acres)
Section 5: N½NE, NW, N½SW, SWSW, W½SESW
Section 6: All
Section 7: All
Section 8: W½W½SW, N½NW, Beginning at the West quarter corner of said Section 8; thence North 0°38'46" West 1,318.41 feet to the Northwest corner of the South half of the Northwest quarter; thence North 88°13'17" East 2,650.54 feet, to the Northeast quarter of the South half of the Northwest quarter; thence South 0°55'29" East 662.49 feet, to the Southeast corner of the Northeast quarter of the Southeast quarter of the Northwest quarter; thence North 85°22' West 1,871.00 feet; thence South 11°25' West 605.62 feet; thence South 0°41'34" East 276.77 feet to the Southeast corner of the Southwest quarter of the Southwest quarter of the Northwest quarter; thence South 88°21'56" West 664.21 feet, to the point of beginning.
Section 17: N½NWNW, SWNWNW
Section 18: NENW, NE, E½SE, E½SW, E½NWSW, S½NW

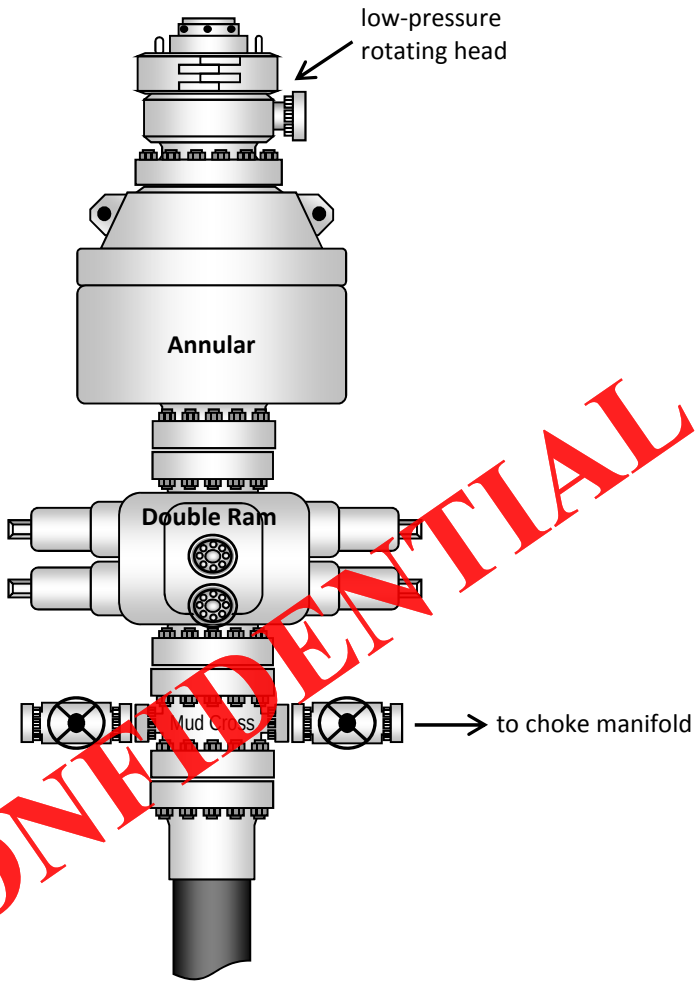
Township 3 South, Range 4 West (2,680.36 acres)
Section 1: N½N½, SENW, S½NE, SE, SESW
Section 2: All
Section 3: N½N½, SENW, S½NE, NWSE, N½NESE
Section 11: N½NW, NE, SENW
Section 12: All
Section 13: N½

LESS AND EXCEPT that certain tract of land referred to as the "Oil Pond" consisting of approximately 24.17 acres m/l, and further described as follows:

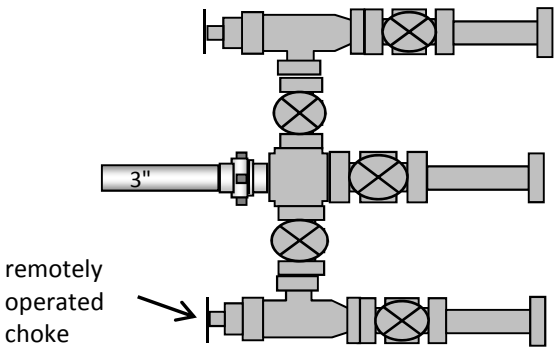
Commencing at the Southeast corner of Section 7, Township 3 South, Range 3 West of the Uintah Special Base and Meridian; thence North 0°26'34" West 1724.05 feet along the East line of said section; thence West 159.51 feet to the True point of beginning; thence running South 8°57'49" West 758.59 feet; thence South 87°13'57" West 479.90 feet; thence North 48°33'06" West 398.50 feet; thence South 82°50'37" West 321.82 feet; thence North 49°00'01" West 358.70 feet; thence North 49°50'42" East 306.66 feet; thence North 45°33'40" East 727.75 feet; thence South 61°36'00" East 830.71 feet to the True point of beginning.

Covering approximately 6,678.23 acres of land, more or less, in Duchesne County, Utah.

Typical 5M BOP stack configuration



Typical 5M choke manifold configuration



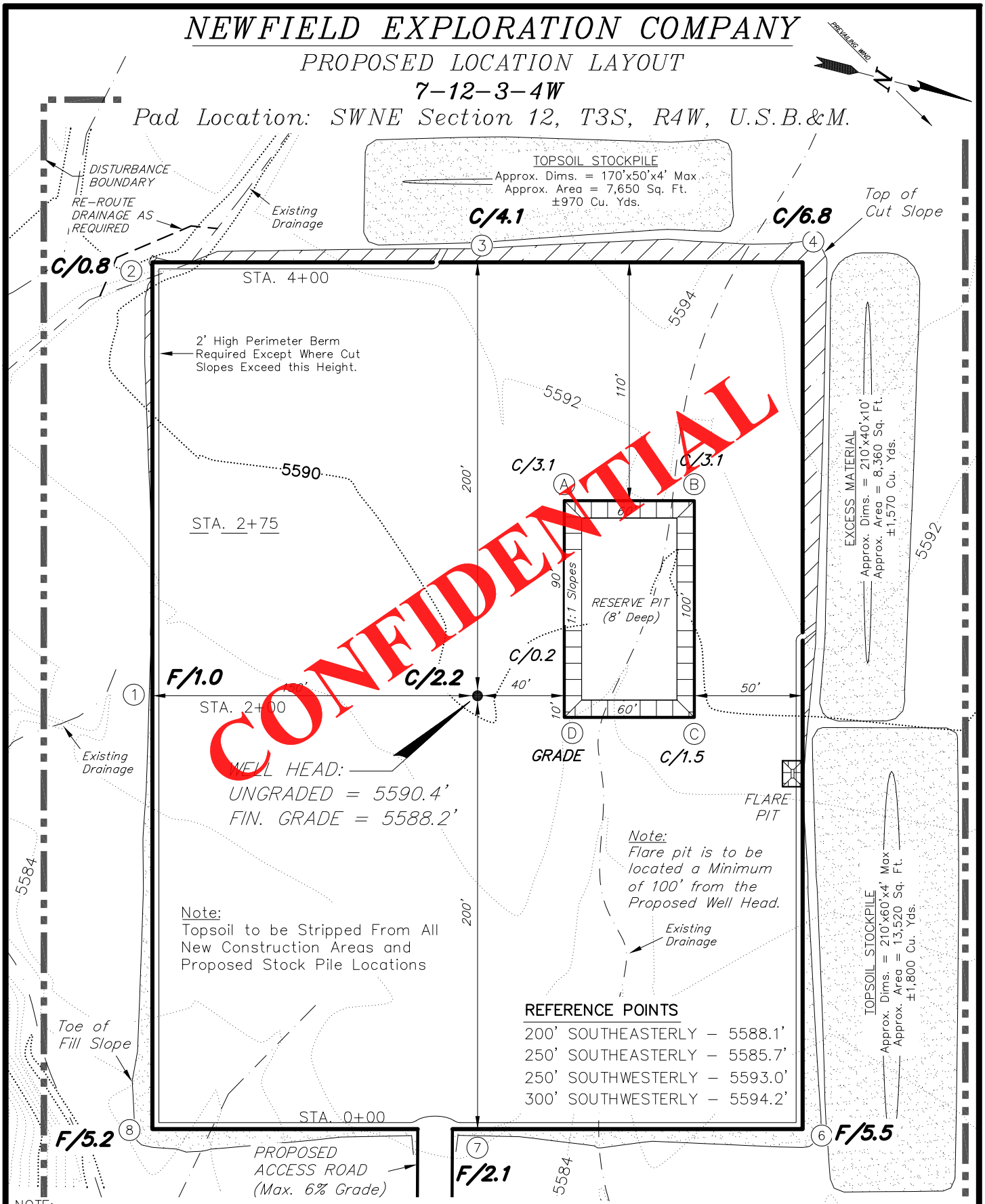
RECEIVED: June 29, 2012

NEWFIELD EXPLORATION COMPANY

PROPOSED LOCATION LAYOUT

7-12-3-4W

Pad Location: SWNE Section 12, T3S, R4W, U.S.B.&M.



NOTE:
The topsoil & excess material areas are calculated as being mounds containing 4,340 cubic yards of dirt (a 10% fluff factor is included). The mound areas are calculated with push slopes of 1.5:1 & fall slopes of 1.5:1.

SURVEYED BY: S.H.	DATE SURVEYED: 11-20-11	VERSION:	Tri State Land Surveying, Inc. (435) 781-2501
DRAWN BY: M.W.	DATE DRAWN: 12-01-11	V1	180 NORTH VERNAL AVE. VERNAL, UTAH 84078
SCALE: 1" = 60'	REVISED: L.K. 06-04-12		

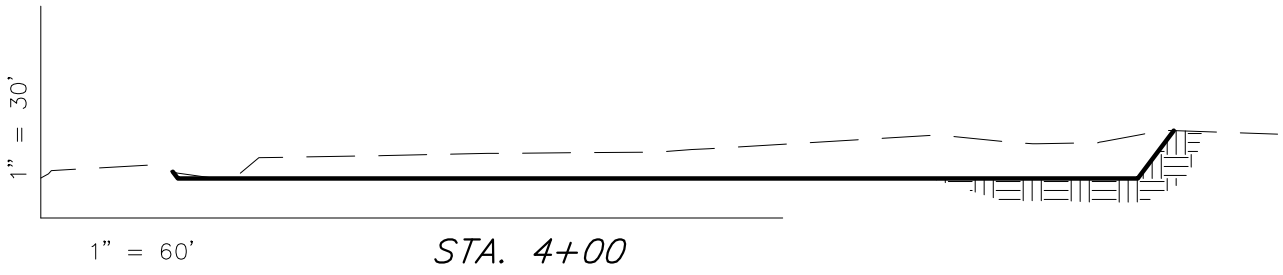
RECEIVED: June 29, 2012

NEWFIELD EXPLORATION COMPANY

CROSS SECTIONS

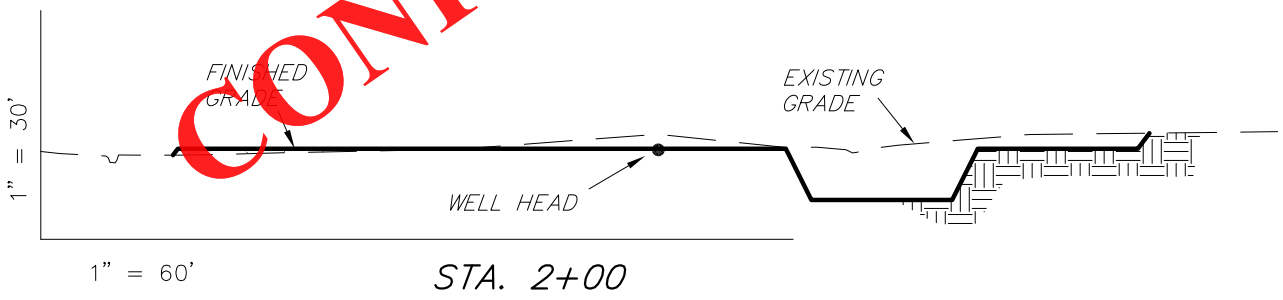
7-12-3-4W

Pad Location: SWNE Section 12, T3S, R4W, U.S.B.&M.

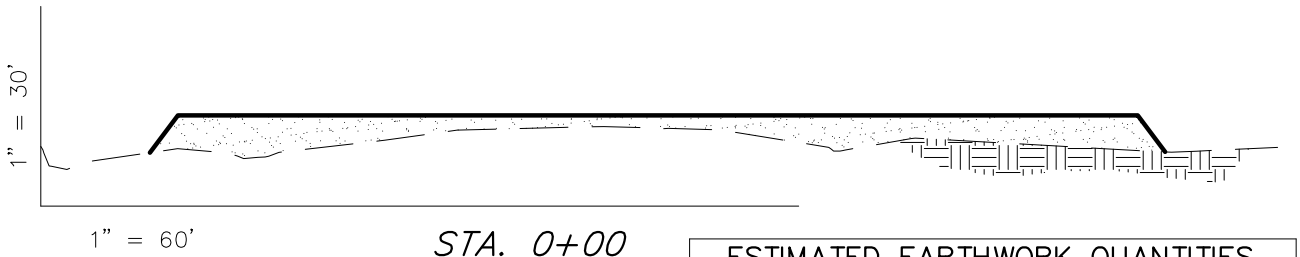


STA. 4+00

STA. 2+75



STA. 2+00



STA. 0+00

NOTE:
UNLESS OTHERWISE NOTED ALL CUT/FILL SLOPES ARE AT 1.5:1

ESTIMATED EARTHWORK QUANTITIES
(No Shrink or swell adjustments have been used)
(Expressed in Cubic Yards)

ITEM	CUT	FILL	6" TOPSOIL	EXCESS
PAD	5,620	5,610	Topsoil is not included in Pad Cut Volume	10
PIT	1,420	0		1,420
TOTALS	7,040	5,610	2,520	1,430

SURVEYED BY: S.H.	DATE SURVEYED: 11-20-11	VERSION:	Tri State Land Surveying, Inc. (435) 781-2501
DRAWN BY: M.W.	DATE DRAWN: 12-01-11	V1	180 NORTH VERNAL AVE. VERNAL, UTAH 84078
SCALE: 1" = 60'	REVISED: L.K. 06-04-12		

RECEIVED: June 29, 2012

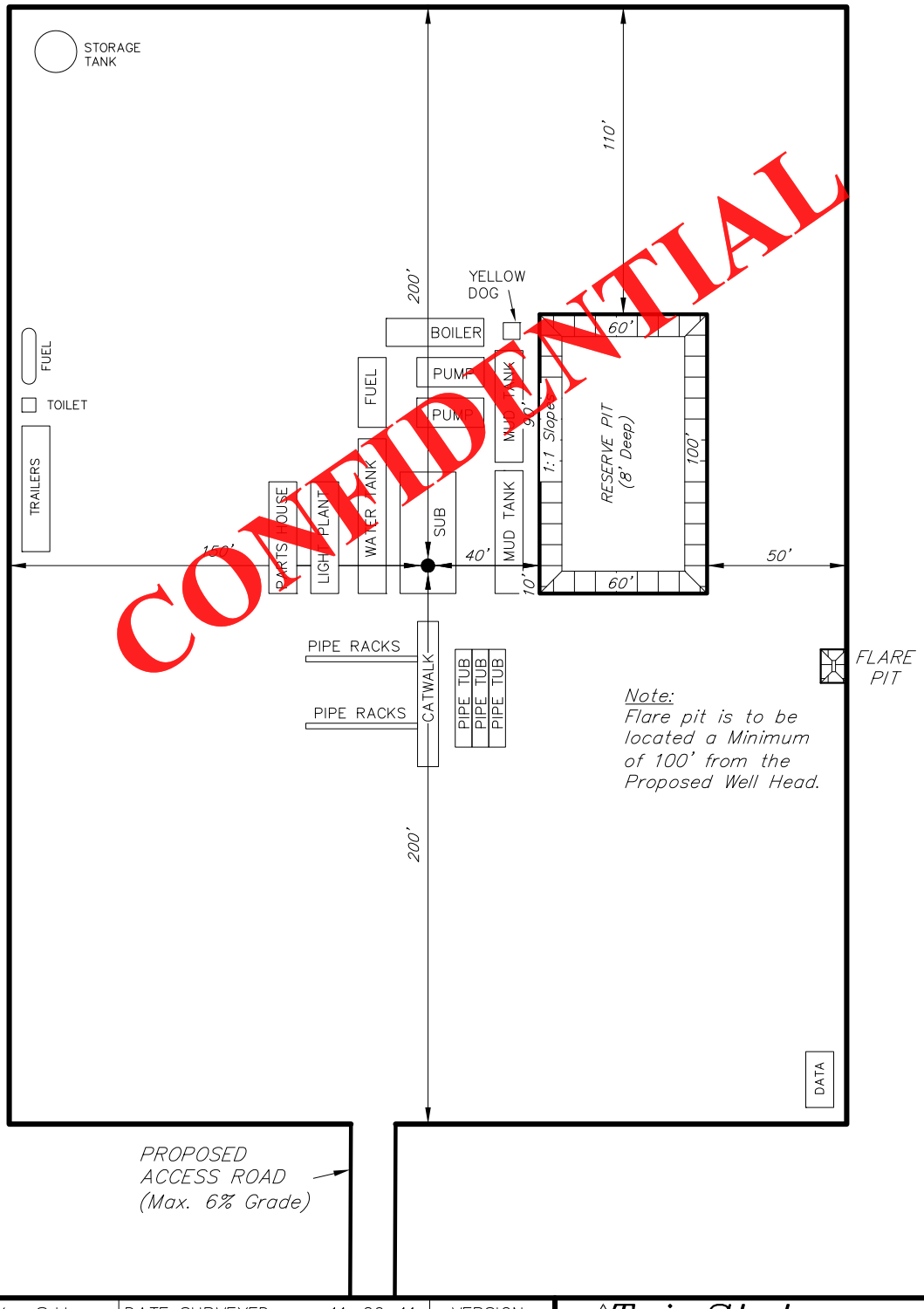
NEWFIELD EXPLORATION COMPANY

TYPICAL RIG LAYOUT

7-12-3-4W

Pad Location: SWNE Section 12, T3S, R4W, U.S.B.&M.

PREVAILING WIND



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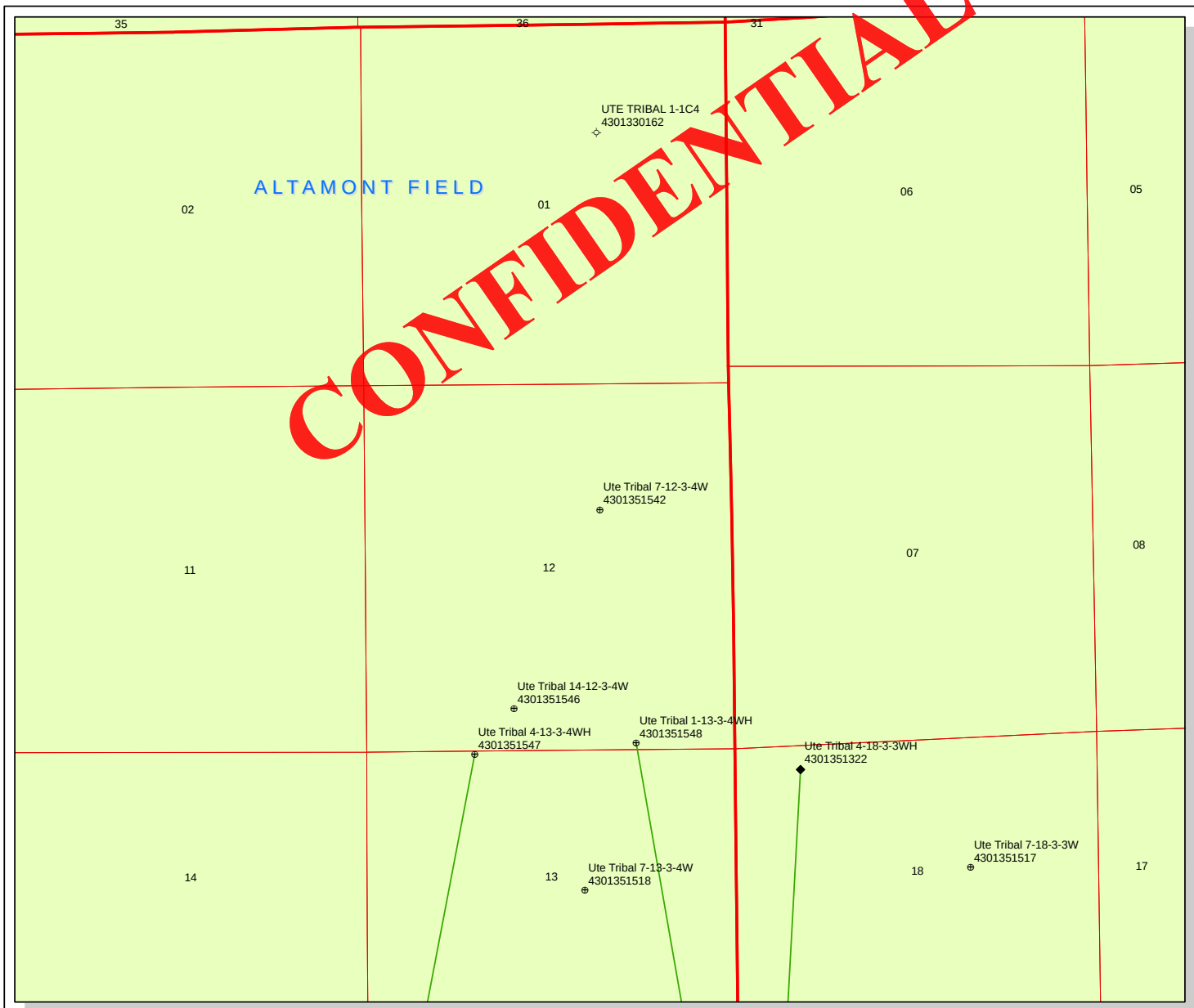
SCALE: 1" = 60'	REVISED: L.K. 06-04-12		

RECEIVED: June 29, 2012

API Well Number: 43013515420000



API Number: 4301351542

Well Name: Ute Tribal 7-12-3-4W

Township T03.0S Range R04.0W Section 12

Meridian: UBM

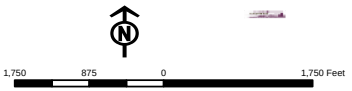
Operator: NEWFIELD PRODUCTION COMPANY

Map Prepared:
Map Produced by Diana Mason

Units
STATUS
ACTIVE
EXPLORATORY
GAS STORAGE
NF PP OIL
NF SECONDARY
PI OIL
PP GAS
PP GEOTHERML
PP OIL
SECONDARY
TERMINATED

Fields
STATUS
Unknown
ABANDONED
ACTIVE
COMBINED
INACTIVE
STORAGE
TERMINATED

Wells Query
Status
APD - Aproved Permit
DRL - Spuded (Drilling Commenced)
GIW - Gas Injection
GS - Gas Storage
LOC - New Location
OPS - Operation Suspended
PA - Plugged Abandoned
PGW - Producing Gas Well
POW - Producing Oil Well
SGW - Shut-in Gas Well
SOW - Shut-in Oil Well
TA - Temp. Abandoned
TW - Test Well
WDW - Water Disposal
WIW - Water Injection Well
WSW - Water Supply Well
Bottom Hole Location - OilGasDb



1:17,549

RECEIVED: July 19, 2012

ON-SITE PREDRILL EVALUATION
Utah Division of Oil, Gas and Mining

Operator NEWFIELD PRODUCTION COMPANY
Well Name Ute Tribal 7-12-3-4W
API Number 43013515420000 **APD No** 6257 **Field/Unit** UNDESIGNATED
Location: 1/4,1/4 SWNE **Sec** 12 **Tw** 3.0S **Rng** 4.0W 1816 FNL 1861 FEL
GPS Coord (UTM) 561108 4454374 **Surface Owner** Newfield RMI LLC

Participants

T. Eaton, F. Bird, Z. Mc Intyre,– Newfield; C. Jensen,– DOGM ; J. Simonsen -BLM; D. Pettty - Tristate

Regional/Local Setting & Topography

The proposed action is in the Arcadia area in Duchesne County in a river floodplain below and north of the eastern portion of the Blue Bench. The area is moderately sloped "foothills" of the bench. The city of Duchesne can be found approximately 5 miles West with Sand Wash Reservoir 6 miles North. The area is characterized by clayey sandy soils with slopes of > 2% surrounded by terracing and benches of several different elevations capped by sandstone cliffs over highly erodible soils consistent with river floodplain profiles. The occasional Butte can also be found. A drainage of significant size with evidence of recent overland flow, is found within the location boundaries. Immediately adjacent the pad boundary can be found a man made pond with wetland vegetation currently growing that currently holds water from natural overland flows The area regionally is cris-crossed with numerous canals and associated laterals from the Lake Fork and Duchesne Rivers and Lake Boreham. The area has long been used for farming and ranching operations and has recently seen increasing development for petroleum extraction.

Surface Use Plan

Current Surface Use
Grazing

New Road Miles	Well Pad	Src Const Material	Surface Formation
0.5244	**Width** 300 **Length** 400	Offsite	UNTA

Ancillary Facilities N

Waste Management Plan Adequate? Y

Environmental Parameters

Affected Floodplains and/or Wetlands N

highly erodible soils

Flora / Fauna

high desert shrubland ecosystem Identified or expected vegetation consists of black sagebrush, shadscale, Atriplex spp., mustard spp, rabbit brush, horsebrush, broom snakeweed, Opuntia spp and spring annuals.
Dominant vegetation;
Galletta, gardner atriplex and opuntia spp surround the proposed site.
Wildlife;

RECEIVED: August 02, 2012

Adjacent habitat contains forbs that may be suitable browse for deer, antelope, prairie dogs or rabbits, though none were observed.

Soil Type and Characteristics

clayey sandy soils with rounded cobbles

Erosion Issues Y

Sedimentation Issues Y

Site Stability Issues N

ponding with wetland vegetation found just adjacent to pad boundaries that could undermine pad

Drainage Diverson Required? Y

multiple drainages present within pad boundaries

Berm Required? Y

Erosion Sedimentation Control Required? Y

drianage needs to be diverted

Paleo Survey Run? N **Paleo Potental Observed?** N **Cultural Survey Run?** N **Cultural Resources?** N

Reserve Pit

Site-Specific Factors		Site Ranking
Distance to Groundwater (feet)	100 to 200	5
Distance to Surface Water (feet)		20
Dist. Nearest Municipal Well (ft)	>5280	0
Distance to Other Wells (feet)	>1320	0
Native Soil Type	Mod permeability	10
Fluid Type	Fresh Water	5
Drill Cuttings	Normal Rock	0
Annual Precipitation (inches)	10 to 20	5
Affected Populations		
Presence Nearby Utility Conduits	Not Present	0
	Final Score	45 1 Sensitivity Level

Characteristics / Requirements

A 40’ x 80' x 8' deep reserve pit is planned in an area of cut on the northwest side of the location. A pit liner is required. Newfield commonly uses a 30 mil liner with a felt underliner. Pit should be fenced to prevent entry by deer, other wildlife and domestic animals. Pit to be closed within one year after drilling activities are complete.

Closed Loop Mud Required? N **Liner Required?** Y **Liner Thickness** 16 **Pit Underlayment Required?** N

Other Observations / Comments

RECEIVED: August 02, 2012

API Well Number: 43013515420000

Chris Jensen
Evaluator

7/18/2012
Date / Time

RECEIVED: August 02, 2012

Application for Permit to Drill
Statement of Basis
Utah Division of Oil, Gas and Mining

APD No	API WellNo	Status	Well Type	Surf Owner	CBM
6257	43013515420000	LOCKED	OW	P	No
Operator	NEWFIELD PRODUCTION COMPANY		**Surface Owner-APD**	Newfield RMI LLC	
Well Name	Ute Tribal 7-12-3-4W		**Unit**		
Field	UNDESIGNATED		**Type of Work**	DRILL	
Location	SWNE 12 3S 4W U 1816 FNL 1861 FEL GPS Coord (UTM) 561098E 4454388N				

Geologic Statement of Basis

The mineral rights for the proposed well are owned by the Ute Tribe. The BLM will be the agency responsible for evaluating and approving the drilling, casing and cement programs.

Brad Hill — **APD Evaluator**

7/30/2012 — **Date / Time**

Surface Statement of Basis

The operator is the surface owner of the location and its representatives were in attendance

The soil type and topography at present do combine to pose a significant threat to erosion or sediment/ pollution transport in these regional climate conditions. A wetland and multiple ephemeeral drainages exist on or near the pad that will need to be diverted or considered for complications to the integrity of the pad. Construction standards of the Operator appear to be adequate for the proposed purpose. I recognize no special flora or animal species or cultural resources on site that the proposed action may harm. The location should be bermed to prevent spills from leaving the confines of the pad. Fencing around the reserve pit will be necessary once the well is drilled to prevent wildlife and livestock from entering. A synthetic liner of 16 mils (minimum) should be utilized in the reserve pit.

Chris Jensen — **Onsite Evaluator**

7/18/2012 — **Date / Time**

Conditions of Approval / Application for Permit to Drill

Category	Condition
Pits	A synthetic liner with a minimum thickness of 16 mils with a felt subliner shall be properly installed and maintained in the reserve pit.
Surface	The reserve pit shall be fenced upon completion of drilling operations.
Surface	Drainages adjacent to the proposed pad shall be diverted around the location.
Surface	The well site shall be bermed to prevent fluids from leaving the pad.

RECEIVED: August 02, 2012

WORKSHEET
APPLICATION FOR PERMIT TO DRILL

APD RECEIVED: 6/29/2012 **API NO. ASSIGNED:** 43013515420000
WELL NAME: Ute Tribal 7-12-3-4W
OPERATOR: NEWFIELD PRODUCTION COMPANY (N2695) **PHONE NUMBER:** 435 719-2018
CONTACT: Don Hamilton

PROPOSED LOCATION: SWNE 12 030S 040W **Permit Tech Review:** ☑
SURFACE: 1816 FNL 1861 FEL **Engineering Review:** ☐
BOTTOM: 1816 FNL 1861 FEL **Geology Review:** ☑
COUNTY: DUCHESNE
LATITUDE: 40.23771 **LONGITUDE:** -110.28173
UTM SURF EASTINGS: 561098.00 **NORTHINGS:** 4454388.00
FIELD NAME: UNDESIGNATED
LEASE TYPE: 2 - Indian
LEASE NUMBER: 14-20-H62-6388 **PROPOSED PRODUCING FORMATION(S):** WASATCH
SURFACE OWNER: 4 - Fee **COALBED METHANE:** NO

RECEIVED AND/OR REVIEWED:

- ☑ **PLAT**
- ☑ **Bond:** INDIAN - RLB00100473
- ☐ **Potash**
- ☐ **Oil Shale 190-5**
- ☐ **Oil Shale 190-3**
- ☐ **Oil Shale 190-13**
- ☑ **Water Permit:** 437478
- ☐ **RDCC Review:**
- ☑ **Fee Surface Agreement**
- ☐ **Intent to Commingle**

Commingling Approved

LOCATION AND SITING:

- ☐ **R649-2-3.**

Unit:

- ☐ **R649-3-2. General**
- ☐ **R649-3-3. Exception**
- ☑ **Drilling Unit**

Board Cause No: Cause 139-90
Effective Date: 5/9/2012
Siting: (4) Producing Grrv-Wstc Wells in Sec Drl Unit

- ☐ **R649-3-11. Directional Drill**

Comments: Presite Completed

Stipulations: 4 - Federal Approval - dmason
5 - Statement of Basis - bhill

RECEIVED: August 02, 2012

GARY R. HERBERT
Governor
GREGORY S. BELL
Lieutenant Governor

State of Utah
DEPARTMENT OF NATURAL RESOURCES
MICHAEL R. STYLER
Executive Director
Division of Oil, Gas and Mining
JOHN R. BAZA
Division Director

Permit To Drill
****

Well Name: Ute Tribal 7-12-3-4W
API Well Number: 43013515420000
Lease Number: 14-20-H62-6388
Surface Owner: FEE (PRIVATE)
Approval Date: 8/2/2012

Issued to:
NEWFIELD PRODUCTION COMPANY , Rt 3 Box 3630 , Myton, UT 84052

Authority:
Pursuant to Utah Code Ann. 40-6-1 et seq., and Utah Administrative Code R649-3-1 et seq., the Utah Division of Oil, Gas and Mining issues conditions of approval, and permit to drill the listed well. This permit is issued in accordance with the requirements of Cause 139-90. The expected producing formation or pool is the WASATCH Formation(s), completion into any other zones will require filing a Sundry Notice (Form 9). Completion and commingling of more than one pool will require approval in accordance with R649-3-22.

Duration:
This approval shall expire one year from the above date unless substantial and continuous operation is underway, or a request for extension is made prior to the expiration date

General:
Compliance with the requirements of Utah Admin. R. 649-1 et seq., the Oil and Gas Conservation General Rules, and the applicable terms and provisions of the approved Application for permit to drill.

Conditions of Approval:
State approval of this well does not supercede the required federal approval, which must be obtained prior to drilling.

Compliance with the Conditions of Approval/Application for Permit to Drill outlined in the Statement of Basis (copy attached).

Notification Requirements:
The operator is required to notify the Division of Oil, Gas and Mining of the following actions during drilling of this well:

- Within 24 hours following the spudding of the well - contact Carol Daniels at 801-538-5284
  (please leave a voicemail message if not available)
  OR
  submit an electronic sundry notice (pre-registration required) via the Utah Oil & Gas website

at http://oilgas.ogm.utah.gov

Reporting Requirements:
All reports, forms and submittals as required by the Utah Oil and Gas Conservation General Rules will be promptly filed with the Division of Oil, Gas and Mining, including but not limited to:

- Entity Action Form (Form 6) - due within 5 days of spudding the well
- Monthly Status Report (Form 9) - due by 5th day of the following calendar month
- Requests to Change Plans (Form 9) - due prior to implementation
- Written Notice of Emergency Changes (Form 9) - due within 5 days
- Notice of Operations Suspension or Resumption (Form 9) - due prior to implementation
- Report of Water Encountered (Form 7) - due within 30 days after completion
- Well Completion Report (Form 8) - due within 30 days after completion or plugging

Approved By:

For John Rogers
Associate Director, Oil & Gas

CONFIDENTIAL

BLM - Vernal Field Office - Notification Form

Operator Newfield Exploration Rig Name/# Ross 29 Submitted By Branden Arnold Phone Number 435-401-0223
Well Name/Number UT-7-12-3-4W
Qtr/Qtr SW/NE Section 12 Township 3S Range 4W
Lease Serial Number 14-20-H62-6388
API Number 43-013-51542

Spud Notice – Spud is the initial spudding of the well, not drilling out below a casing string.

Date/Time 10/2/12 9:00 AM ☒ PM ☐

Casing – Please report time casing run starts, not cementing times.

☒ Surface Casing
☐ Intermediate Casing
☐ Production Casing
☐ Liner
☐ Other

Date/Time 10/2/12 4:00 AM ☐ PM ☒

BOPE

☐ Initial BOPE test at surface casing point
☐ BOPE test at intermediate casing point
☐ 30 day BOPE test
☐ Other

Date/Time _____ _____ AM ☐ PM ☐

Remarks _____

STATE OF UTAH
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS, AND MINING

FORM 9

5.LEASE DESIGNATION AND SERIAL NUMBER: 14-20-H62-6388

SUNDRY NOTICES AND REPORTS ON WELLS

Do not use this form for proposals to drill new wells, significantly deepen existing wells below current bottom-hole depth, reenter plugged wells, or to drill horizontal laterals. Use APPLICATION FOR PERMIT TO DRILL form for such proposals.

6. IF INDIAN, ALLOTTEE OR TRIBE NAME:

7.UNIT or CA AGREEMENT NAME:

1. TYPE OF WELL
Oil Well

8. WELL NAME and NUMBER:
UTE TRIBAL 7-12-3-4W

2. NAME OF OPERATOR:
NEWFIELD PRODUCTION COMPANY

9. API NUMBER:
43013515420000

3. ADDRESS OF OPERATOR:
Rt 3 Box 3630 , Myton, UT, 84052

PHONE NUMBER:
435 646-4825 Ext

9. FIELD and POOL or WILDCAT:
UNDESIGNATED

4. LOCATION OF WELL
FOOTAGES AT SURFACE:
1816 FNL 1861 FEL
QTR/QTR, SECTION, TOWNSHIP, RANGE, MERIDIAN:
Qtr/Qtr: SWNE Section: 12 Township: 03.0S Range: 04.0W Meridian: U

COUNTY:
DUCHESNE

STATE:
UTAH

11.
CHECK APPROPRIATE BOXES TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA

TYPE OF SUBMISSION	TYPE OF ACTION		
✓ NOTICE OF INTENT Approximate date work will start: 11/1/2012	☐ ACIDIZE	☐ ALTER CASING	☐ CASING REPAIR
	✓ CHANGE TO PREVIOUS PLANS	☐ CHANGE TUBING	☐ CHANGE WELL NAME
☐ SUBSEQUENT REPORT Date of Work Completion:	☐ CHANGE WELL STATUS	☐ COMMINGLE PRODUCING FORMATIONS	☐ CONVERT WELL TYPE
	☐ DEEPEN	☐ FRACTURE TREAT	☐ NEW CONSTRUCTION
	☐ OPERATOR CHANGE	☐ PLUG AND ABANDON	☐ PLUG BACK
☐ SPUD REPORT Date of Spud:	☐ PRODUCTION START OR RESUME	☐ RECLAMATION OF WELL SITE	☐ RECOMPLETE DIFFERENT FORMATION
	☐ REPERFORATE CURRENT FORMATION	☐ SIDETRACK TO REPAIR WELL	☐ TEMPORARY ABANDON
	☐ TUBING REPAIR	☐ VENT OR FLARE	☐ WATER DISPOSAL
☐ DRILLING REPORT Report Date:	☐ WATER SHUTOFF	☐ SI TA STATUS EXTENSION	☐ APD EXTENSION
	☐ WILDCAT WELL DETERMINATION	☐ OTHER	OTHER:

12. DESCRIBE PROPOSED OR COMPLETED OPERATIONS. Clearly show all pertinent details including dates, depths, volumes, etc.

Newfield requests permission to utilize Oil Based Mud (OBM) on the Ute Tribal 7-12-3-4W in the production (6-1/8") interval only (Estimated spud date is 11-12-2012). The 9-5/8" surface has been set to 1,000'. If granted approval, the reserve pit would be formally closed prior to moving the rig on location. A lined cuttings pit will be constructed allowing the use of a closed loop system from the surface casing shoe to TD. The water based cuttings from the intermediate section will be dried from the closed loop system and stored in the lined cuttings pit. The oil based cuttings from the 2,155' production interval will be stored in steel pits. Based on landowner and regulatory approval OBM waste will be remediated onsite or will be sent to an approved hydrocarbon waste facility. An updated drilling plan, wellbore schematic, and additional OBM information is also attached.

Approved by the Utah Division of Oil, Gas and Mining

Date: November 01, 2012

By:

NAME (PLEASE PRINT)	PHONE NUMBER	TITLE
Don Hamilton	435 719-2018	Permitting Agent
SIGNATURE		**DATE**
N/A		10/17/2012

RECEIVED: Oct. 17, 2012

NEWFIELD

October 18, 2012

Brad Hill
Oil and Gas Permitting Manager
Department of Natural Resources
Division of Oil, Gas and Mining
1594 West North Temple, Suite 1210
Salt Lake City, Utah 84116

RE: Newfield Drilling Mud Plant
Duchesne, County Utah

Dear Mr. Hill,

Newfield Production Company is submitting this proposal seeking authorization to begin an oil based mud (OBM) drilling fluid program in our drilling operations. Newfield is submitting the enclosed documentation of the planned process for wells with VersaDril Oil Based Mud in the Uinta Basin.

In summary Newfield proposes:

- Drill the $8^{3/4}$ hole with KCL water past fresh water aquifers
- Oil-Based Mud is planned to begin use after 7inch casing is set and near 8000 feet.
- In place of pits, the OBM system will utilize tanks
- During OBM drilling section, Newfield will utilize solid control equipment designed to dry cuttings.
- All OBM cuttings will be stored in a steel bin protecting surface ground
- Based on landowner and regulatory approval OBM waste will be remediated onsite or will be sent to an approved hydrocarbon waste facility

Enclosed is a detailed process plan for this program and supporting documentation for the proposed project. If you have any questions or require additional information, please contact me at (303) 893-0102 or at reales@newfield.com.

Sincerely,

Robert Eales
HSE Analyst

ec: Colby Wilson, Sean Stevens, Kirby Carrol and Douglas Henderer

Oil Based Mud Proposal (OBM) Table of Contents

RECEIVED: Oct. 17, 2012

Newfield Exploration RM OBM Proposal

Newfield Exploration is submitting a request to be granted permission to drill with an Oil Based Mud (OBM) drilling fluid in the Ute Tribal 7-12-3-4W with rig Pioneer 68. Expected spud is 11/15/2012.

In preparation we are submitting a full packet with: mud information (all properties throughout well), location updates to prevent any contamination, rig changes to deal with an OBM fluid, rig additions to handle any OBM spill or build up, solids control equipment data (dewatering and cuttings drying), OBM and OBM waste (solids control discharge) storage, OBM waste remediation (haul off or treatment).

1. Surface Location:
    a. The entire location will be contained with an 18" high berm.
    b. The rig will have ditches in place to contain any spills or leaks that occur around the rig. The ditches will end in sumps to collect all contaminated fluids.
    c. All OBM storage will be bermed with a 54" tall berm and will be lined with a 16 mil liner.
2. Rig Modifications:
    a. Three 400 bbl upright tanks will be used on location to store OBM. These tanks will be tied together with a single manifold to mitigate the possibility of spills within the bermed area.
    b. The entire rig will be equipped with tools to contain OBM should any spilling occur during connections etc. Ex: BOP stack pans and hoses, mud bucket and hoses, drip pans underneath hose ends, racking board pan, super vac (to suck up any build up on location).
    c. Waste storage will all be in shale bins so that no OBM cuttings are ever placed on the ground.
    d. All rig hands that will be coming in contact with OBM and necessary chemicals will be equipped with proper clothing to handle the fluid and chemicals. Washers and dryers will be provided on each rig to allow the rig hands to wash their clothing after every hitch.
3. Solids control equipment and cuttings drying:
    a. During the OBM section of the hole we will we utilizing solids control equipment specially designed to dry OBM cuttings and remove as much diesel retention as possible.

RECEIVED: Oct. 17, 2012

The goal of this equipment is to produce a product that is easily transportable and dry to the point that further cuttings treatments are not required.

b. If a product requires further treatment prior to transporting, a fly ash or LKD chemical will be used to leach the diesel off the cuttings and make them easier to work with.

c. All OBM cuttings will be dumped directly into a steel bin so that we are not placing any OBM product directly on the ground.

4. OBM Waste disposal:

a. Fluid waste that contains hydrocarbons will have to be sent to a disposal site that can handle hydrocarbon products (Approved List Attached).

5. Cuttings Remediation/Disposal

a. With permission we will use Scott's Environmental to solidify all cuttings with a patented process called Duro and Firmus (Action list and Patent Attached). We will be treating all cuttings on location so that there is no possible contamination elsewhere.

b. Scott's is in process of obtaining work contract with State of Utah and UTERO. BLM has approved the Duro and Firmus process.

c. If we are not able to obtain permits in time to treat, we will have to haul cuttings to approved disposal site. (Approved List Attached)

RECEIVED: Oct. 17, 2012

Newfield Production Company
Ute Tribal 7-12-3-4W
SW/NE Section 12, T3S, R4W
Duchesne County, UT

Drilling Program

1. Formation Tops

Uinta	surface
Green River	4,120'
Garden Gulch member	7,060'
Wasatch	9,605'
TD	11,100'

2. Depth to Oil, Gas, Water, or Minerals

Base of moderately saline	1,506'		(water)
Green River	7,060'	- 9,605'	(oil)
Wasatch	9,605'	- TD	(oil)

3. Pressure Control

Section	BOP Description
Surface	12-1/4" diverter
Interm/Prod	The BOP and related equipment shall meet the minimum requirements of Onshore Oil and Gas Order No. 2 for equipment and testing requirements, procedures, etc for a 5M system. A 5M BOP system will consist of 2 ram preventers (double or two singles) and an annular preventer (see attached diagram). A choke manifold rated to at least 5,000 psi will be used.

4. Casing

Description	Interval		Weight (ppf)	Grade	Coup	Pore Press @ Shoe	MW @ Shoe	Frac Grad @ Shoe	Safety Factors		
	Top	Bottom							Burst	Collapse	Tension
Conductor	0'	60'	37	H-40	Weld	--	--	--	--	--	--
14									--	--	--
Surface	0'	1,000'	36	J-55	STC	8.33	8.33	12	3,520	2,020	394,000
9 5/8									6.27	6.35	10.94
Intermediate	0'	8,945'	26	P-110	LTC	9	9.5	15	9,960	6,210	693,000
7									2.36	1.76	2.98
Production	8,745'	11,100'	11.6	P-110	LTC	11	11.5	--	10,690	7,560	279,000
4 1/2									2.04	1.37	2.17

Assumptions:

RECEIVED: Oct. 17, 2012

Surface casing MASP = (frac gradient + 1.0 ppg) - (gas gradient)
Intermediate casing MASP = (reservoir pressure) - (gas gradient)
Production casing MASP = (reservoir pressure) - (gas gradient)
All collapse calculations assume fully evacuated casing with a gas gradient
All tension calculations assume air weight of casing
Gas gradient = 0.1 psi/ft

All casing shall be new.
All casing strings shall have a minimum of 1 centralizer on each of the bottom 3 joints.

5. Cement

Job	Hole Size	Fill	Slurry Description	ft^3 / sacks	OH excess	Weight (ppg)	Yield (ft^3/sk)
Conductor	17 1/2	60'	Class G w/ 2% KCl + 0.25 lbs/sk Cello Flake	41 / 35	15%	15.8	1.17
Surface Lead	12 1/4	500'	Premium Lite II w/ 3% KCl + 10% bentonite	180 / 51	15%	11.0	3.53
Surface Tail	12 1/4	500'	Class G w/ 2% KCl + 0.25 lbs/sk Cello Flake	180 / 154	15%	15.8	1.17
Intermediate Lead	8 3/4	6,060'	Premium Lite II w/ 3% KCl + 10% bentonite	1048 / 297	15%	11.0	3.53
Intermediate Tail	8 3/4	1,885'	50/50 Poz/Class G w/ 3% KCl + 2% bentonite	326 / 263	15%	14.3	1.24
Production Tail	6 1/8	2,355'	50/50 Poz/Class G w/ 3% KCl + 2% bentonite	255 / 206	15%	14.3	1.24

The surface casing will be cemented to surface. In the event that cement does not reach surface during the primary cement job, a remedial job will be performed.

Actual cement volumes for the intermediate and production casing strings will be calculated from an open hole caliper log, plus 15% excess.

6. Type and Characteristics of Proposed Circulating Medium

Interval	Description
Surface - 1,000'	An air and/or fresh water system will be utilized. If an air rig is used, the blooie line discharge may be less than 100' from the wellbore in order to minimize location size. The blooie line is not equipped with an automatic igniter. The air compressor may be located less than 100' from the well bore due to the low possibility of combustion with the air/dust mixture. Water will be on location to be used as kill fluid, if necessary.
1,000' - TD	A water based mud system will be utilized. Hole stability may be improved with additions of KCl or a similar inhibitive substance. In order to control formation pressure the system will be weighted with additions of bentonite, and if conditions warrant, with barite.

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Anticipated maximum mud weight is 11.5 ppg.

8,040' - 10,200' (TD) A diesel based OBM system will used in the 6 1/8" hole below the 7" shoe. We will attempt to retain an oil to water ratio between 75/25 and 80/20. We will be using MI-SWACO's Versa-System that uses two different materials for emulsifier and wetting agent. We will also maintain a salinty in the range of 25% using CaCl (Calcium Chloride). All cuttings will be dried and centrifuged so that they can be easily transfered to steel bins with very little free fluid on them. For disposal of the waste and cuttings, we will either haul to approved disposal facility or treat with apporved process on location.

7. Logging, Coring, and Testing

Logging: A dual induction, gamma ray, and caliper log will be run from TD to the base of the surface casing. A compensated neutron/formation density log will be run from TD to the top of the Garden Gulch formation. A cement bond log will be run from PBTD to the cement top behind the production casing.

Cores: As deemed necessary.

DST: There are no DST's planned for this well.

8. Anticipated Abnormal Pressure or Temperature

Maximum anticipated bottomhole pressure will be approximately equal to total depth (feet) multiplied by a 0.57 psi/ft gradient.

11,100' x 0.57 psi/ft = 6349 psi

No abnormal temperature is expected. No H_2S is expected.

9. Other Aspects

This is planned as a vertical well.

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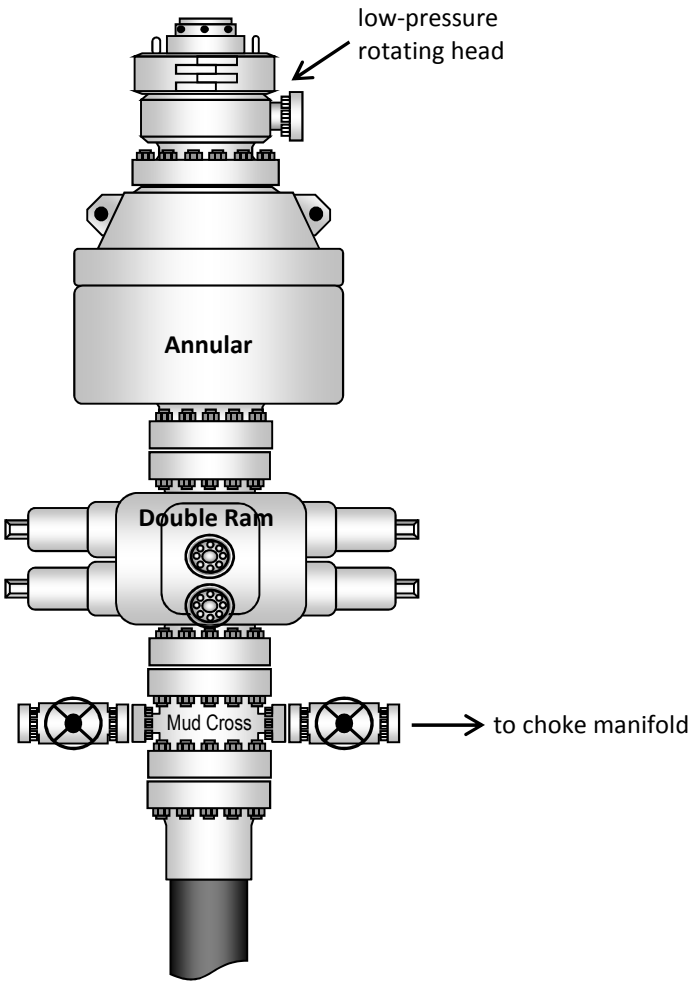
Typical 5M BOP stack configuration



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NEWFIELD
ROCKY MOUNTAINS

Well: Ute Tribal 7-12-3-4W
Field: Central Basin
Legal: SW/NE Section 12, T3S, R4W, Duchesne County, UT

Engineer: Sean Stevens
Rig: Pioneer #69
Elevation: 5,588'

Logging	Formation	Depth TVD	Depth MD	Wellbore Diagram	Hole Size	Casing Specs	Cement Temp	Mud	Directional
	Uinta	surface			12-1/4"	9-5/8", 36# J-55, LTC	Cement to surface	Air/Water	Vertical
None	Surface	1,000'	1,000'						
	Green River	4,120'	4,120'				Lead cement to surface	KCl water	Vertical
	Garden Gulch	7,060'	7,060'		8-3/4"	7", 26# P-110, LTC	Tail cement to 7,060'	KCl water based mud	
	Liner top	8,645'	8,645'						Vertical
Quad Combo	7" casing point	8,945'	8,945'				175º F	9.5 ppg	
	Black Shale	8,995'	8,995'						
	Wasatch	9,605'	9,605'						
	Wasatch 10	9,770'	9,770'		6-1/8"	4-1/2", 11.6# P-110, LTC	Fully cemented with "tail" blend	Diesel Based OBM	Vertical
Quad Combo									
	TD	11,100'	11,100'				225º F	12.5 ppg	

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Newfield

VERSADRIL - OBM Program

Ute Tribal 7-12-3-4W

Duchesne County, Utah

Sec. 12 – T3S – R4W

Customer- Focused, Solutions-Driven

VersaDril
Fluids Program

10/10/2012

RECEIVED: Oct. 17, 2012

October 10, 2012

Newfield
1001 17th Street, Suite 700
Denver, Colorado 80202

Attn: Mr. Colby Wilson

Dear Sir,

Please find enclosed the requested Drilling Fluids recommendations for drilling of the Ute Tribal 7-12-3-4W well with VersaDril Oil Based Mud in the Uinta Basin.

M-I SWACO has structured recommendations from nearby reference wells and the information you provided us.

M-I SWACO recommends drilling the 12 1/4" surface section with Fresh Water and Gel Sweeps due to the potential for severe loss circulation in the area.

Drill the 8 3/4" hole with KCL water and when needed mud up (usually prior to entering Garden Gulch formation) to a Low-Solids Dispersed system (LSD) maintaining 3-4% KCL by weight which will further enhance the inhibitive nature of the mud and prevent swelling of formation clays. The offset wells indicate a maximum mud weight of 10.5 ppg for this interval but the MW should be adjusted as the hole conditions dictate.

The fluid proposed in this program for the 6 1/8" lateral section of hole will be M-I SWACO's VersaDril Oil Based Mud. Maximum anticipated MW for this interval is 12.5 ppg. Prior to filling the rig pits with the VersaDril system the pits must be cleaned and prepared to accept the VersaDril system; the hole will then be displaced as described in this document. This fluid will be maintained through the drilling of the production interval. Drilling with oil based mud can pose several challenges not faced before while drilling with water based drilling fluids; below are a few recommended practices.

- Water Contamination
  - Remove all sources of water going to the rig pits
  - Be prepared to combat water flows if present in the area
- Losses & Lost Oil Based Mud
  - Be prepared to combat lost circulation issues expediently.
  - Have diesel and brine on location for daily additions
  - Expect 1.5 to as high as 2 bbl of fluid to be lost on cuttings for every barrel of hole drilled
- Solids Control and Surface Equipment
  - Additional equipment will be required to maintain a safe, clean, and efficient working environment.
    - Drying Shaker,
    - Mud Vac,
    - Drip Pans,
    - Mud Bucket, etc.

Oil base muds pose various challenges that must be addressed; the above stated list is a small part of the equation. Full discussions are included in this proposal.

M-I SWACO will service this project from our Myton, UT facility with all liquid oil based muds being serviced from our Big Piney, WY facility.

We look forward to servicing this well for you. Should you require further information or have any questions about this proposal, please feel free to contact me at any time.

Respectfully,

Alex Stoica
Project Engineer
M-I SWACO
Denver, Colorado

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KEY ISSUES:

QHSE:

- HSE & Safety is paramount on this and all projects M-I SWACO is involved in. M-I SWACO will not conduct any operation where safety is not the Key Issue. M-I SWACO values its empolyees as well as it's customers and will always strive to maintain a safe healthy work environment.
- M-I SWACO personnel have the right to stop and job or task that presents an unsafe or hazardous working environment.
- M-I SWACO personnel will at all times wear the approperate PPE for any task being performed as well as encourage the use of proper PPE to all personnel involved in the task.

WATER CONTAMINATION:

- Water contamination is of great concern to an oil based fluids system. All water sources to the mud pits need to be removed to prevent accidental contamination of the drilling fluid.
- Never add water of any kind to the system without first getting approval from the drilling fluids specialist on location. There will be times it will be ok to add some water to the system.
- Water flows can devastate an oil based mud system. If water flow is known in the area we will be prepared to weight up the system as necessary to kill the water flow completely.
- If water contamination occurs we will be treating the system with ActiMul and Lime to try and maintain emulsion.

LOSSES & LOST OIL BASED MUD

- Mud losses are the most costly event that could happen to the VersaDril system. Enclosed is a mud weight schedule to help guide us in the right direction to prevent mud losses and or any down time circulating out gas kicks.
- When raising the fluid density, always be cautious and only raise it 2 tenths per circulation. Getting too aggressive in increasing the fluids density could induce losses.
- The addition of a Drying Shaker, Mud Vac, and Mud Bucket will be of great importance in helping to reduce mud losses on surface. It is highly recommended to implement these products on the rig as well as drip pans and a Catch Can on the rotating head.

SOLIDS CONTROL:

- In running a closed loop system on this project, solids can become an issue. The VERSADRIL system is solids tolerant, but all systems have their limitations. A comprehensive solids removal program must be in place to prevent excessive solids loading and undesirable fluids properties.
- Expect to dilute, because you will lose volume on cuttings even with a drying shaker. Dilution rate will vary between 1.5 to as high as 2.0 bbls for every foot of new hole drilled.
- Shaker management will be a priority. Run and maintain the finest screens possible.

ESTIMATED DRILLING FLUIDS COST						
INTERVAL DEPTHS	FLUIDS SYSTEM	INTERVAL DAYS	PRODUCT COST ($)	ENGINEERING COST ($)	ENGINEERING SERVICE TYPE	CUMULATIVE COST ($)
0' to 1,000' **Surface Hole**	FW & Gel Sweeps	2	$1200.00	$700.00	Drive By Service	$1,900.00
1,000' to 8,945' **Intermediate Hole**	3% KCL/PHPA	4	$26,400.00	$1,400.00	Drive By Service	$27,800.00
8,945' to 11,100' **Production Hole**	VersaDril	4	$8,800.00	$1,400.00	Drive By Service	$10,200.00
TOTALS		10	$36,400.00	$3,500.00		$39,900.00

- Cost estimate is based entirely on calculations and past experience with similar fluids & projects. The enclosed cost projections are calculated utilizing Newfield's current discounted contract pricing & M-I SWACO's January 2012 price list.
- This estimate is also based upon the enclosed described fluids systems, as outlined in this fluids recommendation. The estimate does not include materials for abnormal pressure, excessive lost circulation or any other unforeseen event outside normal drilling operations.

WELL DETAILS				
MD OF INTERVAL	HOLE SIZE	CASING SIZE	RECOMMENDED FLUID	EXPECTED DENSITY
1,000'	12-1/4"	9-5/8" / 36# J-55	FW & Sweeps	8.5 – 9.0 ppg
8,945'	8-3/4"	7" / 26# P-110	3% KCL/PHPA	9.0 – 10.5 ppg
11,100'	6-1/8"	4-1/2" / 11.6# P-110	VersaDril	10.5 – 12.5 ppg

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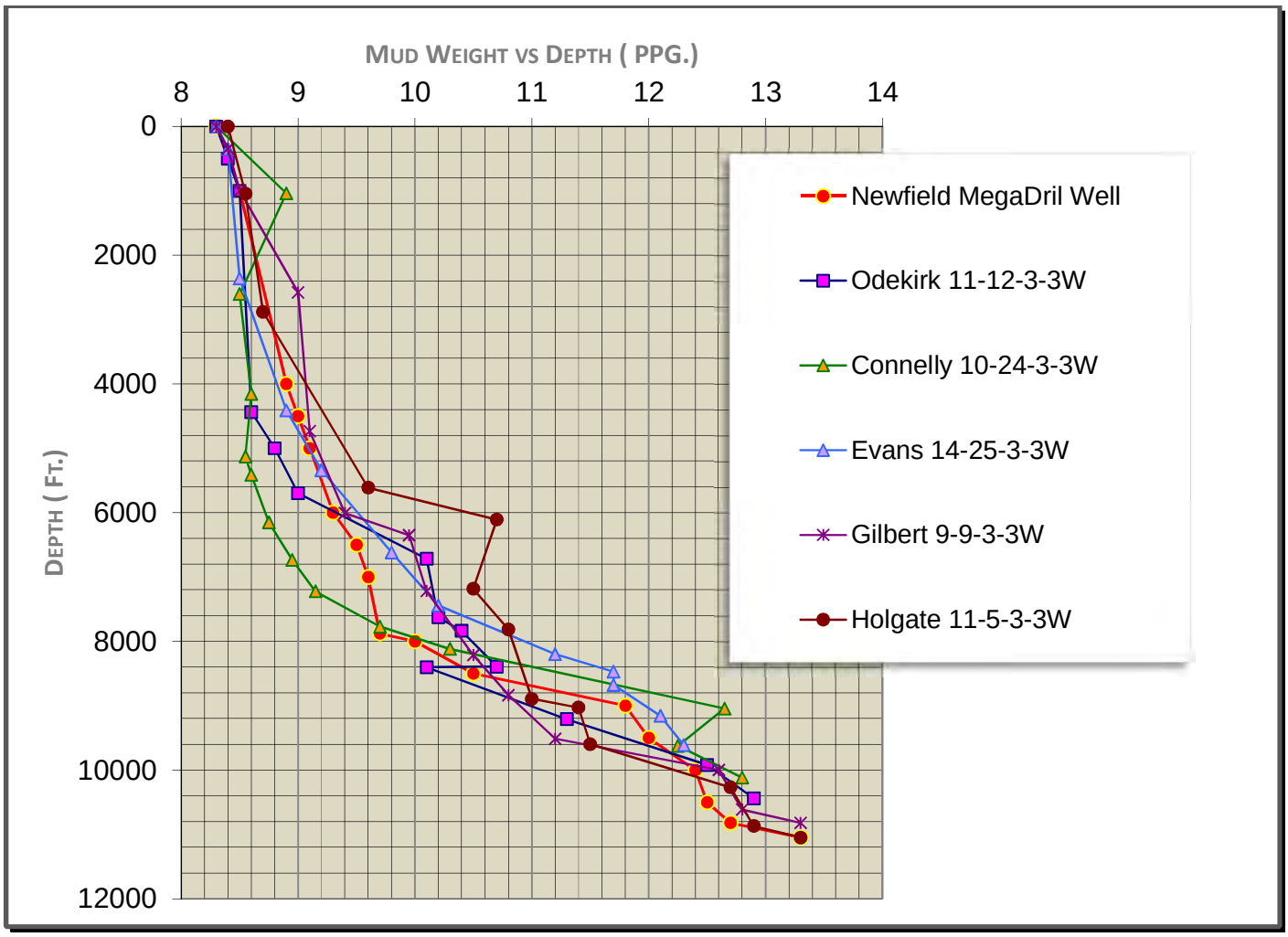

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12-1/4" Surface Hole | Fresh Water & Gel Sweeps |9-5/8" Casing									
0' – 1,000' MD									
Recommended Fluid Properties if Spud Mud is required									
Fluid Density	Plastic Visc	Yield Point	Gels 10s/10min	Total Hardness ppm	pH	API Fluid Loss cc	MBT ppb	Funnel Viscosity Sec/qt	LG Solids %
8.4 – 8.8	5 - 20	5 - 12	2 - 8	20 - 80	9 - 10	8 - 15	5 - 25	32 - 37	0 - 5
Key Products	MaxGel, Lime, Soda Ash, PolyPac R/UL, Caustic Potash (use caustic barrel), Walnut Plug, Tiger Bullets, G-Seal Plus, Sawdust								
Potential Problems	Possible Lost Circulation, Solids Control / Solids Handling, Hole Cleaning								

Interval Discussion:

- Spud the well with fresh water and M-I Gel Sweeps (20-30 bbl sweep, 50+ sec/qt visc and 1/2 can Poly Plus) every 200'-300' or as needed to keep the hole clean
- Alternate 1-2 visc cups of Drilzone or PolyPlus on connections to prevent bit/BHA balling
- At surface TD pump a couple of high-viscosity sweeps and circulate bottoms-up prior to tripping out for casing
- Mud up to a MaxGel spud mud and use LCM additions (Sawdust, Cedar Fiber, Mica, Safe Carb, etc) if losses are encountered, or hole conditions dictate
- If we come across major losses that cannot be stopped with LCM additions; drill surface with Air Mist and add Poly-Plus to the system to help with inhibition of formation clays.
- M-I SWACO recommends the use of Platinum Foam, a foaming agent specifically designed to be used in air-drilling operations. It can be used for dust suppression, mist-foam and stiff-foam drilling. In conjunction with Poly-Plus, Platinum Foam can greatly improve hole cleaning. Refer to Product Bulletin at the end of the program for more information:
- Water @ 2 bbl/min thru mud pumps for down hole tools
    - Water @ 1 bbl/min thru mist unit
    - Air @ 2500 scfm
    - PHPA @ 5 gph in make up water or .25 lb/bbl
    - Soap @ 6 gph
    - PHPA @ 1qt down drill string each connection
    - Soften make up water below 120 mg/l Total Hardness
    - Once casing is set, begin building 3-4% KCL/Polymer system in the rig pits in preparation for drilling the 8-3/4" section.

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8-3/4" Intermediate Hole | 3% KCL & PHPA | 7" Casing									
1,000' – 8,945' MD									
Recommended Fluid Properties									
Fluid Density	Yield Point	PV	Gels 10s/10m	Hardness ppm	$CaCl_2$ (%wt)	API Fluidloss cc	pH	Funnel Viscosity Sec/qt	LG Solids %
8.8 - 10.5	8 - 15	10 - 27	5 - 25	80 - 200	20 - 30	6.0 - 12.0	9 - 10	35 - 50	1 - 5
Key Products	KCL, DuroGel, Duovis, PolyPac R/UL, Caustic Potash (use caustic barrel), Tannathin (Lignite), Asphasol, Lime, SafeCarb (20, 40, 250), Myacide, PolyPlus, Barite								
Potential Problems	Hole Cleaning, Well Control, Possible Lost Circulation, Solids Control / Solids Handling, Torq/Drag, Sloughing Shale, Pick up/Slack Off								

Intermediate Hole Formations		
Formation	Depth	Comments
Green River	4,120'	Possible losses and sloughing shale
Trona	6,225'	Soda Ash/Bicarb contamination, stuck pipe; usually drilled w/KCL water
Mahogany Bench	6,275'	Sloughing shale
Garden Gulch	7,060'	Possible high pressure, sloughing shale
Garden Gulch 1	-	Possible high pressure, sloughing shale
Garden Gulch 2	-	Possible high pressure, sloughing shale
Douglas Creek	-	Hole stability

Interval Discussion:

- Start drilling out the 9-5/8" casing with 3-5% KCL water while circulating the reserve pit or mix KCL into the system at 15-18 lb/ bbl for a starting concentration of 3-5%; then mix as needed to maintain the concentration.
- Start the mud-up process at 6,275 ft (Mahogany Bench Formation) and complete the mud up prior to entering Garden Gulch Formation (by 7,060 ft) with a mud weight of 9.1-9.3 ppg or as needed to contain the wellbore pressure.
- Upon drilling out the 9-5/8" casing treat the system for cement contamination w/ Sodium Bicarbonate
- Duo-Vis should be mixed at 2 ppb to maintain viscosity between 35-50. If M-I Gel or Max Gel is used, it will have to be pre-hydrated because of the inhibitive nature of potassium chloride.
- Polypac UL/R should be mixed at 0.5-2.0 lb/ bbl or as needed to reduce the API FL to 6-8 cc's; if available also use Unitrol in a 1:1 ratio.
- Lignite (Tannathin or CF Desco) 0.25-0.5 ppb improves FL control, build a thin-flexible filter cake along the wellbore walls increasing hole stability. Use Caustic Potash to compensate pH.
- Caustic Potash (KOH) should be mixed at 0.5-1.0 lb/ bbl to maintain a 9.0-10.0 pH and aid as an additional potassium source as inhibitor.
- Mix Asphasol Supreme at 4 ppb to prevent shale sloughing and increase to 8 ppb if sloughing occurs. Asphasol Supreme will strengthen the wellbore and increase hole stability.

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- Lost circulation can exist in this area. Keep a good supply of fibrous and granular lost circulation materials (Mica, G-Seal Plus, MIX II, SafeCarb, Sawdust, etc) on location for any mud losses. (See attached Lost Circulation Pages).
- The KCL system performs best when an encapsulating polymers such PolyPlus (PHPA) is used to minimize the interaction of cuttings and exposed shale with water. Polyplus (PHPA) should be mixed 0.25—0.50 ppb for encapsulation. This method of inhibition will ensure that the reactive clays swelling will be minimized. Do not use PHPA as viscosifier for barite suspension or if the Calcium level (Ca+) is over 300 mg/L.
- The condition of the cuttings should be monitored on a regular basis and if the cuttings appear to be soft and mushy then the KCL concentration should be increased immediately to 7- 8% and maintained.

Note:

- Drilling in the Uinta Basin we expect water flow, losses or lost circulation, gas kicks, reactive clays (sloughing shale). Therefore, it's recommended at the Mud Up to start additions of LCM (about 10% and up) to prevent losses and also to get us ready for MW increase. Consult with Co. Man on location
- Suggest and remind rig personnel (driller) proper drilling procedures (tripping speeds) while tripping in or out of the hole to prevent surging/swabbing the wellbore that can expose to water flow, losses and/or gas kicks.
- For MW increase: mix barite and viscosifier(s) with proper addition of water to prevent dehydration and barite settling. Lignite (or Tannathin) can be used to disperse the mud and reduce viscosity (you want to add water at 2-4 gpm while weighting up); specify the YP (15-20) you are looking for. You rarely want to add thinner and viscosifier at the same time.
- We are not targeting hardness treatment while drilling below the surface casing since we can use Calcium as a second source of inhibition; however, if we are sidetracking the well and it is a high cement contamination level we can treat the system at that point. Therefore, treat Calcium (Ca+) as needed, usually below 300 mg/L, which is acceptable level for PHPA and SafeScav NA (corrosion inhibitor).

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6-1/8" Production Hole | VersaDril | 4-1/2" Liner									
8,945' – 11,100' MD									
Recommended Fluid Properties									
Fluid Density	Yield Point	ES Volts	OWR	Lime Content #/bbl	Pom #/bbl	HTHP Fluid Loss cc	Water in Filtrate cc	Funnel Viscosity Sec/qt	LG Solids %
10.5 - 12.5	8 - 15	400 - 700	80:20	2 - 4	2.5 - 4	6 - 12.0	0 - 0.5	40 - 80	1 - 5
Key Products	Versamul, versacoat, versatrol, versawet, VG Plus, HRP, Lime, CaCl2, Barite, Safe Carb, Vinseal, Walnut Plug, Tiger Bullets								
Potential Problems	Hole Cleaning, Well Control, Torq/Drag, Pick up/Slack off, Possible Lost Circulation, Solids Control / Solids Handling, Water Contamination								

Products Mixed Through Hopper		
Mix Order	Product	Concentration (ppb)
#1	Versamul - Emulsifier	4 - 10
#2	Versacoat - Primary wetting agent	1 - 3
#3	VersaTrol (If required for HTHP Filtrate Control)	2 - 3
#4	Versawet - Secondary wetting agent	1 - 4
#5	VG Plus – Primary Viscosifier (Organophilic clay)	2 - 6
#6	HRP – Secondary Viscosifier	If needed
#7	Lime – Source of Ca^{2+} and as an alkalinity buffer, fatty-acid activator	2 - 4
#8	Calcium Chloride Brine (As needed for salt percentage of % wt)	20 - 30 % wt
#9	M-I Wate – Weighting material	As needed for MW
Products Mixed Through Chemical Barrel		
Mix Order	Product	Concentration
#1		
#2		

PRODUCTION HOLE FORMATIONS		
FORMATION	DEPTH	COMMENTS
Black Shale	8,995'	Possible high pressure
Castle Peak Limestone	-	
CP Lime	-	
Basal Limestone	-	
Wasatch	9,605'	High pressure, hole stability
Wasatch 10	9,770'	
Wasatch 30	-	
Wasatch Red Beds	-	
Total Depth	11,100'	

Interval Discussion:

- Prepare to drill out of 7" casing with the VERSADRIL system arrived on location and transferred to the steel pits.

Recommended Additional Equipment Required for VERSADRIL:

- Sufficient storage tanks to hold all OBM needed.
  - 400 bbl tank for diesel
  - Valve manifold system, hoses, and transfer pumps for VersaDril and diesel.
  - Pit liner and berm around tank farm
  - Three sided cuttings catch tank and optional second cuttings tank for mixing cuttings with fly ash or other drying material (closed loop system)
  - Fly ash or other drying/ absorbency material to mix with cuttings (closed loop system)
  - Lined earthen pit for putting dried cuttings in or an option in place for removing the cuttings to an offsite disposal area.
  - Oil absorbent pads and oil dry material (floor dry)
  - Mud vacuum (strategically placed on rig to reach floor, pump houses, cellar, etc..) for cleanup of OBM.
  - Mud bucket, preferably with a hose attached to it to divert OBM to the cellar or back to the pits. That type of mud bucket tends to be heavier and harder to handle, so the other option is a smaller plastic mud bucket.
  - Some people's skin is more sensitive than others and it is recommended that appropriate rubber gloves be made available to floor hands for connections. Nitrile rubber gloves should be made available to the derrick hands for checking mud. Barrier creams should be made available for all personnel if needed.
  - Super Vac trucks for cleaning pits at TD.

Pits, Transfers & Displacements:

- As the VERSADRIL system is arriving on location and being transferred to the upright storage tanks, the rig pits should be prepared to accept the VERSADRIL system.
- Ensure that the pits are clean and "free of any excess water". Once the pits are ready, start filling them with the VERSADRIL system & prepare to displace.
- While transferring VERSADRIL from storage tanks to the rig pits the mud engineer and derrick hand should be present to make sure no leaks/spills are occurring and that valve alignment is set up properly.
- In addition, while volume is being transferred it is important to have adequate personnel in place to spot leaks, monitor volumes, etc. All valves, hose connections, etc, should be checked by at least two different people prior to starting any transfers.
- A transfer line should be rigged up from the flowline to either the reserve pit or a catch tank for catching returns while displacing.

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- Begin displacement with the **bit on bottom** (Displacement Point) circulate with the existing fluid at least long enough to adequately clean the hole of cuttings.
- To begin drilling, run in the hole to the casing shoe and then displace the casing to VERSADRIL. Returns of the water or other fluid in the casing should be taken to the reserve pit or catch tanks until VersaDril is back to surface; at which time returns should be taken over the shakers
- Shaker screens should be properly selected based depending on the temperature of the VERSADRIL fluid system to prevent losses over the shakers.

Displacement Procedure to Versadril (after 7" is set & cemented):

- A pre-displacement meeting should be held with the company man, tool pusher, driller, derrick hand, and mud engineer prior to the displacement.
- Mud pits on the rig should be filled to near capacity prior to tripping in the hole to drill.
- Once everything is in place for the displacement, run drill pipe in the hole and begin filling the pipe.
- Once it is established that the hole has been displaced to VersaDril, returns of the fluid should be taken over the shakers to the reserve pit or catch tank.
- During displacement pump as fast as possible and DO NOT STOP PUMPING, until the VersaDril System is back to surface.
- Pumps should be run at maximum capacity while displacing to VERSADRIL-OBM at least until the OBM turns the corner at the bit. Only then should the pump rates be reduced if necessary. High pump rates are recommended to ensure a turbulent flow (higher efficiency displacement).
- Rotation and reciprocation of the pipe during displacement procedure is recommended.
- Mud engineer and derrick hand should be on pits at the flowline to monitor returns. Once the calculated time for returns of VersaDril draws near, the mud engineer should be checking the fluid at the flowline visually and with an electrical stability meter to determine when acceptable mud with an ES value > 200 volts is back to the surface.
- Field experience shows the tendency is for the OBM to channel and expect returns a little early. However, do not stop pumping once the displacement has started.
- When the interface returns to surface quarantine it in the in the trip tank or some sort of isolated tank to later mix it back into the active system if the level of contamination permits. Monitor returns at the shakers.
- Signs of interface:
    - Mud weight measurements if the weight of the two fluids differs
    - Electrical stability measurements
    - Change in viscosity and the look of the mud
    - Change in color or surface appearance from grainy to glossy or shiny

Volume Accounting:

- Once drilling resumes with the VERSADRIL system. Maintain volume accounting as done in the previous interval. All volume received or leaving location will be recorded daily in the One-Trax reporting system. All daily additions of diesel, water, brine, crude, etc, will be monitored and recorded daily. All losses to oil on cuttings, formation, etc, will be calculated and recorded daily.
- Many rig hands have not worked around oil based mud and do not understand the value of the mud. M-I SWACO asks that rig site management help the mud engineer stress the importance of minimizing losses of mud on the surface due to spills, etc. and through teaching good drilling practices to limit down hole losses as well.
- Some losses are to be expected from day to day, primarily due to oil on cuttings coming off the shakers. Anticipate 1.0-1.5 bbls of oil per barrel of hole drilled on average to be lost on cuttings, but losses could be even higher as ROP increases. Losses varying from 1.5 to 2.0 bbls/hr can be expected from most centrifuges when being used.
- Losses on the surface can be minimized by using a drip pan under the floor, having a mud bucket with a hose ran to the cellar or pits for wet connections, using pipe wipers, Kelly mud saver sub, and a mud vacuum.

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Chemicals & Usage:

- **VERSAMUL** should be added to the system as initial treatment at 4.0-10.0 ppb and maintained at 4.0-6.0 ppb while drilling. VERSAMUL emulsifier is activated by CALCIUM and it performs better at higher level (over 3.0 ppb) of Excess Lime. This will ensure a strong emulsion and low HTHP fluid loss as well as providing adequate wetting of any barite added to the system. The ES should run > 400 volts and there should be no more than 0.5cc of free water in the HTHP Filtrate. If this is the case additions of VERSAMUL are required. Daily treatments are usually 0.5-2.0 ppb.
- **VERSACOAT** is an organic surfactant which serves as wetting agent and secondary emulsifier when used in combination with VERSAMUL in Versadril-OBM system. VERSACOAT is used to oil-wet barite and drill solids to prevent water-wet solids. It enhances the fluid's resistance to contaminants. Concentrations for initial formulation range from 1.0 to 3.0 ppb and maintained around 2.0 ppb.
- **VERSAWET** is an organic powerful surfactant, an excellent wetting agent used when the LIME content drops or is lowered unexpectedly. VERSAWET is very effective at oil-wetting barite and drill solids and at reducing the adverse effects of water contamination. The initial formulations range from 1.0-4.0 ppb with occasionally daily treatments of 0.05 ppb.
- **LIME** initial additions should be made in a concentration of 4.0-5.0 ppb to provide an excess lime content of 2.5-4. The lime content should be constantly maintained to provide a sufficient "calcium soap" in the mud system.
  EXCESS LIME (PPB) = 1.3 X POM
- **VG-PLUS** organophilic clay should be added at a concentration of 0.5-1.0 ppb to provide the desired viscosity and yield point for good carrying capacity. Additions will also improve the HTHP FL and promote a thin, tight filter cake. Please keep in mind that VG-PLUS operates off of shear, so the effects of the product addition will not be seen for as many as 2-3 full circulations. Never mix more than 10 sx of VG-PLUS in one treatment.
- **VERSATROL M** at 0.75 ppb can be mixed if necessary to further reduce and maintain the HTHP Fluid Loss below 10 cc's/30min (500 psi differential pressure and 250 F). The VERSADRIL system runs an inherently low HTPH with little additions of VERSATROL.
- **DIESEL:** daily additions of diesel and water should be made based on ROP and tested oil water ratio "OWR". These daily additions will help replace volume being lost to oil on cuttings over the shakers, evaporation, and also maintain the desired oil to water ratio. When these additions are calculated properly and excessive losses are not experienced, the well should be TD with approximately the same volume of fluid as started with.
- **CALCIUM CHLORIDE (SACK):** additions should be made on daily basis to maintain 20-25% $CaCl_2$ by wt or as guidance 40,000-80,000 ppm Chlorides content.
- **M-I WATE:** additions of M-I WATE (barite) should be made as needed to maintain the system at the desired mud weight. Any time barite is added to the system, it is recommended that diesel be run at 1 gpm during the additions. To help prevent losses never raise the mud weight faster than 2 tenths per circulation.

Hole Cleaning:

- If hole cleaning appears to be a problem, first try improving all mechanical means such as pump rates and rotary speed. Once those limits are reached, sweeps can be run in addition to raising the yield point with VG PLUS and low end rheologies.
- Sweeps can be made in the pill tank with OBM from the active pits and additions of HRP. Mix HRP in the Pill tank to a concentration 2-4ppb.
- Super Sweep can also be used in the same manner as the HRP discussed above. Mix the Super Sweep at a concentration of 6-10 viscups per 60bbls of Mud.

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Water Contamination:

- Water is a major contaminate of the VERSADRIL system when added in large enough quantities. Water hoses, etc, should be taken off the rig pits while drilling with OBM to minimize the chance of accidental additions.

Shaker Screens:

- It is highly recommended that shaker screens be pressure washed on every connection during fast drilling (100+ ft/hr) and every other connection when ROP slows. This will prevent screens from plugging off and causing mud to run off the ends. It will also extend the life of the screen and ensure someone is visually looking at the screens on a regular schedule. A diesel pressure washer is most effective, but a water pressure washer is suitable as well.
- Just after displacement if the drilling fluid is cold, it is recommended to run large mesh screens to prevent blinding and excess fluid run off the end of the shaker. Once the fluid temperature has increased to operating temperature the screen size can be reduced to the smallest size possible "250-300 mesh". If the screens used initially are not damaged they can be cleaned and stored for re-use on the next well.
- Solids should be controlled through use of the shale shakers, centrifuge, and dilution. At no time should the shale shakers be by-passed until extreme lost circulation is occurring and a high concentration of LCM is trying to be maintained. Shaker screens with holes or tattered surfaces should be changed immediately.

SOLIDS CONTROL:

- Need proper shaker screens and centrifuge practice to maintain our Low Gravity Solids at or below 5%.
- Maintain shaker screens and screen as tight as possible to prevent excessive low gravity solids. Your shakers are your first line of defense in solids control, properly maintained screens and well as proper screen sizing greatly reduces the burden on the rest of the system.

RIG CLEAN UP:

- **CLEAN-UP** the product can be used to clean the rig as well as its equipment at a concentration of 1-3% mixed in a given volume of water. This can also be used to flush lines at the end of the project as required to rig down and move the rig.
- **PPE** Be sure to use all appropriate PPE while dealing with CLEAN-UP. Face shield and chemical gloves in addition to minimum required PPE as listed on MSDS.

Displacement Procedure when $4^{1/2}$" liner on bottom:

- Run in hole with liner and prepare a displacement fluid on surface "diesel, water, WBM". Prepare enough to displace the volume of the liner.
- A pre-displacement meeting should be held with the company man, tool pusher, driller, derrick hand, and mud engineer prior to the displacement.
- Once the liner is set start, cementing. Once all of the cement is pumped switch to your displacement fluid and then finish bumping the plug with VERSADRIL OBM.
- With the plug bumped you should have all the cement in the annulas of the liner and the liner should be full of the chosen displacement fluid.
- Get off of the liner with the work string and wait to start displaceing the remainder of the hole "from the liner top up" to chosen displacement fluid, until the prescribed cement cure time.
- Prior to starting displacement make room in the active system to accept the entire hole volume from the liner top up. Once displace ment has started Pump has hard as you can with the rig pumps and do not stop pumping until the hole is fully displaced.
- Tally all mud volumes and prepare to transfer to next location.

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LCM TREATMENT RECOMMENDATIONS

HOURLY ADDITIONS – Seepage Losses (<10 bbls/hr)

1. Add up to (3) sacks of WALNUT PLUG MEDIUM, and/or (3) sacks of TIGER BULLETS, and/or (3) sacks of SAFE CARB 40 an hour over the suction tank in an effort to cure seepage.

-If 9 sacks/hour additions have not eliminated seepage completely, begin utilizing LCM sweeps.

LCM SWEEP BUILD – Partial Losses (10-50 bbls/hr)

1. Fill the pill tank with 80 bbls of the active system drilling fluid.
2. Check the viscosity. Add M-I GEL / VG-PLUS/ SALT GEL only as necessary to achieve a minimum viscosity of 40 secs/qt.

-Add the following products in the order listed below to achieve a 20 ppb LCM Sweep Concentration:

3. Add (8) sacks of SAFE CARB 40. (5 #/bbl)
4. Add (8) sacks of WALNUT PLUG MEDIUM. (5 #/bbl)
5. Add (4) sacks of G-SEAL PLUS. (5 #/bbl)
6. Add (8) sacks of TIGER BULLETS. (5 #/bbl)

-LCM sweeps should be sent in 15-20 bbl increments waiting a minimum of 10 - 15 minutes between each sweep.

-If LCM sweeps are not proving to be effectively reducing or eliminating formation losses after 6 attempts, Build and spot an LCM Pill at the top of the loss zone.

LCM PILL BUILD – Severe Losses (>50 bbl/hr)

1. Fill the pill tank with 80 bbl of FRESHWATER / VERSADRIL OBM / SALTWATER. (Dependent upon Interval)
2. Check the viscosity. Add M-I GEL / VG-PLUS / SALT GEL only as necessary to achieve a minimum viscosity of 40 seconds/qt.

-Add the following products in the order listed below to achieve a 25 ppb LCM Pill Concentration:

3. Add (10) sacks of CEDAR FIBER. (5 #/bbl)
4. Add (8) sacks of G-SEAL PLUS. (5 #/bbl)
5. Add (16) sacks of TIGER BULLETS. (5 #/bbl)
6. Add (16) sacks of WALNUT PLUG MEDIUM. (10 #/bbl)

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PROJECT PRODUCT & EQUIPMENT STOCK POINTS			
LOCATION	SERVICE	CONTACT	LOCATION PHONE #
Denver, CO	Engineering / Support	Alex Stoica	303-352-1428
Myton, Utah	Sack / Drum Product	Karl Lamb	435-722-3961
Big Piney, Wyoming	OBM Liquid Mud Facility	Marvin Sorensen	307-276-3051

PROJECT SERVICE CONTACTS			
NAME	TITLE	OFFICE #	CELL #
Tim Sorensen	District Manager	303-352-1402	307-760-3139
Brady Allen	Regional Sales Manager	303-352-1410	303-550-8121
Eric Dowdy	Engineering Manager	303-352-1403	303-378-3317
Alex Stoica	Project Engineer	303-352-1428	602-628-3639
Ammon Foster	Sr. Safety Engineer	307-472-7257	307-262-8687
Mike Pittsinger	ES Account Rep.	303-352-1409	970-250-9400
Kevin Nate	District Mgr WP		720-878-3891
Dirk Millhouse	RTSM	303-352-1408	720-234-2079

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DRILLING FLUIDS ENGINEERS / ROLES & RESPONSIBILITIES

The drilling fluids engineer is responsible for all testing and product recommendations to insure that the drilling fluid meets the specifications outlined in the drilling fluids program. He will also perform any additional testing of the fluid to improve treatments and minimize fluid problems. A brief but detailed summary of the past 24 hours will be included on each daily mud report. An accurate product inventory will be kept on location to meet all the requirements of the project. The drillings fluid engineer has the responsibility of educating the entire rig personnel on the proper protective equipment for handling and mixing the various products used in the drilling fluid and the hazards associated with them.

- Test and manage mud properties to follow the guidelines set forth in the mud program, keep an accurate count of all mud products on location, and calibrate the mud balance daily.
- Maintain a library of MSDS for all products on location and conduct training sessions with all pertinent personnel in the handling of the chemicals.
- Perform API mud checks daily and record on the daily mud report.
- Communicate daily with the MI SWACO Project Engineer assigned to your well and discuss any issues or concerns associated with the well and/or mud properties.
- Discuss daily treatments to the mud system with rig personnel at the pre-tour safety meetings.
- Product concentrations will be calculated daily using MI SWACO's ONE-TRAX program to monitor mud treatments.
- Keep an accurate account of all onsite mud volumes and mud losses daily. These volumes will be reported in the Volume Accounting section of the daily mud report.
- Any products that are damaged at the location should be reported to the Well site Leader and Rig Manager immediately, then restacked so damaged material can used in the mud system if possible.
- Participate as required in the reporting and clean up of accidents and spills.
- Comply with all HSE policies and participate in the safety program.
- Attend well planning Spud /Tech Limits meeting if possible.
- Keep in contact with the delivering warehouse on product availability for each drilling interval and any specialty chemicals required for the well.
- Notify the delivering warehouse that mud products or liquid mud may be required at short notice due to unscheduled well events.
- At the end of each hitch the Drilling Fluids Engineer is responsible for making sure all engineering tickets are signed and mailed in to the Riverton office.
- At the end of the well the Drilling Fluids Engineer is responsible for insuring that the following documents are turned in to the Denver and Riverton offices.
    1. Complete OneTrax File
    2. Lessons Learned
    3. Customer Satisfaction Report
    4. End of Well Inventory. (To the delivering warehouse)
- The following reports will be faxed/emailed daily to MI SWACO's Project Engineer responsible for your well in the Denver office:
    1. Daily Mud Report
    2. Well Site Inventory
    3. Daily Mud Volume Accounting
    4. Daily Product Concentrations

QHSE POLICY STATEMENT

"Our employees are the Company's most important asset."

Preventing occupational injuries, illnesses, and protection of the environment are of such consequence that management will provide all the facilities and support reasonably required to ensure success.

We are committed to a health, safety, and environment management system that conforms to the best practices of our industry. Health, safety, and environment considerations are a top priority in planning and development of products, services, and processes. We acknowledge the principle that all accidents can be prevented and actively promote the highest standards of safety awareness and performance. We acknowledge that the environment can be protected through design of environmentally acceptable products and responsible use of those products. Your Company is committed to continuous improvement of its global health, safety, and environmental processes while supplying high quality, environmentally responsible products, and services to our customers. Our objective is the lowest possible number of accidents, injuries, illnesses, and environmental problems. We recognize the importance of working closely with our customers and contractors. Only through the cooperative effort of all can the best possible health, safety, and environmental record be achieved. This policy requires internal cooperation in all health, safety, and environmental matters, not only between supervisor and employee, but also between each employee and his fellow workers.

Your Company recognizes that the responsibilities for health, safety, and environment are shared:

1. Management accepts the responsibility for leadership of the health, safety and environmental program, for its effectiveness and improvement, and for providing for the safeguards required to ensure safe, environmentally responsible conditions;

2. Supervisors are responsible for developing the proper attitudes towards health, safety, and environment in them as well as directing those whom they supervise toward this goal. Supervisors are responsible locally for ensuring that all operations are performed with the utmost regard for the health and safety of personnel and protection of the environment.

3. All employees are responsible for wholehearted, genuine cooperation with every aspect of the health, safety, and environmental program. This includes compliance with all rules and regulations and continuous, safe, environmentally

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Regional and District Headquarters; 1675 Broadway, Suite 700, Denver, Colorado 80202

This suggested program is advisory only and may be rejected in the sole discretion of any and all parties receiving it. In addition all parties receiving this program recognize, agree, and acknowledge that M-I Drilling Fluids L.L.C. (M-I) / M-I SWACO has no care, custody or control of the well, the drilling equipment at the well, nor the premises about the well. Also, there are obviously many conditions within and associated with a well of which M-I can have no knowledge and over which it does not and cannot have control. Therefore, M-I shall not be liable for the failure of any equipment to perform in a particular way or the failure to obtain any particular results from carrying out this program by any party receiving it. Furthermore, the owner and operator of the well and the drilling contractor in consideration of the recommendations contained in this suggested program agree to indemnify and save M-I harmless from all claims and costs for loss, damage or injury to persons or property including, without limitations: subsurface damage, subsurface trespass or injury to the well or reservoir allegedly caused by M-I's operations or reliance by anyone upon this program unless such personal injuries or damage shall be caused by the willful misconduct or gross negligence of M-I.

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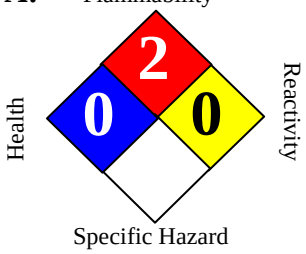
Safety Data Sheet
Diesel Low Sulfur (LSD) and Ultra Low Sulfur Diesel (ULSD)

NFPA:



TESORO

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Diesel Low Sulfur (LSD) and Ultra Low Sulfur Diesel (ULSD)			
Synonyms	:	CARB Diesel, 888100004478			
SDS Number	:	888100004478	**Version**	:	2.23
Product Use Description	:	Fuel			
Company	:	For: Tesoro Refining & Marketing Co. 19100 Ridgewood Parkway, San Antonio, TX 78259			
Tesoro Call Center	:	(877) 783-7676	**Chemtrec (Emergency Contact)**	:	(800) 424-9300

SECTION 2. HAZARDS IDENTIFICATION

Classifications :
Flammable Liquid – Category 3
Skin Irritation – Category 2
Eye Irritation – Category 2B
Aspiration Hazard – Category 1
Carcinogenicity – Category 2
Acute Toxicity - Inhalation – Category 4
Chronic Aquatic Toxicity – Category 2

Pictograms :

Signal Word: **Danger**

Hazard Statements:
Flammable liquid and vapor.
May be fatal if swallowed and enters airways – do not siphon diesel by mouth.
Causes skin irritation.
Causes eye irritation.
Suspected of causing skin cancer if repeated and prolonged skin contact occurs.
Suspected of causing cancer in the respiratory system if repeated and prolonged

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over-exposure by inhalation occurs.
May cause damage to liver, kidneys and nervous system by repeated and prolonged inhalation.
Harmful if inhaled.
May cause drowsiness or dizziness by inhalation.
Toxic to aquatic life with long lasting effects.

Precautionary statements:

Prevention:

Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Keep away from heat, sparks, open flames, welding and hot surfaces.
No smoking.
Keep container tightly closed.
Ground and/or bond container and receiving equipment.
Use explosion-proof electrical equipment.
Use only non-sparking tools if tools are used in flammable atmosphere.
Take precautionary measures against static discharge.
Wear gloves, eye protection and face protection as needed to prevent skin and eye contact with liquid.
Wash hands or liquid-contacted skin thoroughly after handling.
Do not eat, drink or smoke when using this product.
Avoid breathing vapors or mists.
Use only outdoors or in a well-ventilated area.

Response:

In case of fire: Use dry chemical, CO2, water spray or fire fighting foam to extinguish.
If swallowed: Immediately call a poison center, doctor, hospital emergency room, medical clinic or 911. Do NOT induce vomiting. Rinse mouth.
If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower.
If in eye: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
If skin or eye irritation persists, get medical attention.
If inhaled: Remove person to fresh air and keep comfortable for breathing.
Immediately call or doctor or emergency medical provider. See Section 4 and Section 11 for medical treatment information.

Storage:

Store in a well ventilated place. Keep cool. Store locked up. Keep container tightly closed . Use only approved containers.

Disposal:

Dispose of contents/containers to approved disposal site in accordance with local, regional, national, and/or international regulations.

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SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS-No.	Weight %
Fuels, diesel, No 2; Gasoil - unspecified	68476-34-6	100%
Nonane	111-84-2	0 - 5%
Naphthalene	91-20-3	0 - 1%
1,2,4-Trimethylbenzene	95-63-6	0 - 2%
Xylene	1330-20-7	0 - 2%
Sulfur	7704-34-9	15 ppm maximum

SECTION 4. FIRST AID MEASURES

Inhalation : Move to fresh air. Give oxygen. If breathing is irregular or stopped, administer artificial respiration. Seek medical attention immediately.

Skin contact : Take off all contaminated clothing immediately. Wash off immediately with soap and plenty of water. Wash contaminated clothing before re-use. If skin irritation persists, seek medical attention immediately.

Eye contact : Remove contact lenses. Rinse thoroughly with plenty of water for at least 15 minutes. If symptoms persist, seek medical attention.

Ingestion : Do not induce vomiting without medical advice. If a person vomits when lying on his back, place him in the recovery position. Seek medical attention immediately.

Notes to physician : Symptoms: Dizziness, Discomfort, Headache, Nausea, Disorder, Vomiting, Lung edema, Liver disorders, Kidney disorders. Aspiration may cause pulmonary edema and pneumonitis.

SECTION 5. FIRE-FIGHTING MEASURES

Suitable extinguishing media : SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO2, water spray or fire fighting foam. LARGE FIRES: Water spray, fog or fire fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers. Keep containers and surroundings cool with water spray.

Specific hazards during fire fighting : Fire Hazard Do not use a solid water stream as it may scatter and spread fire. Cool closed containers exposed to fire with water spray.

Special protective equipment for fire-fighters : Wear self-contained breathing apparatus and protective suit. Use personal protective equipment.

Further information : Exposure to decomposition products may be a hazard to health. Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam.

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SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions : Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to contain spill areas. Spills may infiltrate subsurface soil and groundwater; professional assistance may be necessary to determine the extent of subsurface impact. Ensure adequate ventilation. Use personal protective equipment.

Environmental precautions : Carefully contain and stop the source of the spill, if safe to do so. Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of fire fighting foam may be useful in certain situations to reduce vapors. The proper use of water spray may effectively disperse product vapors or the liquid itself, preventing contact with ignition sources or areas/equipment that require protection. Discharge into the environment must be avoided. If the product contaminates rivers and lakes or drains inform respective authorities.

Methods for cleaning up : Take up with sand or oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal - caution, flammable vapors may accumulate in closed containers. Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

SECTION 7. HANDLING AND STORAGE

Precautions for safe handling : Keep away from fire, sparks and heated surfaces. No smoking near areas where material is stored or handled. The product should only be stored and handled in areas with intrinsically safe electrical classification.

Hydrocarbon liquids including this product can act as a non-conductive flammable liquid (or static accumulators), and may form ignitable vapor-air mixtures in storage tanks or other containers. Precautions to prevent static-initated fire or explosion during transfer, storage or handling, include but are not limited to these examples:

(1) Ground and bond containers during product transfers. Grounding and bonding may not be adequate protection to prevent ignition or explosion of hydrocarbon liquids and vapors that are static accumulators.

(2) Special slow load procedures for "switch loading" must be followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil or diesel) is loaded into tanks previously containing low flash point products (such gasoline or naphtha).

(3) Storage tank level floats must be effectively bonded.

For more information on precautions to prevent static-initated fire or explosion, see NFPA 77, Recommended Practice on Static Electricity (2007), and API Recommended Practice 2003, Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents (2008).

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Conditions for safe storage, including incompatibilities : Keep away from flame, sparks, excessive temperatures and open flame. Use approved containers. Keep containers closed and clearly labeled. Empty or partially full product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose containers to sources of ignition. Store in a well-ventilated area. The storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks".

Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure.

Keep away from food, drink and animal feed. Incompatible with oxidizing agents. Incompatible with acids.

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Guidelines

List	Components	CAS-No.	Type:	Value
OSHA Z1	Xylene	1330-20-7	PEL	100 ppm 435 mg/m3
	Naphthalene	91-20-3	PEL	10 ppm 50 mg/m3
ACGIH	Diesel Fuel	68476-30-2	TWA	100 mg/m3
	Xylene	1330-20-7	TWA	100 ppm
		1330-20-7	STEL	150 ppm
	Naphthalene	91-20-3	TWA	10 ppm
		91-20-3	STEL	15 ppm
	Nonane	111-84-2	TWA	200 ppm

Engineering measures : Use adequate ventilation to keep gas and vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces. Use only intrinsically safe electrical equipment approved for use in classified areas.

Eye protection : Safety glasses or goggles are recommended where there is a possibility of splashing or spraying.

Hand protection : Gloves constructed of nitrile, neoprene, or PVC are recommended. Consult manufacturer specifications for further information.

Skin and body protection : If needed to prevent skin contact, chemical protective clothing such as of DuPont TyChem®, Saranex or equivalent recommended based on degree of exposure. The resistance of specific material may vary from product to product as well as with degree of exposure.

Respiratory protection : A NIOSH/ MSHA-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited. Refer to OSHA 29 CFR 1910.134, ANSI Z88.2-1992, NIOSH Respirator Decision Logic, and the

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		manufacturer for additional guidance on respiratory protection selection. Use a NIOSH/ MSHA-approved positive-pressure supplied-air respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.
Work / Hygiene practices	:	Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use as a cleaning solvent on the skin. Do not use solvents or harsh abrasive skin cleaners for washing this product from exposed skin areas. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Use care when laundering to prevent the formation of flammable vapors which could ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	:	Clear to straw colored liquid
Odor	:	Characteristic petroleum or kerosene-like odor
Odor threshold	:	0.1 - 1 ppm typically reported
pH	:	Not applicable
Melting point/freezing point	:	Gel point can be about -15°F; freezing requires laboratory conditions
Initial boiling point & range	:	154 - 372 °C (310° - 702 °F)
Flash point	:	38°C Minimum for #1 Diesel, 52°C Minimum for #2 Diesel
Evaporation rate:	:	Higher initially and declining as lighter components evaporate
Flammability (solid, gas)	:	Flammable vapor released by liquid
Upper explosive limit	:	6.5 %(V)
Lower explosive limit	:	0.6 %(V)
Vapor pressure	:	< 2 mm Hg at 20 °C
Vapor density (air = 1)	:	> 4.5
Relative density (water = 1)	:	0.86 g/mL
Solubility (in water)	:	0.0005 g/100 mL
Partition coefficient (n-octanol/water)	:	> 3.3 as log Pow
Auto-ignition temperature	:	257 °C (495 °F)
Decomposition temperature	:	Will evaporate or boil and possibly ignite before decomposition occurs.

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Kinematic viscosity	:	1 to 6 mm²/s range reported for No.1 or No.2 diesel at ambient temperatures
Conductivity (conductivity can be reduced by environmental factors such as a decrease in temperature		Diesel Fuel Oils at terminal load rack: At least 25 pS/m Ultra Low Sulfur Diesel (ULSD) without conductivity additive: 0 pS/m to 5 pS/m ULSD at terminal load rack with conductivity additive: At least 50 pS/m JP-8 at terminal load rack: 150 pS/m to 600 pS/m

SECTION 10. STABILITY AND REACTIVITY

Reactivity	:	Vapors may form explosive mixture with air. Hazardous polymerization does not occur.
Chemical stability	:	Stable under normal conditions.
Possibility of hazardous reactions	:	Can react with strong oxidizing agents, peroxides, acids and alkalies. ~~Do not use with Viton or Fluorel gaskets or seals.~~
Conditions to avoid	:	Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources. Avoid static charge accumulation and discharge (see Section 7).
Hazardous decomposition products	:	Ignition and burning can release carbon monoxide, carbon dioxide, non-combusted hydrocarbons (smoke) and, depending on formulation, trace amounts of sulfur dioxide. Diesel exhaust particals may be a lung hazard (see Section 11).

SECTION 11. TOXICOLOGICAL INFORMATION

Inhalation	:	Vapors or mists from this material can irritate the nose, throat, and lungs, and can cause signs and symptoms of central nervous system depression, depending on the concentration and duration of exposure.
Skin contact	:	Skin irritation leading to dermatitis may occur upon prolonged or repeated contact. Liquid may be absorbed through the skin in toxic amounts if large areas of skin are repeatedly exposed. Long-term, repeated skin contact may cause skin cancer.
Eye contact	:	Eye irritation may result from contact with liquid, mists, and/or vapors.
Ingestion	:	Harmful or fatal if swallowed. Do NOT induce vomiting. This material can irritate the mouth, throat, stomach, and cause nausea, vomiting, diarrhea and restlessness Aspiration hazard if liquid is inhaled into lungs, particularly from vomiting after ingestion. Aspiration may result in chemical pneumonia, severe lung damage, respiratory failure and even death.
Target organs	:	Central nervous system, Eyes, Skin, Kidney, Liver
Further information	:	Studies have shown that similar products produce skin cancer or skin tumors in laboratory animals following repeated applications without washing or removal. The significance of this finding to human exposure has not been determined. Other studies with active skin carcinogens have shown that washing the animal's skin with soap and water between applications reduced tumor formation. Repeated over-exposure may cause liver and kidney injury IARC classifies whole diesel fuel exhaust particulates as carcinogenic to humans (Group 1). NIOSH regards whole diesel fuel exhaust particulates as a potential cause of occupational lung cancer based on animal studies and limited evidence in humans.

Component:

Fuels, diesel, No 2; Gasoil - unspecified	68476-34-6	Acute oral toxicity: LD50 rat Dose: 5,001 mg/kg Acute dermal toxicity: LD50 rabbit Dose: 2,001 mg/kg Acute inhalation toxicity: LC50 rat Dose: 7.64 mg/l Exposure time: 4 h Skin irritation: Classification: Irritating to skin. Result: Severe skin irritation Eye irritation: Classification: Irritating to eyes. Result: Mild eye irritation
Nonane	111-84-2	Acute oral toxicity: LD50 mouse Dose: 218 mg/kg Acute inhalation toxicity: LC50 rat Exposure time: 4 h
Naphthalene	91-20-3	Acute oral toxicity: LD50 rat Dose: 2,001 mg/kg Acute dermal toxicity: LD50 rat Dose: 2,501 mg/kg Acute inhalation toxicity: LC50 rat Dose: 101 mg/l Exposure time: 4 h Skin irritation: Classification: Irritating to skin. Result: Mild skin irritation Eye irritation: Classification: Irritating to eyes. Result: Mild eye irritation Carcinogenicity: N11.00422130
1,2,4-Trimethylbenzene	95-63-6	Acute inhalation toxicity: LC50 rat Dose: 18 mg/l Exposure time: 4 h Skin irritation: Classification: Irritating to skin. Result: Skin irritation Eye irritation: Classification: Irritating to eyes. Result: Eye irritation
Xylene	1330-20-7	Acute oral toxicity: LD50 rat Dose: 2,840 mg/kg Acute dermal toxicity: LD50 rabbit Dose: ca. 4,500 mg/kg Acute inhalation toxicity: LC50 rat Dose: 6,350 mg/l Exposure time: 4 h Skin irritation: Classification: Irritating to skin. Result: Mild skin irritation Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product. Eye irritation: Classification: Irritating to eyes. Result: Mild eye irritation

Carcinogenicity

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NTP	:	Naphthalene (CAS-No.: 91-20-3)
IARC	:	Naphthalene (CAS-No.: 91-20-3)
OSHA	:	No component of this product which is present at levels greater than or equal to 0.1 % is identified as a carcinogen or potential carcinogen by OSHA.
CA Prop 65	:	WARNING! This product contains a chemical known to the State of California to cause cancer. naphthalene (CAS-No.: 91-20-3)

SECTION 12. ECOLOGICAL INFORMATION

Additional ecological information : Keep out of sewers, drainage areas, and waterways. Report spills and releases, as applicable, under Federal and State regulations.

Component:

Diesel	68476-34-6	Toxicity to fish: LC50 Species: Jordanella floridae Dose: 54 mg/l Exposure time: 96 h Toxicity to crustacia: Species: Palaemonetes pugio TLm (48 hour) = 3.4 mg/l

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal : Dispose of container and unused contents in accordance with federal, state and local requirements.

SECTION 14. TRANSPORT INFORMATION

CFR

Proper shipping name	:	DIESEL FUEL
UN-No.	:	UN1202 (NA 1993)
Class	:	3
Packing group	:	III

TDG

Proper shipping name	:	DIESEL FUEL
UN-No.	:	UN1202 (NA 1993)
Class	:	3
Packing group	:	III

IATA Cargo Transport

UN UN-No.	:	UN1202 (NA 1993)
Description of the goods	:	DIESEL FUEL
Class	:	3
Packaging group	:	III
ICAO-Labels	:	3

Packing instruction (cargo aircraft)	:	366
Packing instruction (cargo aircraft)	:	Y344

IATA Passenger Transport

UN UN-No.	:	UN1202 (NA 1993)
Description of the goods	:	DIESEL FUEL
Class	:	3
Packaging group	:	III
ICAO-Labels	:	3
Packing instruction (passenger aircraft)	:	355
Packing instruction (passenger aircraft)	:	Y344

IMDG-Code

UN-No.	:	UN 1202 (NA 1993)
Description of the goods	:	DIESEL FUEL
Class	:	3
Packaging group	:	III
IMDG-Labels	:	3
EmS Number	:	F-E S-E
Marine pollutant	:	No

SECTION 15. REGULATORY INFORMATION

CERCLA SECTION 103 and SARA SECTION 304 (RELEASE TO THE ENVIROMENT)
The CERCLA definition of hazardous substances contains a “petroleum exclusion” clause which exempts crude oil. Fractions of crude oil, and products (both finished and intermediate) from the crude oil refining process and any indigenous components of such from the CERCLA Section 103 reporting requirements. However, other federal reporting requirements, including SARA Section 304, as well as the Clean Water Act may still apply.

TSCA Status	:	On TSCA Inventory
DSL Status	:	All components of this product are on the Canadian DSL list.
SARA 311/312 Hazards	:	Fire Hazard Acute Health Hazard Chronic Health Hazard

SARA III — US. EPA Emergency Planning and Community Right-To-Know Act (EPCRA) SARA Title III Section 313 Toxic Chemicals (40 CFR 372.65) - Supplier Notification Required

Components	CAS-No.
Xylene	1330-20-7
1,2,4-Trimethylbenzene	95-63-6
Naphthalene	91-20-3

PENN RTK — US. Pennsylvania Worker and Community Right-to-Know Law (34 Pa. Code Chap. 301-323)

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Components	CAS-No.
Nonane	111-84-2
Naphthalene	91-20-3
1,2,4-Trimethylbenzene	95-63-6
xylene	1330-20-7
Fuels, diesel, No 2; Gasoil - unspecified	68476-34-6

MASS RTK — US. Massachusetts Commonwealth's Right-to-Know Law (Appendix A to 105 Code of Massachusetts Regulations Section 670.000)

Components	CAS-No.
Xylene	1330-20-7
1,2,4-Trimethylbenzene	95-63-6
Naphthalene	91-20-3
Nonane	111-84-2

NJ RTK — US. New Jersey Worker and Community Right-to-Know Act (New Jersey Statute Annotated Section 34:5A-5)

Components	CAS-No.
Nonane	111-84-2
Naphthalene	91-20-3
1,2,4-Trimethylbenzene	95-63-6
Xylene	1330-20-7
Fuels, diesel, No 2; Gasoil - unspecified	68476-34-6

California Prop. 65 : WARNING! This product contains a chemical known to the State of California to cause cancer.

Naphthalene 91-20-3

SECTION 16. OTHER INFORMATION

Further information

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

10/02/2012

1153, 1250, 1443, 1454, 1814, 1815, 1866, 1925

MI SWACO
A Schlumberger Company

MATERIAL SAFETY DATA SHEET

MSDS No. 10140 **Trade Name:** VERSACOAT* **Revision Date:** 11/01/2010

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Trade Name: VERSACOAT*

Chemical Family: Mixture
Product Use: Oil well drilling fluid additive. Emulsifier.

Supplied by: M-I L.L.C.
P.O. Box 42842
Houston, TX 77242
www.miswaco.slb.com
Telephone Number: 281-561-1512
Emergency Telephone (24 hr.): 281-561-1600
Prepared by: Product Safety Group

Revision No. 6

HMIS Rating
Health: 2 **Flammability:** 3 **Physical Hazard:** 0 **PPE:** J

4=Severe, 3=Serious, 2=Moderate, 1=Slight, 0=Minimal Hazard. *Chronic effects - See Section 11. See Section 8 for Personal Protective Equipment recommendations.

2. HAZARDS IDENTIFICATION

Emergency Overview: Warning! Flammable liquid and vapor. May cause severe eye irritation. May cause skin irritation. May be harmful if absorbed through skin. Vapors or mists may cause central nervous system (CNS) effects if inhaled.

Canadian Classification:
UN PIN No: UN1993 **WHMIS Class:** B2 D2B

Physical State: Liquid **Color:** Dark amber **Odor:** Ammonia

Potential Health Effects:
Acute Effects

Eye Contact: May cause severe eye irritation.
Skin Contact: May be irritating to the skin. May be harmful if absorbed through skin. Prolonged or repeated contact may cause defatting of the skin and/or dermatitis (inflammation).
Inhalation: Vapors or mists may be irritating to the respiratory tract. May cause central nervous system (CNS) effects.
Ingestion: May cause gastric distress, nausea and vomiting if ingested. Aspiration can be a hazard if this material is swallowed.

Carcinogenicity & Chronic Effects: See Section 11 - Toxicological Information.
Routes of Exposure: Eyes. Dermal (skin) contact. Dermal (skin) absorption. Inhalation.
Target Organs/Medical Conditions Aggravated by Overexposure: Eyes. Skin. Respiratory System. Central Nervous System (CNS). Gastrointestinal Tract.

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3. COMPOSITION/INFORMATION ON INGREDIENTS

Ingredient	CAS No.	Wt. %	Comments:
Tall oil reaction product		60 - 100	No comments.
Petroleum distillates, hydrotreated light	64742-47-8	10 - 30	No comments.
Methyl alcohol	67-56-1	5 - 10	No comments.

4. FIRST AID MEASURES

Eye Contact: Immediately flush eyes with large amounts of water. Continue to rinse for at least 15 minutes. Look for and remove contact lenses. Seek immediate medical attention.

Skin Contact: Wash skin thoroughly with soap and water. Remove contaminated clothing and launder before reuse. Get medical attention if any discomfort continues.

Inhalation: Move person to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Ingestion: Do not induce vomiting. Dilute with 2 - 3 glasses of water or milk, if conscious. Never give anything by mouth to an unconscious person. Get immediate medical attention.

General notes: Persons seeking medical attention should carry a copy of this MSDS with them.

Notes To Physician: Aspiration may cause severe lung damage. Evacuate stomach in a way which avoids aspiration.

5. FIRE FIGHTING MEASURES

Flammable Properties

Flash Point: F (C): 82F (27.7C)
Flash Point Method: PMCC
Flammable Limits in Air - Lower (%): ND
Flammable Limits in Air - Upper (%): ND
Autoignition Temperature: F (C): ND
Flammability Class: IC
Other Flammable Properties: ND
Extinguishing Media: Water fog, carbon dioxide, foam, dry chemical.

Protection Of Fire-Fighters:

Special Fire-Fighting Procedures: Do not enter fire area without proper personal protective equipment, including NIOSH/MSHA approved self-contained breathing apparatus. Evacuate area and fight fire from a safe distance. Water spray may be used to keep fire-exposed containers cool. Keep water run off out of sewers and waterways. Note that flammable vapors may form an ignitable mixture with air. Vapors may travel considerable distances and flash back if ignited.

Hazardous Combustion Products: Formaldehyde. Oxides of carbon and nitrogen.

6. ACCIDENTAL RELEASE MEASURES

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Personal Precautions: Use personal protective equipment identified in Section 8.

Spill Procedures: Evacuate the spill area with the exception of the spill response team. Keep personnel removed and upwind of spill. Extinguish all ignition sources. Avoid sparks, flames, heat and smoking. Shut off leak if it can be done safely. Contain spilled material. Do not allow spilled material to enter sewers, storm drains or surface waters. Absorb in vermiculite, dry sand or earth. Place into containers for disposal. Use non-sparking or explosion proof means to transfer material to containers. Note that flammable/combustible vapors may form an ignitable mixture with air. Vapors may travel considerable distances from spill and flash back, if ignited.

Environmental Precautions: Waste must be disposed of in accordance with federal, state and local laws. In the U.S., for products with reportable quanitity (RQ) components - if the RQ is exceeded, report to National Spill Response Office at 1 800 424 8802.

7. HANDLING AND STORAGE

Handling: Put on appropriate personal protective equipment. Avoid contact with skin and eyes. Avoid breathing vapors or spray mists. Use only in a well ventilated area. Ground and bond containers when transferring material. Wash thoroughly after handling.

Storage: Store in dry, well-ventilated area. Keep container closed. Keep away from heat, sparks and flames. Store away from incompatibles. Follow safe warehousing practices regarding palletizing, banding, shrink-wrapping and/or stacking.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure Limits (TLV & PEL - 8H TWA):

Ingredient	CAS No.	Wt. %	ACGIH TLV	OSHA PEL	Other	Notes
Tall oil reaction product		60 - 100	NA	NA	NA	None
Petroleum distillates, hydrotreated light	64742-47-8	10 - 30	NA	NA	NA	(3) Oil mist.
Methyl alcohol	67-56-1	5 - 10	200 ppm; 250 ppm (STEL)	200 ppm; 260 mg/m^3	6000 ppm IDLH (NIOSH)	(skin)

Notes
(3) For Oil mist, mineral: ACGIH TLV 5 mg/m^3, STEL 10 mg/m^3; OSHA PEL 5 mg/m^3
(skin) Potential for cutaneous absorption.

Engineering Controls: Local exhaust ventilation as necessary to maintain exposures to within applicable limits.

Personal Protection Equipment

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazards present and the risk of exposure to those hazards. The PPE recommendations below are based on our assessment of the chemical hazards associated with this product. The risk of exposure and need for respiratory protection will vary from workplace to workplace and should be assessed by the user.

Eye/Face Protection: Wear chemical safety goggles.

Skin Protection: Wear appropriate clothing to prevent repeated or prolonged skin contact. Wear chemical resistant gloves such as nitrile or neoprene.

Respiratory Protection: All respiratory protection equipment should be used within a comprehensive respiratory protection program that meets the requirements of 29 CFR 1910.134 (U.S. OSHA Respiratory Protection Standard) or local equivalent.

A NIOSH/MSHA approved supplied air respirator is recommended if airborne concentrations exceed exposure limits for components.

General Hygiene Considerations: Wash promptly with soap and water if skin becomes contaminated. Work clothes should be washed separately at the end of each work day. Disposable clothing should be discarded, if contaminated with product.

9. PHYSICAL AND CHEMICAL PROPERTIES

Color:	Dark amber
Odor:	Ammonia
Physical State:	Liquid
pH:	ND
Specific Gravity (H2O = 1):	0.87 - 0.97 (at 68F(20C))
Solubility (Water):	Insoluble.
Flash Point: F (C):	82F (27.7C)
Melting/Freezing Point:	ND
Boiling Point:	ND
Vapor Pressure:	ND
Vapor Density (Air=1):	>1
Evaporation Rate:	ND
Odor Threshold(s):	ND

10. STABILITY AND REACTIVITY

Chemical Stability:	Stable
Conditions to Avoid:	Keep away from heat, sparks and flame.
Materials to Avoid:	Oxidizers.
Hazardous Decomposition Products:	For thermal decomposition products, see Section 5.
Hazardous Polymerization	Will not occur

11. TOXICOLOGICAL INFORMATION

Component Toxicological Data: Any adverse component toxicological effects are listed below. If no effects are listed, no such data were found.

Ingredient	CAS No.	Acute Data
Tall oil reaction product		Oral LD50: >2020 mg/kg (rat)
Petroleum distillates, hydrotreated light	64742-47-8	Oral LD50: >39.9 g/kg (rat); Dermal LD50: 2.0 - 4.0 g/kg (rabbit); Inhalation LC50: >24.1 mg/l/1H (rat)
Methyl alcohol	67-56-1	Oral LD 50: 5682 mg/kg (rat); Dermal LD50: 15,800 (rabbit); Inhalation LC50: 64,000 ppm/4H (rat)

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Ingredient	Component Toxicological Summary
Methyl alcohol	Long term exposure to high concentrations of methanol via inhalation or skin absorption may cause adverse effects to vision, e.g., sensitivity to light or blurred vision. (HSDB) Repeated exposure to airborne concentrations of methanol in the range of 200 - 375 ppm have been associated with headaches. (Hazardtext) Inhalation of methanol vapors by female rats exposed during pregnancy caused fetotoxic effects at 10,000 ppm and birth defects at 20,000 ppm. These doses also caused maternal toxicity. Fetotoxic effects were observed in the offspring of female rats fed 20 - 35 g/kg methanol during pregnancy. These doses were also maternally toxic. (Vendor MSDS) Methanol is toxic to humans if ingested in amounts as small as 0.25 ml/kg of body weight. Ingestion of methanol can cause blindness and death in humans.

Product Toxicological Information:
No toxicological data is available for this product.

12. ECOLOGICAL INFORMATION

Component Ecotoxicity Data: Component ecotoxicity data are listed below. If no data are listed, none were found in the component review.

Ingredient	CAS No.	Data
Petroleum distillates, hydrotreated light	64742-47-8	LC50 48H static: 7500 ug/l (Danio rerio (zebra danio)); LC50 4D static: 5900 ug/l (Lepomis macrochirus (bluegill)); LC50 24H static: 3200 ug/l (Oncorhynchus mykiss (rainbow trout)); LC50 48H static: 8800 ug/l (Poecilia reticulata (guppy))
Methyl alcohol	67-56-1	LC50 96H: 29,400 mg/l (fathead minnow - 24 days old); LC50 96H: 13 mg/l (rainbow trout - fingerling); LC50 48H: 8000 mg/l (trout); EC50 5M: 43 g/l (Photobacterium phosphoreum)

Product Ecotoxicity Data: Contact M-I Environmental Affairs Department for available product ecotoxicity data.
Biodegration: ND
Bioaccumulation: ND
Octanol/Water Partition Coefficient: ND

13. DISPOSAL CONSIDERATIONS

Waste Classification: ND

Waste Management: Under U.S. Environmental Protection Agency (EPA) Resource Conservation and Recovery Act (RCRA), it is the responsibility of the user to determine at the time of disposal, whether the product meets RCRA criteria for the hazardous waste. This is because product uses, transformations, mixtures, processes, etc., may render the resulting materials hazardous. Empty containers retain residues. All labeled precautions must be observed.

Disposal Method: Recover and reclaim or recycle, if practical. Should this product become a waste, dispose of in a permitted industrial landfill. Ensure that the containers are empty by the RCRA criteria prior to disposal in a permitted industrial landfill.

MATERIAL SAFETY DATA SHEET

Trade Name: VERSACOAT*

14. TRANSPORT INFORMATION

U.S. DOT

Shipping Description: Flammable liquids, n.o.s., (contains methyl alcohol and petroleum distillates) Class 3, UN1993, PG III.

Emergency Response Guide No.: 128

Canada TDG Shipping Description: See U.S. Shipping Description.

UN PIN No: UN1993

IMDG Shipping Description: See U.S. Shipping Description.

ICAO/IATA Shipping Description: See U.S. Shipping Description.

15. REGULATORY INFORMATION

U.S. Federal and State Regulations

SARA 311/312 Hazard Catagories: Fire hazard. Immediate (acute) health hazard.

SARA 302/304, 313; CERCLA RQ, California Proposition 65: Note: If no components are listed below, this product is not subject to the referenced SARA and CERCLA regulations and is not known to contain a Proposition 65 listed chemical at a level that is expected to pose a significant risk under anticipated use conditions.

Ingredient	SARA 302 / TPQs	SARA 313	CERCLA RQ	CA 65 Cancer	CA 65 Dev. Tox.	CA 65 Repro. F	CA 65 Repro. M
Methyl alcohol	---	1.0%	5000 lb (2270 kg)	---	---	---	---

International Chemical Inventories

Australia AICS - Contains a component that is not listed.
Canada DSL - Components are listed or exempt from listing.
China Inventory - Components are listed or exempt from listing.
European Union EINECS/ELINCS - Components are listed or exempt from listing.
Japan METI ENCS - Contains a component that is not listed.
Korea TCCL ECL - Components are listed or exempt from listing.
New Zealand - Components are listed or exempt from listing.
Philippine PICCS - Components are listed or exempt from listing.
U.S. TSCA - Components are listed or exempt from listing.
U.S. TSCA - No components are subject to TSCA 12(b) export notification requirements.

Canadian Classification:

Controlled Products Regulations Statement: This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

WHMIS Class: B2 D2B

16. OTHER INFORMATION

The following sections have been revised: 1, 2, 4, 5, 6, 8, 10, 14, 15, 16.

NA - Not Applicable, ND - Not Determined.

MATERIAL SAFETY DATA SHEET

Trade Name: VERSACOAT*

*A mark of M-I L.L.C.

Disclaimer:

MSDS furnished independent of product sale. While every effort has been made to accurately describe this product, some of the data are obtained from sources beyond our direct supervision. We can not make any assertions as to its reliability or completeness; therefore, user may rely on it only at user´s risk. We have made no effort to censor or conceal deleterious aspects of this product. Since we cannot anticipate or control the conditions under which this information and product may be used, we make no guartantee that the precautions we have suggested will be adequate for all individuals and/or situations. It is the obligation of each user of this product to comply with the requirements of all applicable laws regarding use and disposal of this product. Additional information will be furnished upon request to assist the user; however, no warranty, either expressed or implied, nor liability of any nature with respect to this product or to the data herein is made or incurred hereunder.

Revision Date 03-Sept-12 SDS No. 10396

Revision 5

Supersedes date 17-Dec-09

SAFETY DATA SHEET
VERSAMOD*

SECTION 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

1.1. Product identifier

Product name VERSAMOD*

1.2. Relevant identified uses of the substance or mixture and uses advised against

Identified uses Oil well drilling fluid additive. Rheology modifier

1.3. Details of the supplier of the safety data sheet

Supplier

M-I SWACO
A Schlumberger Company
Woodlands Drive,
Kirkhill Industrial Estate,
Dyce, Aberdeen AB21 0GW.
Scotland UK
T = +44 (0)1224-246600
F = +44 (0)1224-246699
E-mail = MBXMSDS-EH@miswaco.slb.com

1.4. Emergency telephone number

(24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 561 1600.

SECTION 2: HAZARDS IDENTIFICATION

2.1. Classification of the substance or mixture

Classification (1999/45/EEC) Not classified.

2.2. Label elements

Risk Phrases

NC Not classified.

Safety Phrases

NC Not classified.

2.3. Other hazards

Not Classified as PBT/vPvB by current EU criteria.

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

3.2. Mixtures

FATTY ACID DERIVATIVES	60-100%
Classification (EC 1272/2008) Not classified.	Classification (67/548/EEC) Not classified.

HYDROCARBONS, C13-C16, ISOALKANES, CYCLICS, < 2% AROMATICS	30-60%
EC No.: 918-973-3	

Classification (EC 1272/2008)	Classification (67/548/EEC)
Flam. Liq. 4 - H227 EUH066 Asp. Tox. 1 - H304	Xn;R65. R66.

The Full Text for all R-Phrases and Hazard Statements are Displayed in Section 16.

Composition Comments

The data shown is in accordance with the latest EC Directives. The viscosity of this product is high enough that it is not an aspiration risk and the R65 phrase does not apply.

SECTION 4: FIRST AID MEASURES

4.1. Description of first aid measures

Inhalation

Move the exposed person to fresh air at once. If respiratory problems, artificial respiration/oxygen. Get medical attention if any discomfort continues.

Ingestion

Do not induce vomiting. Immediately give a couple of glasses of water or milk, provided the victim is fully conscious. Get medical attention.

Skin contact

Remove contaminated clothing immediately and wash skin with soap and water. Get medical attention promptly if symptoms occur after washing.

Eye contact

Make sure to remove any contact lenses from the eyes before rinsing. Promptly wash eyes with plenty of water while lifting the eye lids. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

Inhalation.

This is unlikely to occur but symptoms similar to those of ingestion may develop.

Ingestion

May cause discomfort if swallowed.

Skin contact

Prolonged skin contact may cause redness and irritation.

Eye contact

May cause temporary eye irritation.

4.3. Indication of any immediate medical attention and special treatment needed

Get medical attention if any discomfort continues.

SECTION 5: FIREFIGHTING MEASURES

5.1. Extinguishing media

Extinguishing media

Water spray, foam, dry powder or carbon dioxide.

5.2. Special hazards arising from the substance or mixture

Hazardous combustion products

When heated, vapours/gases hazardous to health may be formed.

5.3. Advice for firefighters

Special Fire Fighting Procedures

Containers close to fire should be removed immediately or cooled with water.

Protective equipment for fire-fighters

Self contained breathing apparatus and full protective clothing must be worn in case of fire.

SECTION 6: ACCIDENTAL RELEASE MEASURES

6.1. Personal precautions, protective equipment and emergency procedures

Wear protective clothing as described in Section 8 of this safety data sheet.

6.2. Environmental precautions

Do not allow to enter drains, sewers or watercourses.

6.3. Methods and material for containment and cleaning up

Stop leak if possible without risk. Dike far ahead of larger spills for later disposal. Absorb spillage with suitable absorbent material. Shovel into dry containers. Cover and move the containers. Flush the area with water.

6.4. Reference to other sections

Wear protective clothing as described in Section 8 of this safety data sheet.

SECTION 7: HANDLING AND STORAGE

7.1. Precautions for safe handling

Avoid spilling, skin and eye contact. Avoid inhalation of vapours and spray mists.

7.2. Conditions for safe storage, including any incompatibilities

Store in tightly closed original container in a dry, cool and well-ventilated place.

7.3. Specific end use(s)

The identified uses for this product are detailed in Section 1.2.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1. Control parameters

Ingredient Comments

Oil mist (mineral) workplace exposure limits are currently under review by legislative authorities. This workplace exposure limit (WEL) standard is applicable to highly refined mineral oils and is provided as a guidance limit only LT. EXP = 5mg/m3 and ST. EXP = 10mg/m3.

FATTY ACID DERIVATIVES

DNEL

Dermal	Long Term	Systemic Effects	741 mg/kg bw/day
Inhalation.	Long Term	Systemic Effects	52.26 mg/m3

8.2. Exposure controls

Protective equipment

Process conditions

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering measures

Provide adequate general and local exhaust ventilation.

Respiratory equipment

No specific recommendation made, but respiratory protection may still be required under exceptional circumstances when excessive air contamination exists. Chemical respirator with organic vapour cartridge.

Hand protection

For prolonged or repeated skin contact use suitable protective gloves. Use protective gloves made of: Cotton Viton rubber (fluor rubber). PVC or rubber gloves are recommended.

Eye protection

Wear approved chemical safety goggles where eye exposure is reasonably probable.

Other Protection

Wear appropriate clothing to prevent any possibility of skin contact. Provide eyewash station.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1. Information on basic physical and chemical properties

Appearance	Liquid
Colour	Amber.
Odour	Slight odour.

Solubility	Insoluble in water
Relative density	0.89 - 0.91 s.g @ 20°C
Viscosity	>7 cSt @ 40°C
Flash point	≥ 79°C (174°F) P/M Pensky-Martens.

9.2. Other information

Not relevant

SECTION 10: STABILITY AND REACTIVITY

10.1. Reactivity

There are no known reactivity hazards associated with this product.

10.2. Chemical stability

Stable under normal temperature conditions and recommended use.

10.3. Possibility of hazardous reactions

Not known.

10.4. Conditions to avoid

Not known.

10.5. Incompatible materials

Materials To Avoid

Not known.

10.6. Hazardous decomposition products

When heated, vapours/gases hazardous to health may be formed.

SECTION 11: TOXICOLOGICAL INFORMATION

11.1. Information on toxicological effects

Acute toxicity:

Acute Toxicity (Oral LD50)

> 2000 mg/kg

*Based on components

Aspiration hazard:

Not anticipated to present an aspiration hazard based on chemical structure.

Inhalation

Gas or vapour in high concentrations may irritate respiratory system.

Ingestion

May cause discomfort if swallowed.

Skin contact

Prolonged and frequent contact may cause redness and irritation.

Eye contact

Spray and vapour in the eyes may cause irritation and smarting.

Route of entry

No route of entry noted.

Target Organs

No specific target organs noted

SECTION 12: ECOLOGICAL INFORMATION

Ecotoxicity

Contact M-I SWACO's QHSE Department for ecological information at env@miswaco.slb.com.

12.1. Toxicity

Acute Fish Toxicity

Not considered toxic to fish.

12.2. Persistence and degradability

Degradability

There are no data on the degradability of this product.

12.3. Bioaccumulative potential

Bioaccumulative potential

No data available on bioaccumulation.

12.4. Mobility in soil

Mobility:

The product is insoluble in water.

12.5. Results of PBT and vPvB assessment

Not Classified as PBT/vPvB by current EU criteria.

12.6. Other adverse effects

None known.

SECTION 13: DISPOSAL CONSIDERATIONS

13.1. Waste treatment methods

Recover and reclaim or recycle, if practical. Dispose of waste and residues in accordance with local authority requirements.

SECTION 14: TRANSPORT INFORMATION

General The product is not covered by international regulation on the transport of dangerous goods (IMDG, IATA, ADR/RID).

14.1. UN number

Not applicable.

14.2. UN proper shipping name

Not applicable.

14.3. Transport hazard class(es)

Not applicable.

14.4. Packing group

Not applicable.

14.5. Environmental hazards

Environmentally Hazardous Substance/Marine Pollutant

No.

14.6. Special precautions for user

Not applicable.

14.7. Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code

Not applicable.

SECTION 15: REGULATORY INFORMATION

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

Uk Regulatory References

Chemicals (Hazard Information & Packaging) Regulations. Control of Substances Hazardous to Health Regulations 2002 (as amended) Workplace Exposure Limits EH40.

EU Legislation

Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC, including amendments.

15.2. Chemical Safety Assessment

International Chemical Inventories

Contact REACH@miswaco.slb.com for REACH information. Complies with the following national/regional chemical inventory requirements: Australia (AICS), Canada (DSL / NDSL), China (IECSC), Europe (EINECS / ELINCS), Japan (METI / ENCS), Korea (TCCL / ECL), New Zealand (NZIoC), Phillipines (PICCS), United States (TSCA).

SECTION 16: OTHER INFORMATION

Abbreviations and acronyms used in the safety data sheet

*a mark of M-I L.L.C.

General information

HMIS Health -1 HMIS Flammability - 2 HMIS Physical Hazard - 0 J - Splash Goggles, Gloves, Synthetic Apron, Dust and Vapour Respirator.

Information Sources

Product information provided by the commercial vendor(s). Material Safety Data Sheet, Misc. manufacturers. LOLI. European Chemicals Bureau - ESIS (European Chemical Substances Information).

Revision Comments

General revision. The following sections have been revised: 3, 9 Compiled or revised by Sandra McWilliam

Issued By	Bill Cameron
Revision Date	03-Sept-12
Revision	5
Supersedes date	17-Dec-09
SDS No.	10396

Risk Phrases In Full

R65	Harmful: may cause lung damage if swallowed.
NC	Not classified.
R66	Repeated exposure may cause skin dryness or cracking.

Hazard Statements In Full

EUH066	Repeated exposure may cause skin dryness or cracking.
H227	Combustible liquid.
H304	May be fatal if swallowed and enters airways.

MATERIAL SAFETY DATA SHEET

MSDS No. 10648 **Trade Name:** VERSATROL* **Revision Date:** 04/23/2012

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Trade Name: VERSATROL*

Chemical Family: Naturally occuring mineral.
Product Use: Drilling fluid additive. Fluid loss reducer.

Supplied by: M-I L.L.C.
P.O. Box 42842
Houston, TX 77242
www.miswaco.slb.com
Telephone Number: 281-561-1509
Emergency Telephone (24 hr.): 281-561-1600
Prepared by: Product Safety Group

Revision No. 8

HMIS Rating
Health: 2 **Flammability:** 1 **Physical Hazard:** 0 **PPE:** E

4=Severe, 3=Serious, 2=Moderate, 1=Slight, 0=Minimal Hazard. *Chronic effects - See Section 11. See Section 8 for Personal Protective Equipment recommendations.

2. HAZARDS IDENTIFICATION

Emergency Overview: Warning! May cause eye, skin, and respiratory tract irritation. May cause skin sensitization, an allergic reaction, on repeated exposure. Long term inhalation of particulates may cause lung damage.

Canadian Classification:
UN PIN No: Not regulated. **WHMIS Class:** D2B

Physical State: Solid **Color:** Black **Odor:** Odorless

Potential Health Effects:
Acute Effects
Eye Contact: May irritate eyes.
Skin Contact: May be irritating to the skin. May cause skin sensitization, an allergic reaction, on repeated exposure. May cause skin photosensitization (sensitivity to light).
Inhalation: May cause respiratory tract irritation.
Ingestion: May cause gastric distress, nausea and vomiting if ingested.

Carcinogenicity & Chronic Effects: See Section 11 - Toxicological Information.
Routes of Exposure: Eyes. Dermal (skin) contact. Inhalation.

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Target Organs/Medical Conditions Aggravated by Overexposure: Eyes. Skin. Respiratory System.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Ingredient	CAS No.	Wt. %	Comments:
Gilsonite	12002-43-6	>95	No comments.

Composition Comments: Component LD50 and LC50 values are provided in Section 11, if available.

4. FIRST AID MEASURES

Eye Contact: Promptly wash eyes with lots of water while lifting eye lids. Look for and remove contact lenses. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

Skin Contact: Wash skin thoroughly with soap and water. Remove contaminated clothing and launder before reuse. Get medical attention if any discomfort continues.

Inhalation: Move person to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Ingestion: Dilute with 2 - 3 glasses of water or milk, if conscious. Never give anything by mouth to an unconscious person. If signs of irritation or toxicity occur seek medical attention.

General notes: Persons seeking medical attention should carry a copy of this MSDS with them.

5. FIRE FIGHTING MEASURES

Flammable Properties

Flash Point: F (C): 590F (315C)
Flammable Limits in Air - Lower (%): ND
Flammable Limits in Air - Upper (%): ND
Autoignition Temperature: F (C): 932F (500C)
Explosion Data - Sensitivity to Mechanical Impact: NA
Explosion Data - Sensitivity to Static Discharge: If applicable, information is provided in Section 5 Special Fire-Fighting Procedures, Other Flammable Properties and Section 6 Spill Procedures.
Flammability Class: NA
Extinguishing Media: Use extinguishing media appropriate for surrounding fire.

Protection Of Fire-Fighters:

Special Fire-Fighting Procedures: Do not enter fire area without proper personal protective equipment, including NIOSH/MSHA approved self-contained breathing apparatus. Evacuate area and fight fire from a safe distance. Water spray may be used to keep fire-exposed containers cool. Keep water run off out of sewers and waterways.

Hazardous Combustion Products: Oxides of: Carbon.

RECEIVED: Oct. 17, 2012

Conditions of Flammability: Products are classified as flammable/combustible based on flash point as defined in the Health Canada Controlled Products Regulations, U.S. Occupational Health and Safety Administration Hazard Communication Standard and transportation regulations. See Sections 1, 2, 5, 14 and 15 for flammable/combustible classification information. Flammable/combustible materials may ignite and burn if exposed to a flame or other sources of ignition.
Other Flammable Properties: Particulate may accumulate static electricity. Dusts at sufficient concentrations can form explosive mixtures with air.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions: Use personal protective equipment identified in Section 8.

Spill Procedures: Evacuate the spill area with the exception of the spill response team. Wet product may create a slipping hazard. Contain spilled material. Do not allow spilled material to enter sewers, storm drains or surface waters. Avoid the generation of dust. Sweep, vacuum, or shovel and place into closable container for disposal.

Environmental Precautions: Waste must be disposed of in accordance with federal, state and local laws.

7. HANDLING AND STORAGE

Handling: Put on appropriate personal protective equipment. Avoid contact with skin and eyes. Avoid generating or breathing dust. Product is slippery if wet. Use only with adequate ventilation. Wash thoroughly after handling.

Storage: Store in dry, well-ventilated area. Keep container closed. Store away from incompatibles. Follow safe warehousing practices regarding palletizing, banding, shrink-wrapping and/or stacking.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure Limits (TLV & PEL - 8H TWA):

Ingredient	CAS No.	Wt. %	ACGIH TLV	OSHA PEL	Other	Notes
Gilsonite	12002-43-6	>95	NA	NA	NA	(1)

Notes
(1) Control as an ACGIH particulate not otherwise specified (PNOS): 10 mg/m^3 (Inhalable); 3 mg/m^3 (Respirable) and an OSHA particulate not otherwise regulated (PNOR): 15 mg/m^3 (Total); 5 mg/m^3 (Respirable).

Engineering Controls: Use appropriate engineering controls such as, exhaust ventilation and process enclosure, to ensure air contamination and keep workers exposure below the applicable limits.

Personal Protection Equipment

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Eye/Face Protection: Dust resistant safety goggles.

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Skin Protection: Wear appropriate clothing to prevent repeated or prolonged skin contact. Chemical resistant gloves recommended for prolonged or repeated contact. Use protective gloves made of: Nitrile. Polyvinylchloride (PVC). Natural rubber.

Respiratory Protection: All respiratory protection equipment should be used within a comprehensive respiratory protection program that meets the requirements of 29 CFR 1910.134 (U.S. OSHA Respiratory Protection Standard) or local equivalent.

If exposed to airborne particles of this product use at least a NIOSH-approved N95 half-mask disposable or re-useable particulate respirator. In work environments containing oil mist/aerosol use at least a NIOSH-approved P95 half-mask disposable or re-useable particulate respirator.

General Hygiene Considerations: Work clothes should be washed separately at the end of each work day. Disposable clothing should be discarded, if contaminated with product.

9. PHYSICAL AND CHEMICAL PROPERTIES

Color:	Black
Odor:	Odorless
Physical State:	Solid
pH:	ND
Specific Gravity (H2O = 1):	1.04 - 1.06
Solubility (Water):	ND
Flash Point: F (C):	590F (315C)
Melting/Freezing Point:	ND
Boiling Point:	ND
Vapor Pressure:	NA
Vapor Density (Air=1):	NA
Evaporation Rate:	NA
Octanol/Water Partition Coefficient:	ND
Odor Threshold(s):	ND

10. STABILITY AND REACTIVITY

Chemical Stability:	Stable
Conditions to Avoid:	Keep away from heat, sparks and flame. Excessive heat.
Materials to Avoid:	Oxidizers.
Conditions of Reactivity:	See Conditions and Materials to Avoid, if applicable.
Hazardous Decomposition Products:	For thermal decomposition products, see Section 5.
Hazardous Polymerization	Will not occur

11. TOXICOLOGICAL INFORMATION

Acute Exposure Effects, Irritation and Sensitization: See Section 2.
Chronic, Carcinogenicity, Reproductive Toxicity, Teratogenicity, Embryotoxicity, Mutagenicity Effects: See Component Toxicological Summary and Product Toxicological Information, if available.
Synergistic Products/Effects: ND

Component Toxicological Data: Any adverse component toxicological effects and acute toxicity values (LD50s, LC50s) are listed below. If no effects or acute values are listed for components, no such data were identified.

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Ingredient	Component Toxicological Summary
Gilsonite	No significant health effects were observed in a chronic feeding study conducted for the National Toxicology Program (NTP) where mice and rats were fed diets containing either 2% or 4% Gilsonite for their lifetimes. In another study, 10% Gilsonite in benzene was applied 3 times a week for 80 weeks to the skin of mice and caused no significant increase in skin cancer. Gilsonite distilled at ~2500F (1370C) and dissolved in benzene was carcinogenic to mice when applied 3 times a week for 80 weeks. Gilsonite is not carcinogenic. Processes in which Gilsonite is brought to very high temperatures, however, may alter its structure and may produce carcinogenic substances. Gilsonite heated to 550F (288C) and then cooled was not mutagenic in the Ames assay. Gilsonite heated to 650F (343C) and cooled was mutagenic in the Ames assay. The National Institute for Occupational Safety and Health (NIOSH) was unable to detect polynuclear aromatic hydrocarbons in Gilsonite. Long term inhalation exposure to this particulate may cause a benign pneumoconiosis (irritation caused by dust inhalation which may lead to fibrosis (formation of fibrous tissue)). (NIOSH, HazardText) Prolonged and repeated inhalation of particulate may lead to pulmonary fibrosis, chronic bronchitis, emphysema and bronchial asthma.

Product Toxicological Information: Long term inhalation of particulate can cause irritation, inflammation and/or permanent injury to the lungs. Illnesses such as pneumoconiosis ("dusty lung"), pulmonary fibrosis, chronic bronchitis, emphysema and bronchial asthma may develop.

12. ECOLOGICAL INFORMATION

Component Ecotoxicity Data: Component ecotoxicity data are listed below. If no data are listed, none were found in the component review.

Product Ecotoxicity Data: Contact M-I Environmental Affairs Department for available product ecotoxicity data.
Biodegration: ND
Bioaccumulation: ND

13. DISPOSAL CONSIDERATIONS

Waste Classification: ND

Waste Management: Under U.S. Environmental Protection Agency (EPA) Resource Conservation and Recovery Act (RCRA), it is the responsibility of the user to determine at the time of disposal, whether the product meets RCRA criteria for the hazardous waste. This is because product uses, transformations, mixtures, processes, etc., may render the resulting materials hazardous. Empty containers retain residues. All labeled precautions must be observed.

Disposal Method: Recover and reclaim or recycle, if practical. Should this product become a waste, dispose of in a permitted industrial landfill. Ensure that the containers are empty by the RCRA criteria prior to disposal in a permitted industrial landfill.

14. TRANSPORT INFORMATION

U.S. DOT
Shipping Description: Not regulated for transportation by DOT, TDG, IMDG, ICAO/IATA.

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MATERIAL SAFETY DATA SHEET

Trade Name: VERSATROL*

Canada TDG Shipping Description:	Not regulated.
UN PIN No:	Not regulated.
IMDG Shipping Description:	Not regulated.
ICAO/IATA Shipping Description:	Not regulated.

15. REGULATORY INFORMATION

U.S. Federal and State Regulations

SARA 311/312 Hazard Catagories: Immediate (acute) health hazard.

SARA 302/304, 313; CERCLA RQ, California Proposition 65: Note: If no components are listed below, this product is not subject to the referenced SARA and CERCLA regulations and is not known to contain a Proposition 65 listed chemical at a level that is expected to pose a significant risk under anticipated use conditions.

International Chemical Inventories

Australia AICS - Components are listed or exempt from listing.
Canada DSL - Components are listed or exempt from listing.
China Inventory - Components are listed or exempt from listing.
European Union EINECS/ELINCS - Components are listed or exempt from listing.
Japan METI ENCS - Components are listed or exempt from listing.
Korea TCCL ECL - Components are listed or exempt from listing.
New Zealand - Components are listed or exempt from listing.
Philippine PICCS - Components are listed or exempt from listing.
U.S. TSCA - Components are listed or exempt from listing.
U.S. TSCA - No components are subject to TSCA 12(b) export notification requirements.

Canadian Classification:

Controlled Products Regulations Statement: This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

WHMIS Class: D2B

16. OTHER INFORMATION

The following sections have been revised: 1, 3, 4, 6, 8, 9, 10, 11, 12, 14, 15, 16.

NA - Not Applicable, ND - Not Determined.

*A mark of M-I L.L.C.

Disclaimer:
MSDS furnished independent of product sale. While every effort has been made to accurately describe this product, some of the data are obtained from sources beyond our direct supervision. We can not make any assertions as to its reliability or completeness; therefore, user may rely on it only at user´s risk. We have made no effort to censor or conceal deleterious aspects of this product. Since we cannot anticipate or control the conditions under which this information and product may be used, we make no guartantee that the precautions we have suggested will be adequate for all individuals and/or situations. It is the obligation of each user of this product to comply with the requirements of all applicable laws regarding use and disposal of this product. Additional information will be furnished upon request to assist the user; however, no warranty, either expressed or implied, nor liability of any nature with respect to this product or to the data herein is made or incurred hereunder.

RECEIVED: Oct. 17, 2012

MATERIAL SAFETY DATA SHEET

MSDS No. 10170 **Trade Name:** VERSAWET* **Revision Date:** 04/25/2012

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Trade Name: VERSAWET*

Chemical Family: Mixture
Product Use: Drilling fluid additive.

Supplied by: M-I L.L.C.
P.O. Box 42842
Houston, TX 77242
www.miswaco.slb.com
Telephone Number: 281-561-1509
Emergency Telephone (24 hr.): 281-561-1600
Prepared by: Product Safety Group

Revision No. 7

HMIS Rating
Health: 1 **Flammability:** 1 **Physical Hazard:** 0 **PPE:** J

4=Severe, 3=Serious, 2=Moderate, 1=Slight, 0=Minimal Hazard. *Chronic effects - See Section 11. See Section 8 for Personal Protective Equipment recommendations.

2. HAZARDS IDENTIFICATION

Emergency Overview: Caution! May cause eye, skin and respiratory tract irritation.

Canadian Classification:
UN PIN No: Not regulated. **WHMIS Class:** D2B

Physical State: Liquid **Color:** Dark Amber **Odor:** Fatty Acid

Potential Health Effects:
Acute Effects
Eye Contact: May irritate eyes.
Skin Contact: May be irritating to the skin.
Inhalation: Vapors or mists may be irritating to the respiratory tract.
Ingestion: May cause gastric distress, nausea and vomiting if ingested.

Carcinogenicity & Chronic Effects: See Section 11 - Toxicological Information.
Routes of Exposure: Eyes. Dermal (skin) contact. Inhalation.
Target Organs/Medical Conditions Aggravated by Overexposure: Eyes. Skin. Respiratory System.

RECEIVED: Oct. 17, 2012

3. COMPOSITION/INFORMATION ON INGREDIENTS

Ingredient	CAS No.	Wt. %	Comments:
Tall oil, polymerized, oxidized	68815-17-8	100	No comments.

Composition Comments: Component LD50 and LC50 values are provided in Section 11, if available.

4. FIRST AID MEASURES

Eye Contact: Promptly wash eyes with lots of water while lifting eye lids. Look for and remove contact lenses. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

Skin Contact: Wash skin thoroughly with soap and water. Remove contaminated clothing and launder before reuse. Get medical attention if any discomfort continues.

Inhalation: Move person to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Ingestion: Dilute with 2 - 3 glasses of water or milk, if conscious. Never give anything by mouth to an unconscious person. If signs of irritation or toxicity occur seek medical attention.

General notes: Persons seeking medical attention should carry a copy of this MSDS with them.

5. FIRE FIGHTING MEASURES

Flammable Properties

Flash Point: F (C): >201F (94C)
Flash Point Method: PMCC
Flammable Limits in Air - Lower (%): ND
Flammable Limits in Air - Upper (%): ND
Autoignition Temperature: F (C): ND
Explosion Data - Sensitivity to Mechanical Impact: NA
Explosion Data - Sensitivity to Static Discharge: If applicable, information is provided in Section 5 Special Fire-Fighting Procedures, Other Flammable Properties and Section 6 Spill Procedures.
Flammability Class: IIIB
Extinguishing Media: Water fog, carbon dioxide, foam, dry chemical.

Protection Of Fire-Fighters:

Special Fire-Fighting Procedures: Do not enter fire area without proper personal protective equipment, including NIOSH/MSHA approved self-contained breathing apparatus. Evacuate area and fight fire from a safe distance. Water spray may be used to keep fire-exposed containers cool. Keep water run off out of sewers and waterways.

Hazardous Combustion Products: Oxides of: Carbon.

Conditions of Flammability: Products are classified as flammable/combustible based on flash point as defined in the Health Canada Controlled Products Regulations, U.S. Occupational Health and Safety Administration Hazard Communication Standard and transportation regulations. See Sections 1, 2, 5, 14 and 15 for flammable/combustible classification information. Flammable/combustible materials may ignite and burn if exposed to a flame or other sources of ignition.
Other Flammable Properties: ND

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions: Use personal protective equipment identified in Section 8.

Spill Procedures: Evacuate the spill area with the exception of the spill response team. Keep personnel removed and upwind of spill. Extinguish all ignition sources. Avoid sparks, flames, heat and smoking. Shut off leak if it can be done safely. Contain spilled material. Do not allow spilled material to enter sewers, storm drains or surface waters. Absorb in vermiculite, dry sand or earth. Place into containers for disposal.

Environmental Precautions: Waste must be disposed of in accordance with federal, state and local laws. In the U.S., for products with reportable quanitity (RQ) components - if the RQ is exceeded, report to National Spill Response Office at 1 800 424 8802.

7. HANDLING AND STORAGE

Handling: Put on appropriate personal protective equipment. Avoid contact with skin and eyes. Avoid breathing vapors or spray mists. Use only in a well ventilated area. Wash thoroughly after handling.

Storage: Store in dry, well-ventilated area. Keep container closed. Keep away from heat, sparks and flames. Store away from incompatibles.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure Limits (TLV & PEL - 8H TWA):

Ingredient	CAS No.	Wt. %	ACGIH TLV	OSHA PEL	Other	Notes
Tall oil, polymerized, oxidized	68815-17-8	100	NA	NA	NA	(3) Oil mist.

Notes
(3) For Oil mist, mineral: ACGIH TLV 5 mg/m^3, STEL 10 mg/m^3; OSHA PEL 5 mg/m^3

Engineering Controls: Local exhaust ventilation as necessary to maintain exposures to within applicable limits.

Personal Protection Equipment

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Eye/Face Protection: Wear chemical safety goggles.

Skin Protection: Wear appropriate clothing to prevent repeated or prolonged skin contact. Wear chemical resistant gloves such as nitrile or neoprene.

RECEIVED: Oct. 17, 2012

Respiratory Protection: All respiratory protection equipment should be used within a comprehensive respiratory protection program that meets the requirements of 29 CFR 1910.134 (U.S. OSHA Respiratory Protection Standard) or local equivalent.

If exposed to airborne mist/aerosol of this product, use an organic vapor cartridge with a P-95 pre-filter attached. In work environments containing oil mist/aerosol, use an organic vapor cartridge with a P-95 pre-filter attached.

If exposed to vapors from this product, use a NIOSH/MSHA-approved respirator with an organic vapor cartridge.

General Hygiene Considerations: Work clothes should be washed separately at the end of each work day. Disposable clothing should be discarded, if contaminated with product.
"Safe Handling Guide for Oil-Base and Synthetic-Base Fluid Systems" pamphlet is available from M-I's Occupational Health Department.

9. PHYSICAL AND CHEMICAL PROPERTIES

Color:	Dark Amber
Odor:	Fatty Acid
Physical State:	Liquid
pH:	ND
Specific Gravity (H2O = 1):	0.9496 g/cc at 68F (20C)
Solubility (Water):	Soluble
Flash Point: F (C):	>201F (94C)
Melting/Freezing Point:	ND
Boiling Point:	>500F (260C)
Vapor Pressure:	ND
Vapor Density (Air=1):	>1
Evaporation Rate:	ND
Octanol/Water Partition Coefficient:	ND
Odor Threshold(s):	ND

10. STABILITY AND REACTIVITY

Chemical Stability:	Stable
Conditions to Avoid:	Keep away from heat, sparks and flame.
Materials to Avoid:	Oxidizers.
Conditions of Reactivity:	See Conditions and Materials to Avoid, if applicable.
Hazardous Decomposition Products:	For thermal decomposition products, see Section 5.
Hazardous Polymerization	Will not occur

11. TOXICOLOGICAL INFORMATION

Acute Exposure Effects, Irritation and Sensitization: See Section 2.
Chronic, Carcinogenicity, Reproductive Toxicity, Teratogenicity, Embryotoxicity, Mutagenicity Effects: See Component Toxicological Summary and Product Toxicological Information, if available.
Synergistic Products/Effects: ND

Component Toxicological Data: Any adverse component toxicological effects and acute toxicity values (LD50s, LC50s) are listed below. If no effects or acute values are listed for components, no such data were identified.

Product Toxicological Information: No toxicological data is available for this product.

12. ECOLOGICAL INFORMATION

Component Ecotoxicity Data: Component ecotoxicity data are listed below. If no data are listed, none were found in the component review.

Product Ecotoxicity Data: Contact M-I Environmental Affairs Department for available product ecotoxicity data.
Biodegration: ND
Bioaccumulation: ND

13. DISPOSAL CONSIDERATIONS

Waste Classification: ND

Waste Management: Under U.S. Environmental Protection Agency (EPA) Resource Conservation and Recovery Act (RCRA), it is the responsibility of the user to determine at the time of disposal, whether the product meets RCRA criteria for the hazardous waste. This is because product uses, transformations, mixtures, processes, etc., may render the resulting materials hazardous. Empty containers retain residues. All labeled precautions must be observed.

Disposal Method: Recover and reclaim or recycle, if practical. Should this product become a waste, dispose of in a permitted industrial landfill. Ensure that the containers are empty by the RCRA criteria prior to disposal in a permitted industrial landfill.

14. TRANSPORT INFORMATION

U.S. DOT
Shipping Description: Not regulated for transportation by DOT, TDG, IMDG, ICAO/IATA.

Canada TDG Shipping Description: Not regulated.
UN PIN No: Not regulated.
IMDG Shipping Description: Not regulated.
ICAO/IATA Shipping Description: Not regulated.

15. REGULATORY INFORMATION

U.S. Federal and State Regulations

SARA 311/312 Hazard Catagories: Immediate (acute) health hazard.

SARA 302/304, 313; CERCLA RQ, California Proposition 65: Note: If no components are listed below, this product is not subject to the referenced SARA and CERCLA regulations and is not known to contain a Proposition 65 listed chemical at a level that is expected to pose a significant risk under anticipated use conditions.

International Chemical Inventories

Australia AICS - Components are listed or exempt from listing.
Canada DSL - Contains a component(s) that is listed on the NDSL.
China Inventory - Contains a component that is not listed.
European Union EINECS/ELINCS - Components are listed or exempt from listing.
Japan METI ENCS - Contains a component that is not listed.
Korea TCCL ECL - Components are listed or exempt from listing.
New Zealand - Contains a component that is not listed.
Philippine PICCS - Contains a component that is not listed.
U.S. TSCA - Components are listed or exempt from listing.
U.S. TSCA - No components are subject to TSCA 12(b) export notification requirements.

Canadian Classification:

Controlled Products Regulations Statement: This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

WHMIS Class: D2B

16. OTHER INFORMATION

The following sections have been revised: 1, 2, 4, 16. Format changes.

NA - Not Applicable, ND - Not Determined.

*A mark of M-I L.L.C.

Disclaimer:
MSDS furnished independent of product sale. While every effort has been made to accurately describe this product, some of the data are obtained from sources beyond our direct supervision. We can not make any assertions as to its reliability or completeness; therefore, user may rely on it only at user´s risk. We have made no effort to censor or conceal deleterious aspects of this product. Since we cannot anticipate or control the conditions under which this information and product may be used, we make no guartantee that the precautions we have suggested will be adequate for all individuals and/or situations. It is the obligation of each user of this product to comply with the requirements of all applicable laws regarding use and disposal of this product. Additional information will be furnished upon request to assist the user; however, no warranty, either expressed or implied, nor liability of any nature with respect to this product or to the data herein is made or incurred hereunder.

SAFETY DATA SHEET
VG-PLUS

1 IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

PRODUCT NAME	VG-PLUS
APPLICATION	Invert emulsion drilling fluid.
SUPPLIER	M-I SWACO A Schlumberger Company Endeavour Drive Arnhall Business Park, Westhill Aberdeen AB32 6UF Scotland UK T = +44 (0)1224-742200 F = +44 (0)1224-742288 E-mail = MBXMSDS-EH@miswaco.slb.com
EMERGENCY TELEPHONE	(24 Hour) Europe +44 (0) 1235 239 670, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Middle East and Africa +44 (0) 1235 239 671, Australia +61 2801 44558.

2 HAZARDS IDENTIFICATION

CLASSIFICATION (EC 1272/2008)

Physical	Not classified.
Health	Not classified.
Environmental	Not classified.

HUMAN HEALTH

This product contains a small quantity of quartz, crystalline silica. IARC Monographs, Vol 68, 1997, concludes that there is sufficient evidence that inhaled crystalline silica in the form of quartz or crystobalite from occupational sources causes cancer in humans. IARC classification Group 1. Because of quantity and composition, the health hazard is small.

3 COMPOSITION/INFORMATION ON INGREDIENTS

BENTONITE COMPOUND	60-100%
CLASSIFICATION (67/548) -	

QUARTZ, CRYSTALLINE SILICA	<5%
CAS-No.: 14808-60-7 EC No.: 238-878-4	
CLASSIFICATION (EC 1272/2008) STOT Rep. 2 - H373	CLASSIFICATION (67/548) Xn;R48/20.

The Full Text for all R-Phrases and Hazard Statements are Displayed in Section 16

COMPOSITION COMMENTS

The data shown is in accordance with the latest EC Directives. This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis. Because of quantity and composition, the health hazard is small.

4 FIRST-AID MEASURES

INHALATION

Move the exposed person to fresh air at once. If respiratory problems, artificial respiration/oxygen. Get medical attention if any discomfort continues.

INGESTION

Immediately give a couple of glasses of water or milk, provided the victim is fully conscious. Get medical attention if any discomfort continues.

SKIN CONTACT

Remove contaminated clothing immediately and wash skin with soap and water. Get medical attention promptly if symptoms occur after washing.

EYE CONTACT

Make sure to remove any contact lenses from the eyes before rinsing. Promptly wash eyes with plenty of water while lifting the eye lids. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

5 FIRE-FIGHTING MEASURES

EXTINGUISHING MEDIA

Use fire-extinguishing media appropriate for surrounding materials.

SPECIAL FIRE FIGHTING PROCEDURES

Containers close to fire should be removed immediately or cooled with water.

UNUSUAL FIRE & EXPLOSION HAZARDS

High concentrations of dust may form explosive mixture with air.

SPECIFIC HAZARDS

Fire or high temperatures create: Vapours/gases/fumes of: Oxides of: Carbon. Hydrogen. Hydrogen chloride (HCl).

PROTECTIVE MEASURES IN FIRE

Self contained breathing apparatus and full protective clothing must be worn in case of fire.

6 ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS

Wear protective clothing as described in Section 8 of this safety data sheet.

ENVIRONMENTAL PRECAUTIONS

Do not allow to enter drains, sewers or watercourses.

SPILL CLEAN UP METHODS

Avoid generation and spreading of dust. Shovel into dry containers. Cover and move the containers. Flush the area with water. In case of spills, beware of slippery floors and surfaces.

7 HANDLING AND STORAGE

USAGE PRECAUTIONS

Avoid inhalation of dust and contact with skin and eyes. Avoid handling which leads to dust formation.

STORAGE PRECAUTIONS

Store in tightly closed original container in a dry, cool and well-ventilated place.

8 EXPOSURE CONTROLS/PERSONAL PROTECTION

Name	Std	TWA - 8 hrs		STEL - 15 min		Notes
QUARTZ, CRYSTALLINE SILICA	WEL		0,1 mg/m3			

WEL = Workplace Exposure Limit.

PROTECTIVE EQUIPMENT

ENGINEERING MEASURES

Provide adequate general and local exhaust ventilation.

RESPIRATORY EQUIPMENT

No specific recommendation made, but respiratory protection may still be required under exceptional circumstances when excessive air contamination exists. Dust filter P3 (for especially fine dust/powder).

HAND PROTECTION

For prolonged or repeated skin contact use suitable protective gloves. Neoprene. Nitrile. or Rubber gloves are recommended.

EYE PROTECTION

Wear approved chemical safety goggles where eye exposure is reasonably probable.

OTHER PROTECTION

Wear appropriate clothing to prevent any possibility of skin contact. Provide eyewash station.

9 PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE	Powder, dust		
COLOUR	Off-white		
ODOUR	Slight odour		
SOLUBILITY	Insoluble in water		
RELATIVE DENSITY	1.4 - 1.8 s.g @ 20°C	DECOMPOSITION TEMPERATURE (°C)	200°C

10 STABILITY AND REACTIVITY

STABILITY

Stable under normal temperature conditions and recommended use.

HAZARDOUS DECOMPOSITION PRODUCTS

Fire or high temperatures create: Vapours/gases/fumes of: Oxides of: Carbon. Hydrogen. Hydrogen chloride (HCl).

11 TOXICOLOGICAL INFORMATION

INHALATION

Dust in high concentrations may irritate the respiratory system.

INGESTION

May cause discomfort if swallowed.

SKIN CONTACT

Prolonged and frequent contact may cause redness and irritation.

EYE CONTACT

Particles in the eyes may cause irritation and smarting.

12 ECOLOGICAL INFORMATION

ECOTOXICITY

Contact M-I SWACO's QHSE Department for ecological information at env@miswaco.com.

13 DISPOSAL CONSIDERATIONS

DISPOSAL METHODS

Recover and reclaim or recycle, if practical. Dispose of waste and residues in accordance with local authority requirements.

14 TRANSPORT INFORMATION

GENERAL	The product is not covered by international regulation on the transport of dangerous goods (IMDG, IATA, ADR/RID).

15 REGULATORY INFORMATION

UK REGULATORY REFERENCES

Chemicals (Hazard Information & Packaging) Regulations. Control of Substances Hazardous to Health Regulations 2002 (as amended) Workplace Exposure Limits EH40.

EU DIRECTIVES

Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC, including amendments.

INTERNATIONAL CHEMICAL INVENTORIES

Contact REACH@miswaco.com for REACH information. Complies with the following national/regional chemical inventory requirements: AICS, DSL / NDSL, IECSC, EINECS / ELINCS, TCCL ECL, NZIoC, PICCS, TSCA

16 OTHER INFORMATION

GENERAL INFORMATION

HMIS Health -1 HMIS Flammability - 1 HMIS Physical Hazard - 0 E - Safety glasses, Gloves, Dust Respirator

VG-PLUS

INFORMATION SOURCES

Product information provided by the commercial vendor(s). Material Safety Data Sheet, Misc. manufacturers. LOLI. European Chemicals Bureau - ESIS (European Chemical Substances Information).

REVISION COMMENTS

Updated according to CLP. Compiled or Revised by Ewan MacLeod

ISSUED BY

Bill Cameron

REVISION DATE	15-12-10
REV. NO./REPL. SDS GENERATED	4
SDS NO.	10459

RISK PHRASES IN FULL

R48/20	Harmful: danger of serious damage to health by prolonged exposure through inhalation.

HAZARD STATEMENTS IN FULL

H373	May cause damage to organs <<Organs>> through prolonged or repeated exposure.

RECEIVED: Oct. 17, 2012

Revision Date: 19-05-11 SDS No. 11070

Revision: 5

Supersedes Date: 22-09-10

SAFETY DATA SHEET
VG-SUPREME*

SECTION 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

1.1. Product identifier

Product Name VG-SUPREME*

1.2. Relevant identified uses of the substance or mixture and uses advised against

Identified uses Invert emulsion drilling fluid. Viscosifier

1.3. Details of the supplier of the safety data sheet

Supplier:

M-I SWACO
A Schlumberger Company
Endeavour Drive
Arnhall Business Park, Westhill
Aberdeen AB32 6UF
Scotland UK
T = +44 (0)1224-742200
F = +44 (0)1224-742288
E-mail = MBXMSDS-EH@miswaco.slb.com

1.4. Emergency telephone number

(24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, USA 001 281 561 1600.

SECTION 2: HAZARDS IDENTIFICATION

2.1. Classification of the substance or mixture

Classification (EC 1272/2008)

Physical and Chemical Hazards	Not classified.
Human health	Not classified.
Environment	Not classified.

Classification (1999/45/EEC) Not classified.

Human Health

This product contains a small quantity of quartz, crystalline silica. IARC Monographs, Vol 68, 1997, concludes that there is sufficient evidence that inhaled crystalline silica in the form of quartz or crystobalite from occupational sources causes cancer in humans. IARC classification Group 1. Because of quantity and composition, the health hazard is small.

2.2. Label elements

Label In Accordance With (EC) No. 1272/2008

Not classified.

2.3. Other hazards

Not Classified as PBT/vPvB by current EU criteria.

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

3.2. Mixtures

ORGANOPHILLIC CLAY	60-100%

Classification (EC 1272/2008) Not classified.	Classification (67/548/EEC) Not classified.

QUARTZ, CRYSTALLINE SILICA		<1%
CAS-No.: 14808-60-7	EC No.: 238-878-4	
Classification (EC 1272/2008) STOT Rep. 2 - H373	Classification (67/548/EEC) Xn;R48/20.	

The Full Text for all R-Phrases and Hazard Statements is Displayed in Section 16

Composition Comments

The data shown is in accordance with the latest EC Directives. This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis. Because of quantity and composition, the health hazard is small.

SECTION 4: FIRST AID MEASURES

4.1. Description of first aid measures

Inhalation.

Move the exposed person to fresh air at once. If respiratory problems, artificial respiration/oxygen. Get medical attention if any discomfort continues.

Ingestion

Immediately give a couple of glasses of water or milk, provided the victim is fully conscious. Get medical attention if any discomfort continues.

Skin Contact

Remove contaminated clothing immediately and wash skin with soap and water. Get medical attention promptly if symptoms occur after washing.

Eye Contact

Make sure to remove any contact lenses from the eyes before rinsing. Promptly wash eyes with plenty of water while lifting the eye lids. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

Inhalation.

Irritation of nose, throat and airway.

Ingestion

May cause discomfort if swallowed.

Skin Contact

Prolonged skin contact may cause redness and irritation.

Eye Contact

May cause temporary eye irritation.

4.3. Indication of any immediate medical attention and special treatment needed

Get medical attention if any discomfort continues.

SECTION 5: FIREFIGHTING MEASURES

5.1. Extinguishing media

Extinguishing Media

Water spray, carbon dioxide, dry powder or polar resistant foam.

5.2. Special hazards arising from the substance or mixture

Hazardous Combustion Products

Fire or high temperatures create: Vapours/gases/fumes of: Hydrogen chloride (HCl). Carbon monoxide (CO). Carbon dioxide (CO_2). Nitrous gases (NOx).

Unusual Fire & Explosion Hazards

High concentrations of dust may form explosive mixture with air.

5.3. Advice for firefighters

Special Fire Fighting Procedures

Containers close to fire should be removed immediately or cooled with water.

Protective Measures In Fire

Self contained breathing apparatus and full protective clothing must be worn in case of fire.

SECTION 6: ACCIDENTAL RELEASE MEASURES

6.1. Personal precautions, protective equipment and emergency procedures

Wear protective clothing as described in Section 8 of this safety data sheet.

6.2. Environmental precautions

Do not allow to enter drains, sewers or watercourses.

6.3. Methods and material for containment and cleaning up

Avoid generation and spreading of dust. Shovel into dry containers. Cover and move the containers. Flush the area with water. In case of spills, beware of slippery floors and surfaces.

6.4. Reference to other sections

Wear protective clothing as described in Section 8 of this safety data sheet.

SECTION 7: HANDLING AND STORAGE

7.1. Precautions for safe handling

Avoid inhalation of dust and contact with skin and eyes. Avoid handling which leads to dust formation.

7.2. Conditions for safe storage, including any incompatibilities

Store in tightly closed original container in a dry, cool and well-ventilated place. Keep away from heat, sparks and open flame.

7.3. Specific end use(s)

The identified uses for this product are detailed in Section 1.2.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1. Control parameters

Name	STD	TWA - 8 Hrs		STEL - 15 Min		Notes
QUARTZ, CRYSTALLINE SILICA	WEL		0,1 mg/m3			

WEL = Workplace Exposure Limit.

8.2. Exposure controls

Protective Equipment




Engineering Measures

Provide adequate general and local exhaust ventilation.

Respiratory Equipment

No specific recommendation made, but respiratory protection may still be required under exceptional circumstances when excessive air contamination exists. Dust filter P3 (for especially fine dust/powder).

Hand Protection

For prolonged or repeated skin contact use suitable protective gloves. Neoprene. or Nitrile gloves are recommended.

Eye Protection

Wear dust resistant safety goggles where there is danger of eye contact.

Other Protection

Wear appropriate clothing to prevent any possibility of skin contact. Provide eyewash station.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1. Information on basic physical and chemical properties

Appearance	Solid
Colour	Off-white
Odour	Odourless
Solubility	Insoluble in water
Relative Density	1.4 - 1.8 s.g @ 20°C
Auto Ignition Temperature (°C)	190°C (374°F)

9.2. Other information

Not relevant.

SECTION 10: STABILITY AND REACTIVITY

10.1. Reactivity

There are no known reactivity hazards associated with this product.

10.2. Chemical stability

Stable under normal temperature conditions and recommended use.

10.3. Possibility of hazardous reactions

Hazardous Polymerisation

Will not polymerise.

10.4. Conditions to avoid

Avoid heat, flames and other sources of ignition.

10.5. Incompatible materials

Materials To Avoid

Avoid contact with: Strong oxidising substances.

10.6. Hazardous decomposition products

Fire or high temperatures create: Vapours/gases/fumes of: Hydrogen chloride (HCl). Carbon monoxide (CO). Carbon dioxide (CO2). Nitrous gases (NOx).

SECTION 11: TOXICOLOGICAL INFORMATION

11.1. Information on toxicological effects

Inhalation

Dust may irritate respiratory system or lungs.

Ingestion.

May cause discomfort if swallowed.

Skin Contact

Prolonged and frequent contact may cause redness and irritation.

Eye Contact

Particles in the eyes may cause irritation and smarting.

Route of entry

No route of entry noted.

Target Organs

No specific target organs noted.

SECTION 12: ECOLOGICAL INFORMATION

Ecotoxicity:

Contact M-I SWACO's QHSE Department for ecological information at env@miswaco.com.

12.1. Toxicity

Acute Fish Toxicity

Not considered toxic to fish.

12.2. Persistence and degradability

Degradability:

There are no data on the degradability of this product.

12.3. Bioaccumulative potential

Bioaccumulative Potential:

No data available on bioaccumulation.

12.4. Mobility in soil

Mobility:

The product is insoluble in water.

12.5. Results of PBT and vPvB assessment

Not Classified as PBT/vPvB by current EU criteria.

12.6. Other adverse effects

None known.

SECTION 13: DISPOSAL CONSIDERATIONS

13.1. Waste treatment methods

Recover and reclaim or recycle, if practical. Dispose of waste and residues in accordance with local authority requirements.

SECTION 14: TRANSPORT INFORMATION

General	The product is not covered by international regulation on the transport of dangerous goods (IMDG, IATA, ADR/RID).

14.1. UN number

Not applicable.

14.2 UN Proper shipping name

Not applicable.

14.3 Transport hazard class(es)

Not applicable.

14.4. Packing group

Not applicable.

14.5. Environmental hazards

Environmentally Hazardous Substance/Marine Pollutant

No.

14.6. Special precautions for user

Not applicable.

14.7. Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code

Not applicable.

SECTION 15: REGULATORY INFORMATION

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

Uk Regulatory References

Chemicals (Hazard Information & Packaging) Regulations. Control of Substances Hazardous to Health Regulations 2002 (as amended) Workplace Exposure Limits EH40.

EU Legislation

Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC, including amendments.

15.2. Chemical Safety Assessment

International Chemical Inventories

Contact REACH@miswaco.com for REACH information. Complies with the following national/regional chemical inventory requirements: AICS, DSL / NDSL, IECSC, EINECS / ELINCS, TCCL ECL, NZIoC, PICCS, TSCA,

SECTION 16: OTHER INFORMATION

Abbreviations And Acronyms Used In The Safety Data Sheet

*a mark of M-I L.L.C.

General Information

HMIS Health -1 HMIS Flammability - 0 HMIS Physical Hazard - 0 E - Safety glasses, Gloves, Dust Respirator

Information Sources

Product information provided by the commercial vendor(s). Material Safety Data Sheet, Misc. manufacturers. LOLI. European Chemicals Bureau - ESIS (European Chemical Substances Information).

Revision Comments

General revision. Compiled or Revised by Ewan MacLeod

Issued By	Bill Cameron
Revision Date	19-05-11
Revision	5
Supersedes Date	22-09-10

VG-SUPREME*

SDS No.	11070
Risk Phrases In Full	
R48/20	Harmful: danger of serious damage to health by prolonged exposure through inhalation.
NC	Not classified.
Hazard Statements In Full	
H373	May cause damage to organs <<Organs>> through prolonged or repeated exposure.

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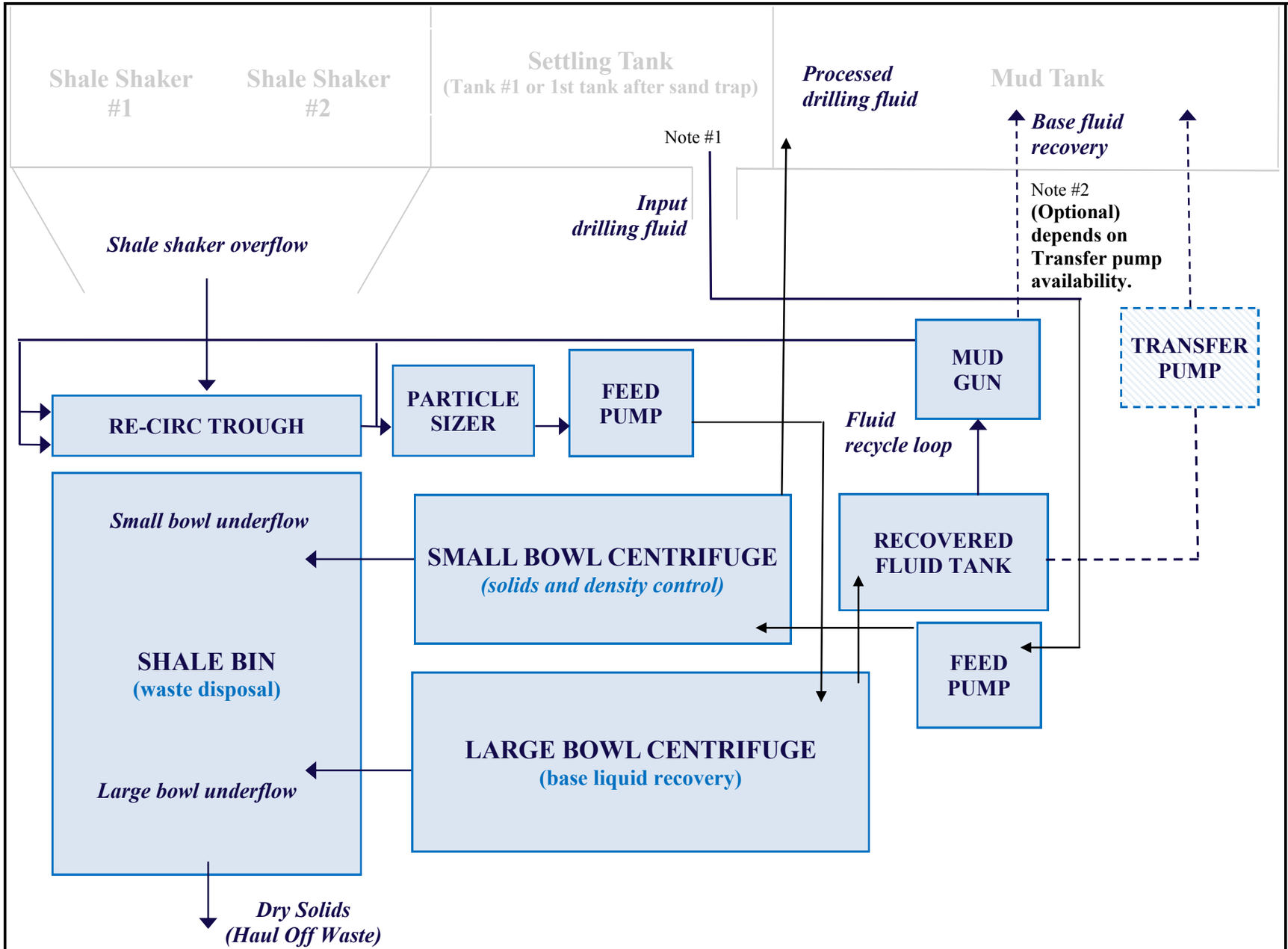

Notes/ Comments:

1) Ensure all rig tank suction fittings are 6" for ideal flow. DO NOT use any thing less them 4" dia.

2) Recommend using a transfer pump to transfer fluid back to rig. If no transfer pump is available Tee off of Mud GUN with ball valve. Avoid using PVC as transfer line

SOLID CONTROL & DRILL FLUID RECOVERY
Recommended Rig-Up

Drawing/ Revision Date: December 12, 2011

Approved By: Andrew Pow

BOS SOLUTIONS
REDEFINING EFFICIENCY

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PFM

Action Item List Pioneer Rig

See below the following action items that need to be addressed before drilling with OBM on Pioneer Rig

Action Items

- Modifications to Pump Room to prevent spills of OBM while working on pumps (As per Jesse Tatman, Newfield Supt.)
- Modifications to Hopper Room to prevent spills while mixing mud (As per Jesse Tatman, Newfield Supt.)
- Plug all open ended valves that will not be in use on the back side of the rig suction pits and settling pits.
- Plug or cap all existing lines not in use on the rig.
- Plug or cap all valves not in use on all frac tanks.
- Use hammer unions instead of cam-locs to prevent any potential spill areas.
- Drip pans to use for disconnecting hoses.
- Cover over pits to prevent contamination of the OBM from snow and rain.
- Cover over the drying shakers to prevent contamination of OBM from snow & rain.
- Cover premix tank to prevent contamination of OBM within the tank.
- Plug any vales or lines not in use on premix tank.
- Catch pan underneath the rig floor routed to a tank and then pumped back into the system over the shakers.
- Racking pan on rig floor to catch any OBM drainage from the drill pipe.
- All hoses to chemical resistant with factory ends installed with hammer unions.
- Emergency spill kits to be kept on location at all times stocked with different size absorbent booms and absorbent pads.

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PFM

- Line the rig area, frac tank area, diesel storage tank area, & chemical storage area with 100 mil. liner.
- Berm all areas to contain any spill that might accrue
- Mud Engineer should hold JSA with personnel before transferring any OBM
- Mud Engineer should have 50 mil. retort on site for running retorts on OBM.
- Mud check to be run on all new mud arriving at the rig site.
- .Catch pans to be used on all transfer pumps or feed pumps.
- All rubber parts to be oil resistant (Hydril, Rams, Pump parts, etc.)
- Solids control equipment, a minimum of 2 drying shakers dressed with API 50 screens and dual big bowl ,high " G" centrifuges with variable speed drives (VFD) used in parallel for removal of LGS or in series with one being used for barite recovery.
- Larger Gas Buster in order to hold more volume. (As per Jesse Tatman, Newfield Supt.)
- Degasser return line to be re-routed from the suction pit back up stream into the settling pits.
- Agitator to be added to the second settling pit downstream of the rig shakers.
- A portable skid vacuum with enough hose to reach all over rig area such as a KSW to be on site at all times for cleanup of any spills.
- A solid guard to be placed in front of each rig shaker. A cover made of plywood and attached with c-clamps over each shaker to prevent splatter from shakers covering shaker area.
- Ty-vek suits and chemical restraint gloves to be furnished for rig personnel.
- A low volume high psi diesel pressure should be provided for washing shakers and top of pit area only. This washer should stay on the pits.
- During each rig visit PFM will walk over rig site checking for any potential spill areas and report any finding to Newfield WSS.

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UTAH DIVISION OF OIL, GAS AND MINING
APPROVED COMMERCIAL DISPOSAL FACILITIES
August 9, 2012

TYPE	OPERATOR	SEC	TOWNSHIP	RANGE	FACILITY/AREA
***	**Brennan Bottom Disposal** Don DeMille	19	06 South	21 East	12 Mile Wash
-	**Brennan Bottom Disposal** Don DeMille	09	09 South	22 East	Glen Bench
**	**Contract Env. Services** Yoshi Okano	18	39 South	26 East	Blanding
***	**Dalbo, Inc.** Gary Richins	35 & 02	05 South 06 South	20 East 20 East	Ace Disposal
***	**Dalbo, Inc.** Gary Richins	05	09 South	22 East	Glen Bench
-	**Danish Flats Env. Services** Jim Bradish	08	20 South	24 East	Grand
-	**Del-Rio Resources, Inc.** Larry Caldwell	12	06 South	19 East	DNL E Gusher
**	**Environmental Energy Innovations** Terry Sherman	18	04 South	02 East	South Myton Bench
-	**Integrated Water Management, LLC** Nate Robinson	30	02 South	04 West	IWM North Blue Bench
-	**Iowa Tanklines, Inc.** Todd Bro	30	04 South	02 West	Pleasant Valley
***	**LaPoint Recycle & Storage** Troy Murray	12	05 South	19 East	LaPoint
-	**Monarch Natural Gas, LLC** Charlene Pearson	36	09 South	18 East	Desert Spring
-	**Monarch Natural Gas, LLC** Charlene Pearson	29	09 South	18 East	Eight Mile Flat
-	**Montezuma Well Services, Inc.** Earl Martinez	14	40 South	22 East	Recapture Brine
**	**Nick's Disposal Pit LLC** Nick Stevenson	29	01 South	03 West	Altamont
***	**R N Industries, Inc** Roger and Nile Chapman	04 & 09	02 South	02 West	Bluebell
-	**R N Industries, Inc** Roger and Nile Chapman	02	09 South	22 East	Chapita
-	**R N Industries, Inc** Roger and Nile Chapman	05	09 South	22 East	Glen Bench

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-	**R N Industries, Inc** Roger and Nile Chapman	25, 26 35, 36	04 South	03 West	Pleasant Valley
-	**R N Industries, Inc** Roger and Nile Chapman	36	10 South	20 East	Seep Ridge
-	**R N Industries, Inc** Roger and Nile Chapman	26 & 35	08 South	21 East	Wonsit
-	**Western Water Solutions** Sam Robinson	09 & 10	04 South	01 West	Sand Pass Ranch

- Facility is approved to accept only produced water and associated RCRA exempt fluids.
** Facility is approved to accept only waste material resulting from crude oil spill clean-up operations.
*** Facility is approved to accept produced water and associated RCRA exempt fluids and waste material resulting from crude oil spill clean-up operations.

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SESI's Design/Build Services

SESI's Design/Build services are considered reuse/recycle options under the waste hierarchy. These services include the engineering for closure, the work to reuse and recycle the waste, and the confirmatory testing of the recycled material.

Firmus®

This proprietary service was developed by SESI over several years for use on fresh-water mud and cuttings, oil-based cuttings, and some saltwater mud and cuttings. The service treats drilling waste with solidification and stabilization technology so that it can be reused as construction material for lease roads, drilling pads, compressor station pads, tank battery berms, and other load-bearing structures. The service is typically broken down into two phases:

Firmus® Plasticity Reduction (Firmus® PR), and
Firmus® Construction.

Firmus PR is designed to reduce the plasticity, dry, and prepare the mud and cuttings for reuse. The resulting material is then transported to the location of the structure to be constructed. At this point, the Firmus® Construction phase is performed. This phase includes further stabilization and shaping of the material to meet the desired loads that will be placed on it. Also during this phase, final samples are taken for confirmation of meeting the closure criteria.

The benefits of the Firmus® service is that it takes waste that is otherwise disposed onsite or offsite and reuses the material for the creation of structures that would otherwise need new raw materials to build. Firmus® services also reduce the customers' environmental footprint, and mitigate the customers' future liability.

From past experience, we have learned that the Firmus® service is most effective when a customer has high contaminant levels, transports the waste offsite for disposal, and/or has multiple wells to drill in a given area.

DuroSM

This proprietary service was developed by SESI over several years for use on fresh-water mud and cuttings, oil-based cuttings, and some saltwater mud and cuttings, too. The service treats drilling waste with solidification and stabilization technology so that it can be reused as a load-bearing structure for setting frac tanks or other equipment during completion or after completion. This is typically accomplished by solidifying and stabilizing the mud and cuttings within the confines of the pit area.

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The Duro[SM] service is similar to Firmus[®] in that it prepares the mud and cuttings for use and then further stabilizes them to support loads. The Duro[SM] process also immobilizes the contaminants to reduce their mobility in the environment. By reusing the waste to support loads over the pit area, the customer's environmental footprint is reduced, the use of other construction materials is reduced, and the potential for future liability from the waste is reduced.

The Duro[SM] process is most effective when the customer's waste has high contaminant levels and/or is being transported offsite for disposal.

Reliable Results Through Proven Approaches

RECEIVED: Oct. 17, 2012

US008007581B2

(12) **United States Patent**
Scott et al.

(10) **Patent No.: US 8,007,581 B2**
(45) **Date of Patent: Aug. 30, 2011**

(54) **INCORPORATION OF DRILLING CUTTINGS INTO STABLE LOAD-BEARING STRUCTURES**

(75) Inventors: **Jonathan Blake Scott**, Longview, TX (US); **Billy Roy Scott**, Diana, TX (US); **Jeanne McCoy Scott**, legal representative, Diana, TX (US); **Dallas N. Little**, Bryan, TX (US)

(73) Assignee: **Scott Environmental Services, Inc.**, Longview, TX (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **12/605,617**

(22) Filed: **Oct. 26, 2009**

(65) **Prior Publication Data**

US 2010/0127429 A1 May 27, 2010

Related U.S. Application Data

(63) Continuation of application No. 10/037,630, filed on Jan. 3, 2002, now abandoned.

(60) Provisional application No. 60/311,439, filed on Aug. 10, 2001.

(51) **Int. Cl.**
C08L 95/00 (2006.01)

(52) **U.S. Cl.** **106/277**; 106/281.1; 106/283; 106/705; 106/716

(58) **Field of Classification Search** 106/277, 106/281.1, 283
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,706,108 B2 * 3/2004 Polston 106/285

* cited by examiner

Primary Examiner — Paul Marcantoni
(74) *Attorney, Agent, or Firm* — Paul & Paul

(57) **ABSTRACT**

Cuttings from drilling through or into natural rock and/or soil can be incorporated into useful, high quality load-bearing structures such as vehicle roads and pads for deep drilling rigs. This process recycles a material previously regarded as valueless at best and often as a pollution hazard. The cuttings, optionally mixed with drilling mud and/or soil, are converted to the useful structures by pozzolanic and/or cementitious reactions after being mixed with suitable other materials and/or are bonded into the useful structures by asphaltic materials.

20 Claims, No Drawings

INCORPORATION OF DRILLING CUTTINGS INTO STABLE LOAD-BEARING STRUCTURES

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation of application Ser. No. 10/037,630, filed on Jan. 3, 2002, which application claims the benefit of Provisional Application Ser. No. 60/311,439 filed Aug. 10, 2001. The entire contents of each application is incorporated herein by reference.

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

Not Applicable.

INCORPORATION-BY-REFERENCE OF MATERIAL SUBMITTED ON A COMPACT DISC

Not Applicable.

BACKGROUND OF THE INVENTION

Field of the Invention

Drilling through or into natural soil and/or rock is performed in a variety of ways to serve practical ends. Any such drilling converts initially continuous solid soil and/or rock into particulate solid matter called "drilling cuttings," which have heretofore been generally regarded in the art as waste material to be disposed of as inexpensively as possible. Hereinafter, the term "drilling cuttings" and any of its grammatical variations shall be understood to mean such cuttings produced by drilling through and/or into natural soil or rock.

For practical reasons, drilling through or into natural soil and/or rock is commonly divided into two kinds: "shallow" and "deep." Relatively shallow drilling with a variety of means known in the art is used, for example, in construction of building foundations and mining excavations and in making water wells in areas where the water table is no more than a few tens of feet below the natural soil surface. Shallow drilling, simply because it is shallow, produces relatively low petroleum and/or natural gas often generates large volumes of cuttings. Therefore, even the most inexpensive possible disposition of the cuttings as waste, specifically burial of the cuttings in soil, often incurs a substantial expense.

Practical deep drilling normally requires more elaborate equipment than is usually used for shallow drilling. More specifically, deep drilling equipment normally comprises at least the following three conceptual entities:

- drilling means, which, after the first few meters of drilling are within the hole being drilled (the "borehole") and are in physical contact with the solid soil and/or rock at the portion of the borehole that is to be enlarged during the next interval of drilling, and which, when suitably driven, convert the volume of solid material that corresponds to the enlargement of the borehole during this particular interval of drilling into particles sufficiently small to be readily removed from the borehole and transported to the earth's surface;
- drilling driving means that supply the energy needed to cause the drilling means to provide actual drilling; and
- a fluid lubricant for the drilling means.

(Although these entities are conceptually distinct, the same physical material may serve as all or part of two or more of them, and in practice the lubricant is probably more often than not also a hydraulic fluid that acts as part of the drilling driving means.) The phrase "deep drilling" when used hereinafter in this specification shall be understood to mean drilling performed by equipment comprising said drilling means, drilling driving means, and fluid lubricant for the drilling means.

The currently most commonly used deep drilling means are various types of rotary drill bits well-known in the drilling art. In once widely practiced and still sometimes used "cable tool" drilling, the drilling means are essentially a hammer that is repeatedly lifted and dropped within the borehole in order to deepen it. In some laboratories today, laser light is being tested as a drilling means, and shock waves propagated through air or other fluids could reasonably be used as drilling means.

Typical deep drilling driving means may be: a solid structure of pipe or cable connected mechanically to the drilling means and rotated, or alternatively lifted and dropped, by motive power supplied at the surface so that the motion of the solid connecting structure is mechanically transferred to the drilling means; a combination of a hydraulic fluid, fluid transport means, and a pump that drives the hydraulic fluid, so that the motion of the hydraulic fluid, by its passage through suitably designed passageways in a rotary drill bit, forces the components of the bit to move in a manner that converts any coherent solid material adjacent to the rotary drill bit into particulates; a source of radiation that is absorbed by the surface of a volume of solid to be added to the volume of the borehole, the absorbing solid surface and part of the solid underlying it being thereby rapidly heated and caused to fracture by heating-induced expansion; and/or means for propagating mechanical shock waves through a fluid in contact with the surface of a volume of solid to be added to the volume of the borehole.

The least expensive possible deep drilling lubricant is the air of the natural atmosphere, and this is actually used in practice in some instances. Another established deep drilling lubricant is a foam of air in a continuous liquid phase, usually preponderantly of water.

However, practical deep drilling for oil and/or natural gas in most locations in the world that are now being explored requires use of a viscous liquid lubricant that comprises, preferably consists essentially of, or more preferably consists of at least one continuous liquid phase and at least one type of dispersed solid particles, most often a clay (such as sodium montmorillonite) that has a sufficiently fine particle size and sufficiently hydrophilic particle surfaces that the clay spontaneously disperses in most aqueous based liquids. (In oil-based lubricants and some water-based ones, additional surfactants are usually added to promote suspension of the clay and/or other solid constituents such as high density, water-insoluble "wetting agents" in the fluid.) Additional detailed information about deep drilling fluids is given in, e.g., H. C. H. Darley and George R. Gray, Composition and Properties of Drilling and Completion Fluids, 5th Ed. (Gulf Publishing Co., Houston, 1988), the entire disclosure of which, except for any part that may be contrary to an explicit statement herein, is hereby incorporated herein by reference. This deep drilling lubricant, when preponderantly liquid and often even when preponderantly gaseous, is generally called "drilling mud" or simply "mud" by those who use it, and the word "mud" when used below in this specification shall be understood to mean deep drilling mud or another deep drilling fluid unless expressly stated to the contrary or required by the context.

Mud normally is pumped continuously into and flows continuously out of a borehole whenever deep drilling is underway. The mud flows into and out of the borehole through separate passageways that are disposed so as to insure that mud pumped into the borehole must reach the near vicinity of the drilling means that is actually cutting a borehole deeper during drilling before the mud can enter any passageway through which mud flows out of the borehole during drilling. The mud serves to cool and lubricate the drilling means and to remove from the borehole soil and/or rock in the form of particles cut by the drilling means, such particles being commonly called "cuttings." (If these cuttings were not removed from the borehole, they would eventually clog the drilling means and make continued drilling impossible.)

The outflowing mixture of mud and cuttings from deep drilling is normally subjected to at least one separation process intended to separate the relatively large particle size cuttings from the relatively fine clay and any other suspended particles deliberately added as part of the drilling mud before it flows into the borehole. The cuttings from this separation are generally more or less wet with the fluid phase of the mixture of mud and cuttings from which they were separated and may contain relatively small portions of the dispersed and/or dissolved solids deliberately added to the drilling mud before it flows into the borehole.

Also, the cuttings as thus separated may be and often are remixed with all or part of the drilling mud used when deep drilling of a particular hole has been completed. The solids volume of the cuttings or mixture of the cuttings with no longer needed drilling mud is usually at least several hundred cubic meters for each well drilled to a depth of five thousand meters.

A major object of this invention is to convert and/or incorporate mixtures of drilling cuttings, optionally mixed with other constituents such as those of deep drilling mud, into stable load-bearing structures.

BRIEF SUMMARY OF THE INVENTION

It has been found that drilling cuttings and mixtures of the cuttings with drilling mud can be converted and/or incorporated into excellent high-load-bearing civil engineering structures such as vehicle roads and drilling pads by one or more processes as described in detail below. Embodiments of the invention include processes for such conversion, extended processes including additional operations that may be conventional in themselves, and the load-bearing structures made by a process according to the invention.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING(S)

Not Applicable.

DETAILED DESCRIPTION OF THE INVENTION AND PREFERRED EMBODIMENTS

A shaped load-bearing structure according to the invention is made by a process comprising, preferably consisting essentially of, or more preferably consisting of, the following operations:

Forming a particulate mixture comprising drilling cuttings; and at least one of groups (2.1) and (2.2) of sub-operations, said group (2.1) comprising sub-operations of:

(2.1.1) mixing said particulate mixture comprising drilling cuttings in a specified proportion with at least one material selected from the group consisting of:

(A) quicklime;
(B) hydrated lime;
(C) Portland Cement;
(D) Class C fly ash;
(E) cement kiln dust;
(F) lime kiln dust;
(G) Class F fly ash; and
(H) other pozzolans

to form a cementitious second mixture;

2.1.2) forming said cementitious second mixture into the shape and size of the desired load-bearing structure; and

2.1.3) causing the shaped and sized second mixture formed in sub-operation (2.1.2) to undergo a pozzolanic reaction to form said load-bearing structure; and said group (2.2) comprising sub-operations of:

2.2.1) mixing said particulate mixture comprising drilling cuttings in a specified proportion with at least one of foamed asphalt and emulsified asphalt to form an asphaltic second mixture;

(2.2.2) forming said asphaltic second mixture into the shape and size of the desired load-bearing structure; and

(2.2.3) causing the shaped and sized asphaltic second mixture formed in sub-operation (2.2.2) to form the load-bearing structure by removal from said shaped asphaltic second mixture of a sufficient fraction of the gas dispersed in any foamed asphalt incorporated into said second mixture and of the liquid continuous phase in which any emulsified asphalt incorporated into said shaped second mixture is emulsified.

Any material as described above that is mixed with the particulate mixture comprising drilling cuttings in sub-operation (2.1.1) or (2.2.1) is denoted herein as a "stabilizer." Following are the believed mechanism of stabilization for each stabilizer and the basic advantages and limitations for each of the types of stabilizers listed above, those types of stabilizers listed explicitly above being preferred over other pozzolanic stabilizers.

Quick Lime and Hydrated Lime.

Whether hydrated lime, i.e., $Ca(OH)_2$, or quicklime, i.e., CaO, is selected as a source of stabilization, it is believed that hydrated lime is more effective for stabilization. Therefore, if quicklime is selected as the source of stabilization, at an early stage during the formation of the second mixture as described in sub-operations (2.1.1) and (2.2.1) above, the quicklime preferably is transformed to hydrated lime through reaction with adequate quantities of water. This water may derive from the particulate mixture comprising drilling cuttings as described above or may be added separately. Since the gram-molecular weight of $Ca(OH)_2$ is approximately 74 and the gram-molecular weight of CaO is approximately 56, the minimum mass of water required for hydration is 34 percent of the mass of the CaO to be hydrated. Practically, however, hydration, also called "slaking," of quicklime is not usually 100 percent efficient within a reasonable time. Under most conditions, therefore, the mass of the water available for slaking any mass of quicklime used as a stabilizer in a process according to the invention preferably is at least, with increasing preference in the order given, 50, 60, 70, 80, 90, or 99% of the mass of the quicklime.

Lime is believed to stabilize primarily the clay fraction of the first mixture of mud and cuttings to be stabilized with which it is mixed to form a second mixture as described above. Therefore, when lime is an important or the sole component of the stabilizing agent used in a process according to this invention, the particulate mixture comprising drilling cuttings to be stabilized preferably comprises clay as a percentage of its solids content that is at least, with increasing

preference in the order given, 2, 4, 6, 8, 10, 12, 15, 20, or 25%. Independently, the particulate mixture comprising drilling cuttings to be stabilized with lime in a process according to the invention preferably has a Plasticity Index (hereinafter usually abbreviated as "PI" and determined according to American Society for Testing and Materials (hereinafter usually abbreviated as "ASTM") Procedure D-4318) that is at least, with increasing preference in the order given, 3, 5, 7, 9, 11, 13, 15, 20, 25, or 30 percent. Lime is believed to react with the clay in the high pH environment created when lime and water are mixed. In this environment, the silica and alumina contents of the clay are believed to become sufficiently soluble, as pozzolans, to react with the calcium and water to form calcium-silicate-hydrates and calcium-aluminate-hydrates that are cementitious products.

(A pozzolan is defined as a high surface area siliceous or alumino-siliceous material that in the presence of an alkaline earth-containing alkali such as lime produces a cementitious reaction.) This postulated reaction, along with calcium exchange on clay surfaces, reduces the plasticity of, improves the workability of, improves the drying and drainage of, and provides a substantial strength gain for, the particulate mixture comprising drilling cuttings to be stabilized.

The major advantages of lime are that: it vastly improves the workability of highly plastic mixtures comprising cuttings to be stabilized; and it reacts slowly enough to allow plenty of mixing time—up to four days. The major limitation is that lime does not react with soils that do not contain a reactive clay fraction. Therefore, lime is not reactive with gravelly and sandy soils without clay. Lime may not be reactive with sandy, silty-sandy, and silty soils without reactive clay. However, combinations of lime and fly ash can be effectively used to stabilize these soils.

Portland Cement.

The basic reactions in stabilization with Portland Cement (hereinafter usually abbreviated as "PC") stabilization are believed to be the cementitious, hydration reaction that occurs when calcium silicates and calcium aluminates present in the Portland Cement hydrate with added water. The strength gain is independent of soil mineralogy, e.g., whether any clay is present in the soil. However, some pozzolanic reaction between lime released during the cementitious reaction and any clay that is present in the particulate mixture comprising drilling cuttings to be stabilized can and is believed to occur. Portland Cement provides workability and strength improvements similar to those achieved with lime. The major differences are that: PC usually works better with low PI, granular soils, whereas lime works better with higher PI, clayey soils; strength gain with PC is quicker than with lime; and PC will usually provide a higher final strength than lime in any structure made by stabilization in a process according to this invention. The faster strength gain can be either an advantage or a disadvantage, depending on circumstance; it can be an advantage in meeting a short construction schedule, but the construction/shaping time is usually limited to four hours after mixing in order to avoid significant strength loss. A second limitation is a greater prevalence of significant shrinkage cracking in structures stabilized with high percentages of PC.

Class C Fly Ash.

Class C fly ash is a non-combustible residue of coal. This residue is composed primarily of high surface area silicates and aluminates and often contains calcium from calcium oxide naturally present in the coal and/or added to abate air pollution by reacting with gaseous oxides of sulfur generated by the combustion of some coal. When water is added to Class C fly ash, any silicates and aluminates in the fly ash that have been fused with calcium oxide are believed to react as with PC to form cementitious products, while the silicates and aluminates that have not previously been fused with lime are believed to react as pozzolans if an outside source of lime is added. Class C fly ash is accordingly believed to stabilize cementitious second mixtures as described above through combined processes of hydration and pozzolanic reactions that result in improved workability of the second mixtures during shaping and sizing and in increased shear strength in the cured structure.

Fly ashes are quite variable and source dependent. Class C fly ash for use in a process according to this invention preferably has the following characteristics, each of these characteristics being independently preferred and combinations of the characteristics being still more preferred, the preference being greater, the greater the number of preferred characteristics combined:

- the percentage of the mass of the fly ash retained on a No. 325 sieve preferably is not more than, with increasing preference in the order given, 34, 32, 30, 28, 26, 24, 22, 20, 18, 16, 14, 12, 10, 8, 6, 4, or 2%;
- the total content of SiO_2+Al_2O_3+Fe_2O_3 preferably constitutes a percentage of the total mass of the fly ash that is at least, with increasing preference in the order given, 50, 60, 65, 70, 75, 80, 85, 90, 95, or 99%;
- the total content of sulfur, measured as its stoichiometric equivalent as SO_3, preferably is not more than, with increasing preference in the order given, 5.0, 4.0, 3.0, 2.5, 2.0, 1.5, 1.0, 0.5, 0.3, or 0.1%; and
- the loss on ignition of the fly ash preferably is not more than, with increasing preference in the order given, 10, 8, 6, 4, 2.0, 1.5, 1.0, 0.5, 0.3, or 0.1%.

Class C fly ash is similar to PC in its ability to provide high strength, its ability to provide stabilization even in the absence of clay in the particulate mixture comprising drilling cuttings to be stabilized, and in its fast strength development. The principal advantage of Class C fly ash is that it can be considerably less expensive than PC or lime if available from a source near where a process according to the invention is performed. The principal disadvantage of Class C fly ash is its variability in setting time, which requires more frequent testing than with PC, except in relatively rare instances where a sufficiently large supply of the fly ash with consistent properties is available.

Combinations of Lime and Fly Ash.

Class F fly ash is a more or less pure pozzolan which contains little or no alkaline earth metal content. Lime reacts with Class F ash as it does with clay to produce a pozzolanic reaction which can be of substantial value in strength development in a shaped and sized secondary mixture as described above. Class F ash and lime can be effectively used together to stabilize mixtures of mud and cuttings with a wide range of mineralogical contents ranging from clays to sands and gravels. Since a pozzolan is contributed by the ash, clay is not required to react with the lime.

Like Class C ash, Class F ash is variable from source to source. Class F fly ash for use in a process according to this invention preferably has the following characteristics, each of these characteristics being independently preferred and combinations of the characteristics being still more preferred, the preference being greater the greater the number of preferred characteristics combined:

- the percentage of the mass of the fly ash retained on a No. 325 sieve preferably is not more than, with increasing preference in the order given, 34, 32, 30, 28, 26, 24, 22, 20, 18, 16, 14, 12, 10, 8, 6, 4, or 2%;

- the total content of $SiO_2+Al_2O_3+Fe_2O_3$ preferably constitutes a percentage of the total mass of the fly ash that is at least, with increasing preference in the order given, 70, 75, 80, 85, 90, 95, or 99%;
- the total content of sulfur, measured as its stoichiometric equivalent as SO_3, prefer ably is not more than, with increasing preference in the order given, 5.0, 4.0, 3.0, 2.5, 2.0, 1.5, 1.0, 0.5, 0.3, or 0.1%;
- the loss on ignition of the fly ash preferably is not more than, with increasing preference in the order given, 10, 8, 6, 4, 2.0, 1.5, 1.0, 0.5, 0.3, or 0.1%; and
- the unconfined compressive strength (hereinafter usually abbreviated as "UCS"), measured as described below, preferably is at least, with increasing preference in the order given, 800, 850, 900, 950, 1000, 1050, 1100, 1, 1200, 1250, 1300, 1350, 1400, 1450, or 1500 pounds per square inch (hereinafter usually abbreviated as "psi").

The unconfined compressive strength of the fly ash is measured on samples that have previously been mixed with lime and/or Portland Cement in the same proportion between the fly ash and lime and/or Portland Cement as is intended for the combination to be used in stabilization. Tests on these mixtures are performed in accordance with ASTM Procedure C-593 to determine the UCS value.

Combinations of Class F fly ash and lime have advantages and disadvantages similar to those of lime, except that: the need for reactive clay in the particulate mixture comprising drilling cuttings to be stabilized is removed by using Class F fly ash; the variability of characteristics of all fly ash is introduced; and the method of application can be varied to advantage in some instances: Lime can be added first to clay-containing mixtures, with the fly ash added later. The initial mixing of lime with the clay will reduce plasticity and improve workability while the later addition of fly ash will enhance strength. This may be superior to lime stabilization alone in mixtures of mud and cuttings to be stabilized, which, even though they may contain clay, do not react rapidly enough with lime to produce sufficient pozzolanic strength development for the purpose of a process according to this invention.

Combinations of Class C or Fluidized Bed Fly Ash and Portland Cement.

These combinations are particularly advantageous in two-stage processes according to the invention, in which the fly ash is used as a drier in the first stage and the cement as an activator in the second stage.

Other Cementitious and Pozzolanic Stabilizers.

Besides lime, PC, and fly ash, other cementitious and pozzolanic stabilizers which may he candidates for stahilization in a process according to this invention include cement kiln dust (hereinafter usually abbreviated as "CKD") and lime kiln dust (hereinafter usually abbreviated as "LKD"). These materials are by-products of cement and lime manufacture, respectively. CKD and LKD are similar to a Class C fly ash in that they both contain some self-cementing calcium-silicate (hereinafter usually abbreviated as "CS") and calciumaluminate (hereinafter usually abbreviated as "CA") compounds. However, both types of kiln dust may have considerable free lime, "free lime" being defined for this usage as the total amount of calcium hydroxide and calcium oxide, both measured as their stoichiometric equivalent as CaO, that are present in the material in a form free to react cementitiously with additional silicates and/or aluminates that may he mixed with the material. LKD is generally higher in free lime and lower in CS and CA products than CKD. The only advantage of CKD or LKD over lime, PC, or fly ash is a lower cost. To provide a substantial cost advantage in a process according to this invention, CKD and/or LKD usually must be locally available near the process site. Both CKD and LKD are quite variable.

Asphalt Emulsions and Foams.

Asphalt emulsions consist essentially of fine particles of asphalt emulsified in water. The emulsion is a sufficiently low viscosity liquid to be mixed with a particulate mixture comprising drilling cuttings to be stabilized at normal ambient field temperatures (i.e., from about 0 to 50° C.), whereas a normal unemulsified asphalt would have to be heated to around 300° C. in order to mix intimately with soil or aggregate. The emulsified particles of asphalt preferably have an average particle size (largest linear dimension) that is at least, with increasing preference in the order given, 0.2, 0.5, 0.7, 1.0, 1.2, 1.4, 1.6, 1.8, or 2.0 micrometres (hereinafter usually abbreviated as "m") and independently preferably is not more than, with increasing preference in the order given, 30, 20, 15, 13, 11, 9, 7, or 5 m. Dispersion in water is maintained by using at least one emulsifying agent, the emulsifying-effective moieties of which may have a positive or a negative charge or be electrically neutral. Ordinarily, cationic emulsions (i.e., those in which the emulsified asphalt particles have a positive charge) are preferred for use with alkaline mixtures of mud and cuttings to be stabilized, while anionic emulsions in which the emulsified asphalt particles have a negative charge are preferred if the particulate mixture comprising drilling cuttings to be stabilized are acidic. However, climatic conditions also affect preferences because an anionic emulsion will not normally cure properly in a high humidity environment, and curing of emulsions is very important to their success. Curing involves first properly coating the aggregate or soil with the emulsion and then removing the water in which the asphalt had heen dispersed from the asphalt by draining and/or evaporating the water and leaving behind an asphalt coating of the aggregates. Adequate curing occurs when the proper asphalt emulsion is selected and proper construction methods are used to effect aeration of the mixture during mixing. The residual asphalt then coats the aggregate to provide a cohesive "glue" which in turn provides stahility and durability to the mixture.

In some circumstances, Asphalt stabilization may be cheaper than chemical stabilization. Asphalt is often preferred for stabilizing relatively rare mixtures of mud and cuttings to be stabilized that have little or no plasticity and/or have such a high organic content that they cannot be stabilized with economically practical amounts of pozzolanic or cementitious materials. Foamed asphalt and emulsified asphalt should produce essentially the same result. However, the technology for the use of foamed asphalt is not widely developed.

A major limitation with asphalt stabilization is that if or when it is desired to recycle a structure made in a process according to this invention with asphalt stabilization to its original or near original state, recycling will usually be more complicated and correspondingly more expensive hecause of the presence of the organic binder. On the other hand, calcium-based pozzolanic stabilizers can be recycled to a near virgin state by pulverization and mixing. The material will retain a relatively high pH, between about 8 and 11, but this can be reduced through dilution (mixing with virgin soil) if necessary. If the initial pH is near the higher end of this range, the pH will even be spontaneously reduced, at least in well-aerated parts of the recycled material, by gradual conversion of more alkaline calcium-containing substances to calcium carbonate by reaction with atmospheric carhon dioxide.

Because of the highly variable nature of the particulate mixtures comprising drilling cuttings to be stabilized and of

some of the stabilizers used (the fly ashes and kiln dusts), the preferred amounts of stabilizers can be explicitly specified herein only in rather broad terms, as shown in Table 1 below for the most important and preferred single and combination stabilizers. However, with minimal experimentation that is well within ordinary skill in the art, considerably narrower preferences for each particular instance can be readily determined by one of the testing protocols set forth below. The most desirable stabilizer(s) to be tested initially can be readily determined by those skilled in the art by consideration of the advantages and disadvantages of the various stabilizers as described above, the required civil engineering properties of the load-bearing structure to be made in a process according to the 'invention, and the costs of the various stabilizers at the site of the fabrication of the structure.

TABLE 1

Broad Preferences for Amounts of Preferred Stabilizers to be Used

Stabilizer	Preferred Amount of Stabilizer, as a Percentage of Solids in the Stabilizer to Solids in the Particulate Mixture Comprising Drilling Cuttings to be Stabilized
Portland Cement (as the sole stabilizer)	At least, with increasing preference in the order given, 0.5, 1.0, 1.5, 2.0, 2.5, or 2.9% and independently preferably not more than, with increasing preference in the order given, 15, 12, 10, 8, or 6.0%
Lime (as the sole stabilizer)	At least, with increasing preference in the order given, 1.0, 2.0, 2.5, 3.0, 3.5, or 4.0% and independently preferably not more than, with increasing preference in the order given, 20, 15, 12, 10, or 8%
Lime and fly ash (as the sole stabilizers)	Lime that is at least, with increasing preference in the order given, 0.2, 0.5, 0.8, 1.0, 1.2, 1.4, 1.6, 1.8, or 2.0% and independently preferably is not ore than, with increasing preference in the order given, 9, 7, 5, or 3%; fly ash that is at least, with increasing preference in the order given, 0.2, 0.5, 0.8, 1.0, 1.2, 1.4, 1.6, 1.8, or 2.0% and independently preferably is not more than, with increasing preference in the order given, 20, 17, 14, 12, 10, 8, or 6%; and, independently, a ratio of fly ash to lime that is at least, with increasing preference in the order given, 0.3:1.00, 0.5:1.00, 0.7:1.00 or 0.9:1.00 and independently preferably is not more than, with increasing preference in the order given, 5:1.00, 3.0:1.00, 2.5:1.00, or 2.01:100
Class C and/or fluidized bed fly ash and Portland Cement (as the sole stabilizers)	Fly ash that is at least with increasing preference in the order given, 0.2, 0.5, 0.8, 1.2, 1.6. 2.0, 2.4, 2.8, 3.2, 3.6, 4.0, 4.4, or 4.8% and independently preferably is not more than, with increasing preference in the order given, 50, 35, 30, 25, or 20, 17, 14, 11, or 9%: Portland Cement that is at least, with increasing preference in the order given, 0.5, 0.8, 1.0, 1.2, 1.4, 1.6, 1.8, 2.0, 2.2, 2.4, 2.6, or 2.8% and independently preferably is not more than, with increasing preference in the order given, 15, 10, 8.5, 8.0, 7.5, 7.0, or 6.5%; and, independently, a ratio of fly ash to cement that is at least, with increasing preference in the order given, 0.10:1.0, 0.20:1.00, 0.30:1.00, 0.35:1.00, 0.40:1.00, or 0.45:1.00 and independently preferably is not more than, with increasing preference in the order given, 30, 25, 20, 15, or 10%
Class C fly ash, lime kiln dust, and/or cement kiln dust (as the sole stabilizer(s))	At least, with increasing preference in the order given, 0.5, 1.0, 1.5, 2.0, 2.5, or 3.0% and independently preferably not more than, with increasing preference in the order given, 30, 25, 20, 15, or 10%
Asphalt, emulsified or foamed	At least, with increasing preference in the order given, 0.5, 1.0, 1.5, 2.0, 2.5, or 3.0% and independently preferably not more than, with increasing preference in the order given, 25, 20, 15, 12, 10, or 8%

Test Protocols.

Preliminary Tests—Visual Evaluation and Concentrations of Interfering Constituents.

The major objectives of visual evaluation are to estimate the moisture content of the particulate mixture comprising drilling cuttings to be stabilized, this moisture content being normally quite high when a mud with an aqueous liquid continuous phase is used, and to determine the presence or absence in the particulate mixture comprising drilling cuttings to be stabilized of any foreign, non-soil-like material such as organics, salt crystals, especially sulfate salts, and/or the like. Thus, the visual identification screens the material for any constituents that are unusual and/or require special stabilization strategies.

Sulfates can interfere with pozzolanic reactions and cementitious reactions when calcium-based stabilizers are used, causing a severely expansive reaction and loss of density and often strength. For this reason, it is necessary to screen the cuttings for the presence of soluble sulfates. If soluble sulfates are found to be less than or equal to 3 parts per thousand by mass of the solids content of the particulate mixture comprising drilling cuttings to be stabilized, this unit of concentration being hereinafter usually abbreviated as "ppt," there is no significant risk of these adverse effects from sulfates during stabilization. (The concentration of sulfates preferably should be determined on the basis of Texas Department of Transportation Test Methods TEX-620-J and TEX-619-J. The partitioning of soluble sulfates from the cuttings that is part of these test procedures preferably is done with ten parts water to one part soil.) If soluble sulfates are present in a higher concentration than 3 ppt, there is some risk of such adverse effects. Nevertheless, a process according to the invention can still be used to stabilize high sulfate mixtures. For example, a highly sulfate tolerant type of Portland Cement can be used. Additional details on this and other methods of coping with high sulfate content soil and/or rock are given in Little, "The Effect of Sulfates on Lime-Soil Interactions" in *Handbook for Stabilization of Pavement Subgrades and Base Courses with Lime* (Candle-Hunt Publishing Company, Dubuque, Iowa, 1995), pp. 51-52 and references cited therein, and in Searcher, S. L. and Little, D. N., "Microstructural Stability of Sulfate-Contaminated Crushed Concrete Treated with Cementitious Materials," 1999 Annual Meeting of the Transportation Research Board, all of which, except for any part which may be inconsistent with any explicit statement herein, are hereby incorporated herein by reference.

It is also known that organic material in excess of one percent by weight may be deleterious to pozzolanic and

cementitious reactions in calcium-based stabilizers. If organics are present in levels that interfere with calcium-based stabilization, they will prevent strength development. Therefore, the simplest way to evaluate the effect of organics is to assess the rate and level of strength gain, a test that is preferred for other purposes in any event and is described below. However, even though fairly high concentrations of organic material may be tolerated in the particulate mixture comprising drilling cuttings provided in operation (1) as described above of a process according to this invention, they will require larger amounts of calcium-based stabilizer, and therefore be more expensive to treat, whenever calcium-based stabilizers are used. Accordingly, the concentration of organic material in the particulate mixture comprising drilling cuttings provided in operation (1) as described above of a process according to this invention that employs group (2.1) of sub-operations as described above preferably does not exceed, with increasing preference in the order given, 15, 13, 11, 9, 7, 5, 3, or 1% by mass of said particulate mixture comprising drilling cuttings.

If a mixture desired to be treated according to the invention contains too much of sulfate, organic material, or any other constituent that interferes with attaining the desired degree of stabilization, it may nevertheless be treated by a process according to this invention by diluting the initially unsuitable mixture with other sources of particulate rock and/or soil in sufficient quantity to bring the concentrations of interfering material to an adequately low level in the diluted mixture.

One of the most common "interfering constituents" of a mixture to he treated in a process according to this invention is water from aqueous based drilling muds. This particular constituent, when present in a mixture desired to be utilized in a process according to the invention, is rarely, if ever, preferably reduced in concentration by dilution with another source of soil and/or rock. Instead, any large excess of water is preferably separated from the mixture by a less expensive technique, such as allowing the suspensions to settle and drawing off accumulated water from above the settled bed of solids, spreading the wet mixture over a large outdoor area to promote evaporation of the water, mixing with a solid drying agent, or the like. A particularly preferred technique, when the concentration of water in the mixture and the nature of the soil and/or rock to be treated are suitable, is to utilize a relatively inexpensive drying agent, such as fly ash and/or kiln dust that also has a stabilizing effect as described above. Any such material added should be regarded as part of the stabilizer when the amount of stabilizer is selected along the guidelines in Table 1. This technique is particularly advantageous when mixtures of lime with fly ash and/or kiln dust are to be used as the preponderant stabilizer, because the lime can be added at a later stage of mixing, when it is not so readily bound by excessive amounts of water in the mixture to be stabilized and thereby prevented, or at least delayed, from promoting desired pozzolanic stabilization reactions.

Mixture of Cuttings with Other Sources of Particulate Rock and/or Soil for Purposes Other than Dilution of Interfering Constituents.

Dilution of cuttings with other sources of particulate soil and/or rock is a very useful supplemental technique in a process according to the invention in many instances, even when no dilution is required to reduce the concentrations of interfering substances. For example, suitable soil is often available at very low cost in the vicinity of a site where a structure is to be built by a process according to the invention. In such an instance, the cost of such a structure can often be considerably reduced by mixing some low cost soil with the cuttings, because most naturally formed soils will need less stabilizer per unit volume than most cuttings to be used in a process according to the invention, and the stabilizer is usually more costly than either cuttings or natural soil. Furthermore, a mixture of natural soil and cuttings often forms a stronger structure in a process according to the invention than could be obtained from stabilizing nearby natural soil alone with the same amount of stabilizer. Still further, of course, one object of the invention is to convert drilling cuttings to useful structures, particularly when such conversion will reduce potential liability for environmental pollution by the cuttings. Accordingly, it is preferred that particulate rock and/or soil produced by drilling constitute at least, with increasing preference in the order given, 10, 20, 30, 40, 50, 60, 70, 80, or 90% by mass of the particulate mixture comprising drilling cuttings provided in operation (1) as described above of a process according to this invention, unless the use of such a high fraction of cuttings leads to results inconsistent with other preferences expressed herein for characteristics of the finished structures built by a process according to the invention. (For example, the use of cuttings and stabilizer only in a structure built hy a process according to the invention could in some cases result in a structure more susceptible to cracking or other deterioration during aging of the structure than if some other source of particulate rock and/or soil were incorporated into the structure.)

Alternatively or additionally, the fraction of cuttings in the particulate mixture comprising drilling cuttings provided in operation (1) as described above of a process according to this invention preferably is such that the unconfined compressive strength of a structure built by a process according to the invention is greater by at least, with increasing preference in the order given, 3, 6, 9, 12, 15, 18, 21, 24, 27, or 30% than the unconfined compressive strength of a reference structure built by a process that is identical, except that all of the cuttings included in the particulate mixture comprising drilling cuttings provided in operation (1) as described above for the process according to this invention are substituted by an equal volume of the constituents other than cuttings that are present in said particulate mixture.

Lime and/or Hydrated Lime Stabilization.

The degree of stabilization normally desired requires that if lime is the sole or greatly predominant stabilizer, a sufficient amount of lime be added not only to reduce plasticity of clay fines (improve workability) but also to achieve a substantial pozzolanic reaction between clay fines and hydrated lime. This test protocol ensures that an appropriate amount of lime is added to achieve the desired engineering properties.

Step 1: Determine the pH of mixtures of the particulate mixture comprising drilling cuttings to be stabilized with lime in amounts varying in $Ca(OH)_2$ content from 0 to 10 percent. Select a target lime content in accordance with ASTM C-977.

Step 2: Prepare samples according to ASTM D-698 to determine a predicted optimum moisture content for samples with the target percentage of hydrated lime determined in Step 1, with at least one of 1.0 and 2.0 percent below, and with at least one of 1.0 and 102.0 percent above the target lime content determined in Step 1. Samples should be intimately mixed with the specific type of lime and/or hydrated lime intended for use in a process according to this invention and allowed to mellow for two hours prior to compaction.

Step 3: Fabricate three samples at and/or within 2% of the predicted optimum 10 moisture content determined in Step 2 for each trial PC content. Condition the samples at 100 percent relative humidity and at a temperature of 40° C. (The approximate 100 percent relative humidity environ-

ment is difficult to achieve in many high temperature chambers. In order to maintain the level of moisture required for pozzolanic reaction and cementitious reaction, it is advisable to wrap the sample in plastic and then to place the sample with approximately 10 grams of water in a readily sealable and unsealable moisture-proof plastic bag.)

Step 4: Determine the UCS of the samples prepared in Step 3 after these samples have been compacted in accordance with ASTM D-698. ASTM Procedure D-5102 is used to determine UCS. The test should be performed on the standard-sized samples used in compaction density evaluation. Prior to UCS testing, the samples are wrapped in a fibrous geofabric capable of transporting moisture along the circumference of the sample, placed on a porous stone covered to the top with water, and allowed to absorb moisture through capillary soak for a period of 24 hours.

Step 5: Plot the compressive strengths of the three samples at each of the three lime contents determined in Step 4 on a chart of compressive strength versus stabilizer content. Select the lime content that provides both the highest compressive strength and an acceptable compressive strength based on the section below titled, "Target Engineering Properties and Structural Thickness Requirements."

Portland Cement Stabilization.

Step 1: Select three trial PC contents based on Table 1. If these stabilizer contents do not provide acceptable strength, then additional trials may be made.

Step 2: Prepare samples according to ASTM D-698 to determine a predicted optimum moisture content for a sample with each PC percentage selected in Step 1. The particulate mixture comprising drilling cuttings to be stabilized should be intimately mixed with PC and then immediately compacted.

Step 3: Fabricate three samples at and/or within 2% of the predicted optimum moisture content determined in Step 2 for each trial PC content. Cure the samples by placing them in a sealed plastic bag and place the bagged samples in a curing room at a temperature of 25° C. for 7 days.

Step 4: Determine the UCS of the samples fabricated in Step 3 by the same procedures as for Step 4 under the heading "Lime and/or Hydrated Lime Stabilization" above.

Step 5: Plot the compressive strengths of the three samples at each of the three PC contents on a chart of compressive strength versus stabilizer content. Select the PC content in the same manner as used for selecting lime content in Step 5 under the heading "Lime and/or Hydrated Lime Stabilization" above.

Class C Fly Ash, Lime Kiln Dust, and/or Cement Kiln Dust Stabilization.

Step 1: Select three trial ash and/or dust contents from Table 1. If these stabilizer contents are not satisfactory, then additional testing may be required.

Step 2: Prepare samples according to ASTM D-698 to determine a predicted optimum moisture content for a sample with each percentage of ash and/or dust selected in Step 1. Samples should be intimately mixed with the ash and/or dust and then compacted immediately.

Step 3: Fabricate three samples at and/or within 2% of the predicted optimum moisture content determined in Step 2 for each trial ash and/or dust content. Cure the samples by placing them in a sealed plastic bag and placing the bagged samples in a curing room at a temperature of 25° C. for 7 days.

Step 4: Determine the UCS of the samples cured in Step 3 by the same procedures as for Step 4 under the heading "Lime and/or Hydrated Lime Stabilization" above.

Step 5: Plot the compressive strengths of the three samples at each of the three ash and/or dust contents on a chart of compressive strength versus stabilizer content. Select the ash and/or dust content in the same manner as used for selecting lime content in Step 5 under the heading "Lime and/or Hydrated Lime Stabilization" above.

Stabilization with Combinations of Portland Cement, Lime, and/or Hydrated Lime with Fly Ash, Cement Kiln Dust, and/or Lime Kiln Dust.

1. Single State Type.

Step 1.1: Based on Table 1, determine target contents for each of the lime group and the ash/dust group. The combinations of lime and Class F fly ash in Table 1 are based on the amount of fly ash required to provide a pozzolan source and, secondly, the amount of lime required to sufficiently activate the Class F ash. However, if more plastic cuttings are encountered and do not react with the lime group alone to provide sufficient strength gain, then the lime group content may have to be increased above that listed in Table 1 in order to modify the clay content of the particulate mixture comprising drilling cuttings to be stabilized prior to activating the pozzolanic reaction with the Class F ash.

Step 1.2: Prepare samples according to ASTM D-698 to determine a predicted optimum moisture content for a sample with each combination of lime group and ash/dust group content selected in Step 1. Samples should be intimately mixed with both the lime group and the ash/dust group stabilizers. The stabilizers of both groups may be added at the same time unless the plasticity index of the cuttings as determined according to ASTM Procedure D-4318 exceeds 15 percent. In that instance, the lime group stabilizer should be mixed first with the particulate mixture comprising drilling cuttings to be stabilized, immediately followed by the ash/dust group stabilizer.

Step 1.3: Fabricate three samples at and/or within 2% of the predicted optimum moisture content determined in Step 2 for each trial content combination. Cure the samples by placing them in a sealed plastic bag and place the bagged samples in an oven or curing room at a temperature of 40° C. for 7 days.

Step 1.4: Determine the unconfined compressive strength (UCS) of the samples cured in Step 3 by the same procedures as for Step 4 under the heading "Lime and/or Hydrated Lime Stabilization" above.

Step 1.5: Plot the compressive strengths of the three samples at each of the three contents combinations on a chart of compressive strength versus stabilizer content. Select the lime group and ash/dust group contents in the same manner as used for selecting lime content in Step 5 under the heading "Lime and/or Hydrated Lime Stabilization" above.

2. Two Stage Type.

Step 2.1: The purpose of the initial step is to select a drying and pre-stabilization agent (hereinafter usually abbreviated as "DPSA") that has the capability of drying the drill cuttings to a level of acceptable workability and of initiating the stabilization process. Typical candidates for DPSA include fly ash, lime kiln dust, cement kiln dust, and quicklime. The DPSA candidates should be able to produce a high enough pH to initiate a pozzolanic reaction between silica and alumina in the cuttings and calcium from the DPSA. This pozzolanic reaction accomplishes part of the drying process and begins the strength gain process. Proper selection of the DPSA permits successful drying and stabilization. Within these constraints, the selection of the appropriate DPSA is largely based on site-specific availability and cost effectiveness.

Step 2.2: Mix trial amounts of the candidate DPSA with the cuttings in their natural moisture state. The mixing process should simulate the level of preliminary mixing that can be achieved in the field. A reasonable process is to mix the DPSA with the cuttings in a mixing bowl with a spatula. Then allow the mixture of cuttings and DPSA to dry overnight and test the resulting moisture content. A satisfactory level of drying is achieved when the cuttings can be molded into a cohesive mass in the palm of a normal human hand. (This is typically at about three to five percentage points above optimum moisture for compaction according to American Association of State Highway and Transportation Officials Procedure T-99, if some soil is to be blended with the mixture in the final structure to be built according to the invention.)

Step 2.2': (Used only when soil is to be added to the mixture in the final structure to be built according to the invention.) Blend samples of the dried mixture from step 2.2 with several proportions of the soil to be used. Determine the moisture density relationship of the blend of cuttings, DPSA, and soil. A reasonable moisture-density relationship according to American Association of State Highway and Transportation Officials Procedure T-99 normally should be achieved with about five samples.

Step 2.3: Determine the type and amount of second stage stabilizer, alternatively denoted as "activator," to be used. The activator can be the same material as the DPSA, but typically will be Portland Cement or lime (calcium oxide or calcium hydroxide). The primary role of the activator is to react with the soil and/or DPSA pozzolans to complete the pozzolanic reaction and to augment the pozzolanic reaction by a hydration cementitious reaction as required to achieve the desired compressive strength. The activator not only completes the stabilization process but also completes the drying process.

Step 2.4: Determine the amount of the activator selected in Step 2.3 that is needed to achieve the required unconfined compressive strength. The determination can usually be effectively begun by molding three samples at the predicted optimum moisture content determined in step 2.2 (including 2.2' if this step is used) and three additional samples at each of one percent less than optimum and one percent in excess of optimum. Nine samples according to this procedure should be made for each of the mixtures without activator and for activator contents of each of 3.0, 5.0, and 7.0 percent. The UCS of these samples is tested after curing and conditioning as described for Steps 3 and 4 under the heading "Lime and/or Hydrated Lime Stabilization" above.

Step 2.5: Select an appropriate mixture design based on the results of UCS Testing in Step 2.4. The UCS is used in a layered elastic model of the structure to be built according to the invention as described in the section of this description below after the heading "Target Engineering Properties and Structural Thickness Requirements."

Stabilization with Asphalt (Emulsified and/or Foamed).

Step 1: Select a slow setting (hereinafter usually abbreviated as "SS") emulsion for cuttings having greater than 15 percent by mass of material passing a sieve with openings 0.075 millimeter(s) (hereinafter usually abbreviated as "mm"). Otherwise, select a medium setting (hereinafter usually abbreviated as "MS") emulsion. (A determination of whether an anionic or cationic emulsion should be used is based on coating and adhesion tests described in subsequent steps).

Step 2: Determine a trial emulsion and/or foam content for the particulate mixture comprising drilling cuttings to be stabilized as follows:

$$\%\ \text{emulsion and/or foam} = [(0.06 \times B) + (0.01 \times C] \times 100) / A,$$

where A is percent residue by ASTM D-244, B is percent of dried particulate mixture comprising drilling cuttings to be stabilized that passes a No. 4 sieve, and C is (100–B).

Step 3: The trial emulsion and/or foam content determined in Step 2 is combined with the particulate mixture comprising drilling cuttings to be stabilized, corrected to a dry weight, and formed into a coating, which is visually estimated as satisfactory or unsatisfactory for its intended use of the mix. The procedure for forming the coating consists of the following operations: (3.1) Determine the moisture content of a representative particulate mixture comprising drilling cuttings to be stabilized; (3.2) mix in water by hand for 10 seconds or until visually uniformly dispersed, the amount of water being determined by visual inspection of the mixture; (3) add the selected weight of the trial emulsion and/or foam content to the moist aggregate at the anticipated use temperature and mix vigorously by hand for 60 seconds or until sufficient dispersion has occurred throughout the mixture; and (4) place the mixture on a flat surface and visually estimate the degree of coating.

Step 4: Prepare three or more specimens each at a minimum of three different emulsion and/or foam contents. If the mixture in the coating test of Step 3 appears satisfactory, use one specimen with the same emulsion and/or foam concentration as used for Step 3, with one other specimen below and one other specimen above the trial emulsion and/or foam content. If the mixture in the coating test of Step 3 appears to be dry, use one specimen with the foam and/or emulsion content used for Step 3 and increase the foam and/or emulsion content for each of the other two specimens. Conversely, if the mixture in the coating test of Step 3 appears too wet, reduce the foam and/or emulsion content for the second and third specimens. (A normal difference between the emulsion and/or foam contents is one percent, or a residual asphalt content difference of 0.65 percent for an emulsion and/or foam with a 65 percent residual content.)

Step 5: Determine adhesion by the following sequence of operations: (1) Cure a 100 gram portion of the mix from Step 4 in a shallow container for 24 hours in a forced draft oven at 60° C.; (2) put the oven-cured mix in a 600 milliliter (hereinafter usually abbreviated as "ml") size beaker containing 400 ml of boiling distilled water; 3) bring to a boil again, and maintain boiling and stir at one revolution per second; (4) pour off water and place the mix on a piece of white absorbent paper; and (5) after the mix has dried, visually evaluate the amount of retained asphalt coating. If satisfactory, continue the mix design or if not acceptable, then the amount of emulsion and/or foam used should be modified or another grade selected.

Step 6: Compact a freshly prepared specimen of the most satisfactory mixture(s) from Step 5 according to ASTM D 59 or D 1560. (Aeration or drying of a dense-graded mixture is often required prior to specimen compaction. If the total liquid volume exceeds the voids in the mineral aggregate plus any absorbed liquid volume, proper compaction cannot be achieved.)

Step 7: Determine volumetrics and stability of the compacted mixtures. Volumetrics such as air voids, voids

filled with bitumen, and voids in the mineral aggregate, can be determined by properly accounting for moisture and following appropriate ASTM testing procedures, including D-70, D-1188, D-2726, and D-3203. Marshall stability and flow should be determined following the procedures of ASTM D-1559 beginning at paragraph five (Procedure), except that the compacted specimens preferably are placed in an air bath for a minimum of two hours at the test temperature of 25° C. (±1° C.). A stability value of 2,224 N or greater has been found to be satisfactory for most pavements with low to moderate traffic volume. Hveem stability preferably is determined following ASTM D-1560 (paragraphs four through nine), except that the compacted specimens preferably are placed in an air bath for a minimum of two hours at the test temperature of 25° C. (±1° C.). A stability value of 30 or greater has been found to be satisfactory for most pavements with low to moderate traffic volume.

Target Engineering Properties and Structural Thickness Requirements.

The combination of thickness and physical properties, e.g., stiffness and strength, of the stabilized particulate mixture comprising drilling cuttings must be capable of supporting all of the continuous and/or varying loads applied to it during its designed use.

For example, if the structure to be built by a process according to the invention is a drilling pad, the pad must be able to support heavy equipment hauled in and out of the site during the drilling operations. However, stiffness and strength values far greater than those needed are disadvantageous for at least two reasons: very high stiffness and strength values result in greater susceptibility to cracking and similar forms of brittle deterioration that can substantially shorten the useful life of a structure, and achieving very high strength and stiffness usually requires considerably larger fractions of stabilizer in a structure, thereby increasing its cost.

To assess the required engineering properties and thickness combinations required of the stabilized particulate mixture comprising drilling cuttings, a layered elastic structural evaluation is preferred. In this type of evaluation, the structure to be built is modeled as a succession of layers. Each layer is modeled by a modulus and a Poisson's ratio with an assigned thickness. A load configuration is modeled to simulate the critical traffic applied to the structure and includes consideration of the wheel load, load geometries, and tire contact pressure. The layered elastic model (hereinafter usually abbreviated as "LEM") calculates stresses and strains within the pavement system. Stresses and strains at critical points, e.g., compressive strains at the top of the natural subgrade, and shearing stresses within the structural layer, are calculated and compared to criteria used to assess performance in terms of the number of applications of such a design load that the structure can withstand.

A factorial LEM analysis was performed considering the effects of four variables: the number of load applications, subgrade strength, structural layer thickness, and structural layer strength and modulus. The design load was defined as an 18,000 pound single axle load, which is expected to resnlt in a structure that is fully satisfactorily strong, stiff, and durable for a normal deep drilling pad or lease road needed in connection with deep drilling. Table 2 illustrates some results of the factorial analysis. "E" in Table 2 represents the resilient modulus. The value for E given in Table 2 was calculated by the most conservative of established empirical correlations between resilient modulus and UCS, specifically that:

E(in thousands of psi)0.124(UCS{in PSI})+9.98.

The unit "thousands of psi" is hereinafter usually abbreviated as "kpsi."

The UCS values shown in Table 2 are for samples that have been moisture-conditioned for 7 days. If unconditioned samples are used instead, the UCS values should be 100 psi higher than those shown in Table 2.

The control in Table 2 is a compacted crushed limestone gravel base with a UCS value of 45 psi and a modulus that is expected to be within a range from 13 to 18 kpsi, based on typical properties of unbound aggregate bases under a stress representative of that on a structural pad or a lease road.

A considerably higher UCS value than the maximum value of 300 psi shown in Table 2 can be achieved by using high stabilizer percentages. However, the 300 psi value is considered to be the upper limit practically required of most stabilized bases subjected to moisture conditioning that simulates the deep drilling field environment. In fact, if a stabilized layer can maintain at least 100 psi following moisture conditioning, it normally should provide adequate field durability when used in the thicknesses shown for that UCS value in Table 2. However, if the structure is being built in an area with a continuously high water table or an area where there are large seasonal fluctuations in water table, a higher UCS value may be advantageous to prevent deterioration from these environmental influences. In a normal deep drilling field environment, however, for the reasons given above, the UCS values obtained after 7 days of aging of the actual mixture of materials to be used in building a structure by a process according to this invention preferably does not exceed the value given in Table 2 for the structure thickness and subgrade strength values as shown in Table 2 by a percentage of said value given in Table 2 that is more than, with increasing preference in the order given, 300, 250, 200, 190, 180, 170, 160, 150, 140, 130, 120, 110, 100, 90, 80, 70, 60, 50, 40, 30, or 20 percent. For example, if the subgrade strength is at least 5,000 psi but less than 10,000 psi and the thickness of the structure to be built is 16 inches, the conditioned UCS value preferably is at least 100 psi but need not be more than 120 psi, but if the thickness is only 10 inches, the conditioned UCS value preferably is at least 300 psi and need not be more than 360 psi.

TABLE 2

Factors and Values Thereof Considered in Factorial Analysis and Resulting Thickness Requirements

Subgrade Strength	Strength and Stiffness of the Stabilized Particulate Mixture Comprising Particles of "Control" or of Soil, Rock, or Both Rock and Soil	Recommended Thickness, inches
Soft	Control (E = 13-18 kpsi)	18
($E_{subgrade}$ = 5.0 kpsi)	UCS = 100 psi (E = 22 kpsi)	16
	UCS = 200 psi (E = 35 kpsi)	12
	UCS = 300 psi (E = 47 kpsi)	10
Moderate	Control (E = 13-18 kpsi)	13
($E_{subgrade}$ = 10.0 kpsi)	UCS = 100 psi (E = 22 kpsi)	12
	UCS = 200 psi (E = 35 kpsi)	9
	UCS = 300 psi (E = 47 kpsi)	8
Strong	Control (E = 12.6-18 kpsi)	8
($E_{subgrade}$ = 15.0 kpsi)	UCS = 100 psi (E = 22 kpsi)	8
	UCS = 200 psi (E = 35 kpsi)	8
	UCS = 300 psi (E = 47 kpsi)	8

The thickness values recommended in Table 2 can accommodate at least 10,000 applications of the design load with less than 1 inch depth of rutting. (These values were compared to those found using the U.S. Army Corps of Engineers

granular base rutting model and found to be at least as large as those recommended by that model.)

The thicknesses in Table 2 are exact only for the specified purposes and conditions. Each instance of use of a process according to this invention should be evaluated hy the methods outlined above using the actual stabilizer(s) and particulate mixture comprising drilling cuttings to be stabilized and the particular strength, stiffness, and durability requirements of the actual structure to be huilt.

In a particularly preferred embodiment of the invention, the mixture comprising drilling cuttings provided in operation (1) of a process according to the invention as described above is a mixture that has been produced by drilling through the surface of the earth to form a borehole by a process comprising sub-operations of:

1.1) Providing drilling means, drilling driving means that cause the drilling means to operate at the bottom of said borehole, and drilling mud; and

1.2) Causing said drilling driving means to drive said drilling means while said drilling mud flows into and out of said horehole through separate passage-ways disposed so as to insure that mud pumped into the borehole must reach the near vicinity of the drilling means that is deepening, widening, and/or otherwise increasing the volume of said borehole before the mud can enter any passageway through which a mixture of mud and cuttings flows out of the borehole during drilling, said mixture of mud and cuttings, optionally after removal therefrom of all or part of the constituents of said mixture that are not cuttings and/or additions thereto of other particulate material, constituting said mixture that has heen produced by drilling through the surface of the earth to form a borehole.

The invention may be further appreciated by consideration of the following examples, at least some, but not necessarily all, of which are according to the invention.

EXAMPLES OF DEVELOPMENT OF STRUCTURAL STRENGTH IN MIXTURES INCORPORATING DRILLING CUTTINGS

Example 1

In this example, the cuttings used were obtained during drilling in the vicinity of Buffalo in Freestone County, Tex., using water-based drilling mud. The native soil in this area is described as follows by government sources: "Edge Fine Sandy Loam, 5 to 12% Slopes. The Edge Series consists of deep over siltstone, well drained, very slowly permeable upland soils. The surface to 11 inches is fine sandy loam. The subsoil is reddish and clay loam 11 to 29 inches." Cuttings from drilling through this soil with a water-based drilling mud were collected in a waste pit on the drilling site and allowed to settle for a period of at least several months. Settled and moist sediment of this type was used as the cuttings to be stabilized during this example. These cuttings were determined by ASTM D 4318 to have an Atterberg Liquid Limit of 25, Plastic Limit of 16, and Plasticity Index of 9, while the native surface soil was independently determined to have an Atterberg Liquid Limit of 18 and Plastic Limit of 19.

Based on the principles given above, concentrations of 3, 5, and 7% of Type 1 Portland Cement and a concentration of 10% of Class C Fly Ash were chosen as candidate stabilizers for a mixture of the selected cuttings with twice its own mass of the native soil taken from the top 12 inches thereof. In accordance with the Test Protocols given above for hoth these stabilizers, a predicted optimum moisture content for each mixture was determined according to ASTM D 698 for each mixture, with the results shown in Table 3 below.

TABLE 3

Concentration and Type of Stabilizer	Predicted Optimum Moisture Percent
3% Cement	11.4
5% Cement	10.6
7% Cement	11.0
10% Class C Fly Ash	9.6

Samples incorporating the predicted optimum moisture percent and moisture percents differing from the predicted optimum by 2% both greater and less were then prepared and cured as described above in the test protocols. The UCS values for these samples are shown in Table 4 below.

TABLE 4

	UCS Value in psi with Percents of Moisture:		
Concentration and Type of Stabilizer	Predicted Optimum −2	Predicted Optimum	Predicted Optimum +2
3% Cement	159	181	136
5% Cement	196	336	219
7% Cement	243	389	358
10% Class C Fly Ash	28	54	40

In this instance, a UCS value expected to be satisfactory for very heavy duty service is readily achieved with 5% or 7% cement and a value satisfactory for slightly lighter duty service was achieved with 3% cement. The particular type of Class C Fly Ash used was not as effective in achieving strength gain as the cement.

Example 2

In this example, the cuttings used were obtained during drilling in Midland County, Tex., using water-based drilling mud. The native soil in this area is of two types, which are described as follows by government sources: "Miles Loamy Fine Sand, 0 to 3° A Slopes . . . . The Miles Series consists of deep, moderately drained soils on uplands . . . [From] 0 to 14 inches [the soil is/has] reddish-brown (5YR 5/4) loamy fine sand, dark reddish-brown (5YR 3/4) when moist; weak, very fine, subangular blocky structure; soft, very friable; common roots; neutral; gradual, smooth boundary" and "Sharvana Fine Sandy Loam, 0 to 3% Slopes. The Sharvana [S]eries consists of moderately permeable soils on uplands.

These soils are shallow to indurated caliche . . . . In a representative profile the surface layer is reddish-brown fine sandy loam about 6 inches thick. The next layer is reddish-hrown sandy clay loam about 8 inches thick." Cuttings from drilling through this soil with a water-based drilling mud were collected in a waste pit on the drilling site and allowed to settle for a period of at least several months. Settled and moist sediment of this type was used as the cuttings to be stabilized for the purpose of this example.

Based on the principles given above, concentrations of 3, 5, and 7% of Type 1 Portland Cement and a concentration of 10% of Class C Fly Ash were chosen as candidate stabilizers for a mixture of the selected cuttings with twice its own mass of the native soil taken from the top 12 inches thereof. In accordance with the Test Protocols given above for both these stabilizers, a predicted optimum moisture content for each

mixture was determined according to ASTM D 698 for each mixture, with the results shown in Table 5 below.

TABLE 5

Concentration and Type of Stabilizer	Predicted Optimum Moisture Percent
3% Cement	11.0
5% Cement	11.5
7% Cement	11.0
10% Class C Fly Ash	10.5

Samples incorporating the predicted optimum moisture percent and moisture percents differing from the predicted optimum by 2% both greater and less were then prepared and cured as described above in the test protocols. The UCS values for these samples are shown in Table 6 below.

TABLE 6

	UCS Value in psi with Percents of Moisture:		
Concentration and Type of Stabilizer	Predicted Optimum −2	Predicted Optimum	Predicted Optimum +2
3% Cement	132	122	80
5% Cement	221	156	127
7% Cement	254	223	161
10% Class C Fly Ash	115	80	63

In this instance, a UCS value expected to be satisfactory for very heavy duty service is readily achieved with 5% or 7% cement and a value satisfactory for slightly lighter duty service was achieved with 3% cement. The particular type of Class C Fly Ash used was not quite as effective in achieving strength gain as even the lowest percentage of the cement, but was much more effective than in Example 1.

Examples 3 to 9

In all of these examples, the cuttings used were obtained during drilling at various sites in Latimer County, Okla., using oil-based drilling mud. Cuttings from drilling through these soils with an oil-based drilling mud were passed over a shaker table and through a centrifuge in tandem to separate the cuttings from the drilling mud, which was recycled to drilling. Separated cuttings of this type were used as the cuttings to be stabilized during these examples. These cuttings for Examples 5 to 9 were determined by ASTM D 4318 to have Atterberg Liquid Limits, Plastic Limits, and Plasticity Indices as shown in Table 7 below, while the nearby surface soil was independently determined to have values for the same characteristics at the time of mixing with the cuttings used in the various examples as also shown in Table 7.

TABLE 7

		Atterberg Test Values for:		
Example No.	Cuttings or Soil?	Liquid Limit	Plastic Limit	Plasticity Index
5	Soil	31	22	9
	Cuttings	55	45	10
6	Soil	56	28	28
	Cuttings	31	26	5
7	Soil	20	71	3
	Cuttings	55	42	13
8	Soil	35	20	15
	Cuttings	65	50	15

TABLE 7-continued

		Atterberg Test Values for:		
Example No.	Cuttings or Soil?	Liquid Limit	Plastic Limit	Plasticity Index
9	Soil	24	17	7
	Cuttings	48	39	9

Based on the principles given above, concentrations of 3, 5, and 7% of Type 1 Portland Cement and a concentration of a combination of 10% of Class C Fly Ash and 2% of Portland Cement were chosen as candidate stabilizers for the mixtures of the selected cuttings with twice their own masses of the native soil taken from the top 12 inches thereof. In accordance with the Test Protocols given above for both these stabilizers, an estimated optimum moisture content for each mixture was determined according to ASTM D 698 for each mixture, with the results shown in Table 8 below.

TABLE 8

Example No.	Concentration and/or Type of Stabilizer	Predicted Optimum Moisture Percent
3	3% Cement only	18.7
	5% Cement only	17.0
	7% Cement only	18.4
	Fly Ash + Cement	18.0
4	3% Cement only	20.4
	5% Cement only	19.5
	7% Cement only	19.9
	Fly Ash + Cement	18.6
5	3% Cement only	20.5
	5% Cement only	19.9
	7% Cement only	18.8
	Fly Ash + Cement	18.6
6	3% Cement only	18.9
	5% Cement only	17.3
	7% Cement only	14.0
	Fly Ash + Cement	9.8
7	3% Cement only	15.0
	5% Cement only	13.6
	7% Cement only	14.1
	Fly Ash + Cement	13.7
8	3% Cement only	16.0
	5% Cement only	18.2
	7% Cement only	17.9
	Fly Ash + Cement	15.5
9	3% Cement only	14.7
	5% Cement only	14.6
	7% Cement only	13.5
	Fly Ash + Cement	12.8

Samples incorporating the predicted optimum moisture percent and moisture percents differing from the predicted optimum by 2% both greater and less were then prepared and cured as described above in the test protocols. The UCS values for these samples are shown in Table 9 below.

TABLE 9

	Concentration	UCS Value in psi with Percents of Moisture:		
Example No.	and/or Type of Stabilizer	Predicted Optimum −2	Predicted Optimum	Predicted Optimum +2
3	3% Cement only	73	82	63
	5% Cement only	152	113	80

TABLE 9-continued

Example No.	Concentration and/or Type of Stabilizer	UCS Value in psi with Percents of Moisture: Predicted Optimum −2	Predicted Optimum	Predicted Optimum +2
	7% Cement only	215	229	160
	Fly Ash + Cement	94	87	61
4	3% Cement only	104	128	93
	5% Cement only	128	172	160
	7% Cement only	191	226	184
	Fly Ash + Cement	190	220	200
5	3% Cement only	92	75	50
	5% Cement only	156	104	92
	7% Cement only	172	122	119
	Fly Ash + Cement	44	37	32
6	3% Cement only	46	53	35
	5% Cement only	48	66	72
	7% Cement only	89	62	141
	Fly Ash + Cement	17	33	55
7	3% Cement only	105	73	60
	5% Cement only	218	166	119
	7% Cement only	294	189	157
	Fly Ash + Cement	117	90	57
8	3% Cement only	84	55	44
	5% Cement only	116	97	76
	7% Cement only	142	147	101
	Fly Ash + Cement	140	80	58
9	3% Cement only	87	59	57
	5% Cement only	118	125	82
	7% Cement only	172	142	127
	Fly Ash + Cement	170	109	102

In most of these instances, a UCS value expected to be satisfactory for moderately heavy duty service is readily achieved with 5% or 7° A) cement. The combination of cement and the particular type of Class C Fly Ash used, along with 3% cement only, was not as effective in achieving strength gain as the cement in most instances, but the combination was nearly as good for Example 4. These results emphasize that the exact materials to be used need to be tested and optimized in order to achieve very highly satisfactory structures.

Examples 10 to 15

In these examples, the cuttings always included some cuttings that had been obtained by drilling with water-based mud. Therefore, in accordance with the preferences indicated above, the processes according to the invention were divided into two stages. In the first stage, the cuttings and any mud of the same type used to produce them that had previously been mixed for storage were mixed with a Class C Fly Ash, a type of stabilizer that is also a relatively inexpensive drying agent, to form a preliminary mixture. In the second stage, the preliminary mixture was itself mixed with soil from within the top 2 feet of naturally occurring soil near the site of the drilling operation that had generated the cuttings and with Type I Portland Cement to form the final mixtures that were conditioned for several days before strength testing as described above. Except for Examples 11, 14, and 15, the nearby surface soil that was used in the immediately previously described mixtures was also mixed with Class C Fly Ash and with at least some of the same fractions of the same type of Portland Cement as had been used to make these immediately previously described mixtures, in order to determine whether the incorporation of cuttings would change the strength values that could be obtained with soil, fly ash, and cement alone. (These mixtures that contained no drilling cuttings are not examples according to the invention.) Table 10 below gives further details of Examples 10-15.

TABLE 10

Example No.	Location (North Latitude I West Longitude)	Soil Only or Mixture with Cuttings?	% by Mass of All Constituents in Conditioned Mixture Except Portland Cement: Soil	Water-Based Cuttings and Any Mud Mixed with Them in Storage	Oil-Based Cuttings and Any Mud Mixed with Them in Storage	Fly Ash
10	30° 36.0' I	Soil	80	0	0	20
	91° 30.5'	Mixture	50	30	12	8
11	32° 58.3' I	Mixture	71	24	0	5
	97° 23.1'					
12	33° 81' I	Soil	65	0	0	35
	97° 22.2'	Mixture	71	21	0	7
13	33° 10.6' I	Soil	70	0	0	30
	97° 18.4'	Mixture	71	22	0	7
14	33° 10.0' I	Mixture	71	26	0	3
	97° 18.2'					
15	32° 58.3' I	Mixture	72	25	0	4
	97° 22.5'					

Some of the mixtures as described in Table 10 were then mixed with 3.0, 5.0, and 7.0 percent of their own mass of Type I Portland Cement. The predicted optimum moisture 10 percent values for some of these mixtures were determined in accordance with the procedures specified above. Results are shown in Table 11 below.

TABLE 11

Example No.	Concentration of Cement	Predicted Optimum Moisture Percent
10	3%	22.0
	5%	20.9
	7%	20.3
11	5%	24.1
12	5%	24.2
13	5%	19.5

TABLE 11-continued

Example No.	Concentration of Cement	Predicted Optimum Moisture Percent
14	5%	18.8
15	5%	23.1

Samples incorporating the predicted optimum moisture percent and moisture percents differing from the predicted optimum by 2% both greater and less were then prepared and cured as described above in the test protocols. For Examples 11 through 15, the predicted optimum for a mixture with 5% of cement was used irrespective of the actual percent of cement in the sample tested. The UCS values for these samples are shown in Table 12 below. These values were determined after 7 days of conditioning for Examples 10, 14, and 15 and after 5 days of conditioning for Examples 11 through 13.

In Examples 10 and 12, the mixtures containing cuttings developed substantially greater UCS values under most of the conditions tested than the compared mixtures without cuttings, even though the latter contained more of the fly ash stabilizer.

TABLE 12

Example No.	Concentration of Cement	Cuttings Present in Conditioned Mixture?	UCS Value in psi with Percents of Moisture: Predicted Optimum – 2	Predicted Optimum	Predicted Optimum + 2
10	3%	No	109	77	55
		Yes	128	107	84
	5%	No	160	103	59
		Yes	153	127	113
	7%	No	164	90	63
		Yes	169	135	117
11	3%	Yes	113	135	80
	5%	Yes	161	170	155
	7%	Yes	217	189	198
12	5%	No	166	144	163
		Yes	264	264	223
	7%	Yes	342	318	249
13	3%	Yes	129	83	Not Tested
	5%	No	278	257	Not Tested
		Yes	148	113	85
	7%	Yes	137	113	75
	3%	Yes	133	123	71
	5%	Yes	181	169	156
	7%	Yes	219	219	150
15	3%	Yes	133	107	64
	5%	Yes	223	155	147

Construction of a Working Lease Road Incorporating Cuttings by a Process According to the Invention.

A volume of about 573 cubic meters (hereinafter usually abbreviated as "m^3") that was constituted preponderantly of cuttings formed by drilling with an oil-based drilling mud and also included some fluidized bed fly ash (a material containing about 16% stoichiometric equivalent as SO_3 of sulfur) that had been added to the cuttings as a drying agent was used as the initial mixture comprising soil, rock, or both rock and soil to begin the process according to this invention. Analysis showed that this initial mixture contained 9.9 ppt of soluble sulfate and 86 ppt of total petroleum hydrocarbons and had a bulk density of 1.4 megagrams per cubic meter (hereinafter usually abbreviated as "Mg/m^3"). Because this initial mixture contained too much sulfate for direct use in a process according to the invention as described above, the initial mixture was diluted with some of the native soil in this area, which is described as "Bengal-Denman association, moderately steep" by the U.S. Department of Agriculture Soil Conservation Service, (now named the Natural Resources Conservation Service). Further details about this soil are available in Soil Survey of Latimer County, Okla., Issue of December 1981. This soil was analyzed and found to contain 1.23 ppt of soluble sulfate and 15 ppt of total organic carbon and to have a bulk density 1.5 Mg/m3. Calculation shows that this soil can be mixed in a bulk volume ratio of 7:3 with the initial mixture of cuttings and fluidized bed fly ash to form an amended initial mixture with no more than 3 ppt of sulfate. Because this is still near the upper limit of sulfate that can be treated in a process according to this invention without concern, Portland Cement was selected as the stabilizer for use in the process according to the invention, inasmuch as Portland Cement is the most tolerant of sulfate of all the lime-based stabilizers shown in Table 1, and in particular "ASTM C 150, Type II" cement, a sulfate-tolerant type of cement, was selected. Consideration of Table 1 shows that 6.0 ppt of the cement should produce a satisfactory final structure.

Accordingly, the Bengal-Denman soil noted above was mixed with a volume fraction of 4% of the soil volume with this type of cement to form a combined stabilizer-diluent mixture. This mixture, because the cement has a bulk specific gravity of 3.14, contained 7.8 ppt of the cement.

A layer of the initial mixture containing oil-based cuttings and high sulfate as noted above, the layer being about 0.15 meters in depth and from 11 to 14 meters in width, was deposited along the line of the road to be constructed, and then covered with a second layer of the stabilizer-diluent mixture described above, this second layer being about 0.46 meters in depth and the same width as the first layer. The entire particulate contents of these two layers were then mixed with a soil stabilizer machine, a machine that is known in the art to achieve excellent mixing throughout the entire depth of particulates mixed. Sufficient water was then added atop this mixture to provide an amount of water by mass equal to 12 to 14% of the mass of the mixture, and after a pause of 30 minutes to allow the water to permeate through the depth of the particulate bed, the top of the bed was successively

rolled with a "sheep's foot roller" that applied a pressure of 200 to 300 pounds per square inch, bladed, and rolled with a smooth roller which applied very little pressure and acted essentially as a finishing tool. A thickness of 0.4 centimeter of gravel was then spread over the top of the thus prepared road bed. All of these operations for the entire road construction were completed within three hours after the mixing of the stabilizer-diluent mixture with the initial mixture had begun.

Within two days after the construction, as described above, of a structure intended to serve as a road was completed, the structure began to be used as a road, and in over four months of service it has shown no evidence of deterioration of any type, including rutting, despite frequent passage over the road of tractor-trailer trucks and their loads totaling about eighty thousand pounds for each truck. There was heavy rain during this period, and conventional lease roads, consisting essentially of several inches thickness of gravel, that were in the same area and subjected to the same level of traffic loads needed frequent re-graveling to reduce rutting. Thus, the road constructed by a process according to the invention demonstrated clearly superior quality.

The invention claimed is:

1. A process for constructing a load-bearing structure incorporating drilling cuttings, said structure having a shape and a size and containing a continuous portion having a cross-sectional area at least as large as the area of a circle having a diameter of 101 millimeters, said process comprising operations of:

(1) forming a particulate mixture comprising drilling cuttings; and

(2) at least one of groups (2.1) and (2.2) of suboperations, said group (2.1) comprising suboperations of:

(2.1.1) mixing said particulate mixture comprising drilling cuttings with at least one stabilizer seleeted from the group consisting of:

(A) quicklime;

(B) hydrated lime;

(C) Portland Cement;

(D) Class C fly ash;

(E) cement kiln dust;

(F) lime kiln dust;

(G) Class F fly ash; and

(H) other pozzolans to form a cementitious second mixture,

(2.1.2) forming said cementitious second mixture into the shape and size of the load-bearing structure and developing structural strength within said shaped and sized second mixture by pozzolanic reaction to form said load-bearing structure,

said load-bearing structure having sufficient resistance to rutting that any rut formed in such surface by 10,000 applications of a single axle load of 18,000 pounds will have a depth of rutting that is less than 1 inch;

and said group (2.2) comprising suboperations of: (2.2.1) mixing said particulate mixture comprising drilling cuttings with at least one of foamed asphalt and emulsified asphalt to form an asphaltic second mixture; (2.2.2) forming said asphaltic second mixture into the shape and size of the load- bearing structure; and developing structural strength within the shaped and sized asphaltic second mixture by curing, said load-bearing structure having sufficient resistance to rutting that any rut formed in such surface by 10,000 applications of a single axle load of 18,000 pounds will have a depth of rutting that is less than 1 inch.

2. A process according to claim **1**, wherein at least 10 percent by mass of said particulate mixture are deep drilling cuttings that have been generated by a process comprising the following suboperations:

(1.1) providing drilling means, drilling driving means that cause the drilling means to operate at the bottom of a borehole, and drilling mud; and

(1.2) causing said drilling driving means to drive said drilling means while said drilling mud flows into and out of said borehole through separate passageways disposed so as to insure that mud pumped into the borehole must reach the near vicinity of the drilling means that is deepening, widening, and/or otherwise increasing the volume of said borehole before the mud can enter any passageway through which a mixture of mud and cuttings flows out of the borehole during drilling, said mixture of mud and cuttings, optionally after removal therefrom of all or part of the constituents of said mixture that are not cuttings, constituting said deep drilling cuttings.

3. A process according to claim **2**, wherein at least part of the deep drilling cuttings have been produced by drilling with a water-containing drilling mud.

4. A process according to claim **3**, said process comprising group (2.1) of suboperations.

5. A process according to claim **4**, wherein said stabilizer is seleeted from the group consisting of quicklime, hydrated lime, Portland Cement, Class C fly ash, lime kiln dust, cement kiln dust, and mixtures of Portland Cement with at least one of lime kiln dust, cement kiln dust, and Class C fly ash.

6. A process according to claim **5**, wherein said stabilizer is a mixture of Portland Cement with at least one of lime kiln dust, cement kiln dust, and Class C fly ash; and

suboperation (2.1.1) is accomplished in two stages, in the first of which at least one of lime kiln dust, cement kiln dust, and Class C fly ash is mixed with said particulate mixture comprising drilling cuttings and in the second of which Portland Cement is mixed into the mixture previously formed by mixing at least one of lime kiln dust, cement kiln dust, and Class C fly ash with said particulate mixture comprising drilling cuttings.

7. A process according to claim **6**, wherein, based on the particulate mixture comprising drilling cuttings to be stabilized:

the amount of Portland Cement used as a stabilizer is at least 1.0%;

the amount of Class C fly ash used as a stabilizer is at least 2.0%; and

the ratio of the amount of Class C fly ash used as a stabilizer to the amount of Portland Cement used as a stabilizer is at least 0.50:1.0 but is not more than 10:1.0.

8. A process according to claim **2**, wherein at least part of the deep drilling cuttings have been produced by drilling with an oil-containing drilling mud.

9. process according to claim **8**, said process comprising group (2.1) of suboperations.

10. A process according to claim **9**, wherein said stabilizer is selected from the group consisting of quicklime, hydrated lime, Portland Cement, Class C fly ash, fluidized bed fly ash, lime kiln dust, cement kiln dust, and mixtures of Portland Cement with at least one of lime kiln dust, cement kiln dust, Class C fly ash, and fluidized bed fly ash.

11. A process according to claim **10**, wherein:

said stabilizer is a mixture of at least one of Class C fly ash, cement kiln dust, lime kiln dust, or fluidized bed fly ash with Portland Cement; and

suboperation (2.1.1) is accomplished in two stages, in the first of which at least one of Class C fly ash, cement kiln

dust, lime kiln dust, or fluidized bed fly ash is mixed with said particulate mixture comprising drilling cuttings and in the second of which Portland Cement is mixed into the mixture previously formed by mixing fly ash, cement kiln dust, lime kiln dust, or fluidized bed fly ash with said particulate mixture comprising drilling cuttings.

12. A process according to claim **11**, wherein said load-bearing structure has an unconfined compressive strength of at least 100 psi and has a thickness of:

at least 8 inches if constructed on a subgrade with a resilient modulus that is at least 15.0 kpsi;

at least 12 inches if constructed on a subgrade with a resilient modulus that is at least 10.0 kpsi but less than 15.0 kpsi; and

at least 16 inches if constructed on a subgrade with a resilient modulus that is at least 5.0 kpsi but less than 10.0 kpsi.

13. A process according to claim **10**, wherein said load-bearing structure has an unconfined compressive strength of at least 100 psi and has a thickness of:

at least 8 inches if constructed on a subgrade with a resilient modulus that is at least 15.0 kpsi;

at least 12 inches if constructed on a subgrade with a resilient modulus that is at least 10.0 kpsi but less than 15.0 kpsi; and

at least 16 inches if constructed on a subgrade with a resilient modulus that is at least 5.0 kpsi but less than 10.0 kpsi.

14. A process according to claim **7**, wherein said load-bearing structure has an unconfined compressive strength of at least 100 psi and has a thickness of: at least 8 inches if constructed on a subgrade with a resilient modulus that is at least 15.0 kpsi;

at least 12 inches if constructed on a subgrade with a resilient modulus that is at least 10.0 kpsi but less than 15.0 kpsi; and

at least 16 inches if constructed on a subgrade with a resilient modulus that is at least 5.0 kpsi but less than 10.0 kpsi.

15. A process according to claim **6**, wherein said load-bearing structure has an unconfined compressive strength of at least 100 psi and has a thickness of:

at least 8 inches if constructed on a subgrade with a resilient modulus that is at least 15.0 kpsi;

at least 12 inches if constructed on a subgrade with a resilient modulus that is at least 10.0 kpsi but less than 15.0 kpsi; and

at least 16 inches if constructed on a subgrade with a resilient modulus that is at least 5.0 kpsi but less than 10.0 kpsi.

16. A process according to claim **5**, wherein said load-bearing structure has an unconfined compressive strength of at least 100 psi and has a thickness of:

at least 8 inches if constructed on a subgrade with a resilient modulus that is at least 15.0 kpsi;

at least 12 inches if constructed on a subgrade with a resilient modulus that is at least 10.0 kpsi but less than 15.0 kpsi; and

at least 16 inches if constructed on a subgrade with a resilient modulus that is at least 5.0 kpsi but less than 10.0 kpsi.

17. A process according to claim **4**, wherein said load-bearing structure has an unconfined compressive strength of at least 100 psi and has a thickness of:

at least 8 inches if constructed on a subgrade with a resilient modulus that is at least 15.0 kpsi;

at least 12 inches if constructed on a subgrade with a resilient modulus that is at least 10.0 kpsi but less than 15.0 kpsi; and

at least **16** inches if constructed on a subgrade with a resilient modulus that is at least 5.0 kpsi but less than 10.0 kpsi.

18. A process according to claim **3**, wherein said load-bearing structure has an unconfined compressive strength of at least 100 psi and has a thickness of:

at least 8 inches if constructed on a subgrade with a resilient modulus that is at least 15.0 kpsi;

at least 12 inches if constructed on a subgrade with a resilient modulus that is at least 10.0 kpsi but less than 15.0 kpsi; and

at least 16 inches if constructed on a subgrade with a resilient modulus that is at least 5.0 kpsi but less than 10.0 kpsi.

19. A process according to claim **2**, wherein said load-bearing structure has an unconfined compressive strength of at least 100 psi and has a thickness of:

at least 8 inches of constructed on a subgrade with a resilient modulus that is at least 15.0 kpsi;

at least 12 inches if constructed on a subgrade with a resilient modulus that is at least 10.0 kpsi but less than 15.0 kpsi; and

at least 16 inches if constructed on a subgrade with a resilient modulus that is at least 5.0 kpsi but less than 10.0 kpsi.

20. A process according to claim **1**, wherein said load-bearing structure has an unconfined compressive strength of at least 100 psi and has a thickness of:

at least 8 inches if constructed on a subgrade with a resilient modulus that is at least 15.0 kpsi;

at least 12 inches if constructed on a subgrade with a resilient modulus that is at least 10.0 kpsi but less than 15.0 kpsi; and

at least 16 inches if constructed on a subgrade with a resilient modulus that is at least 5.0 kpsi but less than 10.0 kpsi.

* * * * *

FORM 3160-5
(August 2007)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

CONFIDENTIAL

FORM APPROVED
OMB No. 1004-0137
Expires: July 31,2010

SUNDRY NOTICES AND REPORTS ON WELLS
Do not use this form for proposals to drill or to re-enter an abandoned well. Use Form 3160-3 (APD) for such proposals.

SUBMIT IN TRIPLICATE - Other Instructions on page 2

5. Lease Serial No.
BIA EDA 14-20-H62-6388

6. If Indian, Allottee or Tribe Name.

7. If Unit or CA/Agreement, Name and/or

1. Type of Well
☒ Oil Well ☐ Gas Well ☐ Other

8. Well Name and No.
UTE TRIBAL 7-12-3-4W

2. Name of Operator
NEWFIELD PRODUCTION COMPANY

9. API Well No.
4301351542

3a. Address Route 3 Box 3630
Myton, UT 84052

3b. Phone *(include are code)*
435.646.3721

10. Field and Pool, or Exploratory Area
MYTON-TRIBAL EDA

4. Location of Well *(Footage, Sec., T., R., M., or Survey Description)*

SWNE Section 12 T3S R4W

11. County or Parish, State
DUCHESNE, UT

12. CHECK APPROPRIATE BOX(ES) TO INIDICATE NATURE OF NOTICE, OR OTHER DATA

TYPE OF SUBMISSION	TYPE OF ACTION			
☐ Notice of Intent	☐ Acidize	☐ Deepen	☐ Production (Start/Resume)	☐ Water Shut-Off
☒ Subsequent Report	☐ Alter Casing	☐ Fracture Treat	☐ Reclamation	☐ Well Integrity
☐ Final Abandonment	☐ Casing Repair	☐ New Construction	☐ Recomplete	☒ Other Spud Notice
	☐ Change Plans	☐ Plug & Abandon	☐ Temporarily Abandon	
	☐ Convert to Injector	☐ Plug Back	☐ Water Disposal	

13. Describe Proposed or Completed Operation: (Clearly state all pertinent details, including estimated starting date of any proposed work and approximate duration thereof. If the proposal is to deepen directionally or recomplete horizontally, give subsurface locations and measured and true vertical depths of all pertinent markers and zones. Attach the Bond under which the work will be performed or provide the Bond No. on file with BLM/BIA. Required subsequent reports shall be filed within 30 days following completion of the involved operations. If the operation results in a multiple completion or recompletion in a new interval, a Form 3160-4 shall be filed once testing has been completed. Final Abandonment Notices shall be filed only after all requirements, including reclamation, have been completed, and the operator has determined that the site is ready for final inspection.)

On 10/2/12 MIRU Ross #29. Spud well @3:00 PM. Drill 80' of 17 1/2" hole with air mist. TIH W/ 2 Jt's 14" H-40 36.75# csgn. Set @ 80. On 10/3/12 cement with 90 sks of class "G" w/ 2% CaCL2 + 0.25#/sk Cello- Flake Mixed @ 15.8ppg w/ 1.17ft3/sk yield. Returned 10 barrels cement to pit. WOC.

I hereby certify that the foregoing is true and correct *(Printed/ Typed)* Branden Arnold	Title
Signature	Date 10/18/2012

THIS SPACE FOR FEDERAL OR STATE OFFICE USE

Approved by	Title	Date
Conditions of approval, if any, are attached. Approval of this notice does not warrant or certify that the applicant holds legal or equitable title to those rights in the subject lease which would entitle the applicant to conduct operations thereon.	Office	

Title 18 U.S.C. Section 1001 and Title 43 U.S.C. Section 1212, make it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious and fraudulent statements or representations as to any matter within its jurisdiction

(Instructions on page 2)

RECEIVED
OCT 26 2012
DIV. OF OIL, GAS & MINING

Casing / Liner Detail

Well Ute Tribal 7-12-3-4W

Prospect Central Basin

Foreman

Run Date:

String Type Surface, 9.625", 36#, J-55, LTC (Generic)

- Detail From Top To Bottom -

Depth	Length	JTS	Description	OD	ID
1,031.70			18' KB		
18.00	966.15	22	9 5/8 Casing	9.625	
984.15	1.45		Float collar	9.625	
985.60	44.22	1	Shoe Joint	9.625	
1,029.82	1.88		Guide Shoe	9.625	
1,031.70			-		

Cement Detail

Cement Company: BJ

Slurry	# of Sacks	Weight (ppg)	Yield	Volume (ft^3)	Description - Slurry Class and Additives
Slurry 1	471	15.8	1.17	551.07	Class "G"+2%CaCl

Stab-In-Job?	No
BHT:	0
Initial Circulation Pressure:	
Initial Circulation Rate:	
Final Circulation Pressure:	
Final Circulation Rate:	
Displacement Fluid:	Water
Displacement Rate:	
Displacement Volume:	75.1
Mud Returns:	
Centralizer Type And Placement:	

Middle of first, top of second every other for a total of 5.

Cement To Surface?	Yes
Est. Top of Cement:	0
Plugs Bumped?	Yes
Pressure Plugs Bumped:	1089
Floats Holding?	No
Casing Stuck On / Off Bottom?	No
Casing Reciprocated?	No
Casing Rotated?	No
CIP:	5:25
Casing Wt Prior To Cement:	
Casing Weight Set On Slips:	

Form 3160-3
(August 2007)

RECEIVED

JUL 02 2012

BLM

FORM APPROVED
OMB No. 1004-0136
Expires July 31, 2010

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

APPLICATION FOR PERMIT TO DRILL OR REENTER

CONFIDENTIAL

1a. Type of Work: ☒ DRILL ☐ REENTER

1b. Type of Well: ☒ Oil Well ☐ Gas Well ☐ Other ☐ Single Zone ☒ Multiple Zone

2. Name of Operator
NEWFIELD EXPLORATION COMPANY
Contact: DON S HAMILTON
Email: starpoint@etv.net

3a. Address
ROUTE 3 BOX 3630
MYTON, UT 84052

3b. Phone No. (include area code)
Ph: 435-719-2018
Fx: 435-719-2019

4. Location of Well *(Report location clearly and in accordance with any State requirements.*)*
At surface SWNE 1816FNL 1861FEL 40.237686 N Lat, 110.281608 W Lon
At proposed prod. zone SWNE 1816FNL 1861FEL 40.237686 N Lat, 110.281608 W Lon

5. Lease Serial No.
1420H626388

6. If Indian, Allottee or Tribe Name
UINTAH AND OURAY

7. If Unit or CA Agreement, Name and No.

8. Lease Name and Well No.
UTE TRIBAL 7-12-3-4W

9. API Well No.
43-013-51542

10. Field and Pool, or Exploratory
UNDESIGNATED
NATURAL BUTTES

11. Sec., T., R., M., or Blk. and Survey or Area
Sec 12 T3S R4W Mer UBM
SME: FEE

14. Distance in miles and direction from nearest town or post office*
15.38 MILES NORTHWEST OF MYTON, UTAH

12. County or Parish
DUCHESNE

13. State
UT

15. Distance from proposed location to nearest property or lease line, ft. (Also to nearest drig. unit line, if any)
1816

16. No. of Acres in Lease
19034.57

17. Spacing Unit dedicated to this well
40.00

18. Distance from proposed location to nearest well, drilling, completed, applied for, on this lease, ft.
0

19. Proposed Depth
11100 MD
11100 TVD

20. BLM/BIA Bond No. on file
WYB000493

21. Elevations (Show whether DF, KB, RT, GL, etc.
5590 GL

22. Approximate date work will start
08/15/2012

23. Estimated duration
60 DAYS

24. Attachments

The following, completed in accordance with the requirements of Onshore Oil and Gas Order No. 1, shall be attached to this form:

1. Well plat certified by a registered surveyor.
2. A Drilling Plan.
3. A Surface Use Plan (if the location is on National Forest System Lands, the SUPO shall be filed with the appropriate Forest Service Office).
4. Bond to cover the operations unless covered by an existing bond on file (see Item 20 above).
5. Operator certification
6. Such other site specific information and/or plans as may be required by the authorized officer.

25. Signature
(Electronic Submission)

Name (Printed/Typed)
DON S HAMILTON Ph: 435-719-2018

Date
06/29/2012

Title
PERMITTING AGENT

Approved by (Signature)

Name (Printed/Typed)
Jerry Kenczka

Date
OCT 23 2012

Title
Assistant Field Manager
Lands & Mineral Resources

Office
VERNAL FIELD OFFICE

Application approval does not warrant or certify the applicant holds legal or equitable title to those rights in the subject lease which would entitle the applicant to conduct operations thereon.
Conditions of approval, if any, are attached.

CONDITIONS OF APPROVAL ATTACHED

Title 18 U.S.C. Section 1001 and Title 43 U.S.C. Section 1212, make it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

Additional Operator Remarks (see next page)

Electronic Submission #141918 verified by the BLM Well Information System
For NEWFIELD EXPLORATION COMPANY, sent to the Vernal
Committed to AFMSS for processing by LESLIE ROBINSON on 07/03/2012 (12LBR0440AE)

NOTICE OF APPROVAL

RECEIVED
OCT 29 2012
DIV. OF OIL, GAS & MINING

UDOGM

**** BLM REVISED ** BLM REVISED ** BLM REVISED ** BLM REVISED ** BLM REVISED ****

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
VERNAL FIELD OFFICE
170 South 500 East VERNAL, UT 84078 (435) 781-4400

CONDITIONS OF APPROVAL FOR APPLICATION FOR PERMIT TO DRILL

Company:	**Newfield Production Company**	**Location:**	**SWNE, Sec. 12, T3S, R4W**
Well No:	**Ute Tribal 7-12-3-4W**	**Lease No:**	**14-20-H62-6388**
API No:	**43-013-51542**	**Agreement:**	**N/A**

OFFICE NUMBER: (435) 781-4400

OFFICE FAX NUMBER: (435) 781-3420

A COPY OF THESE CONDITIONS SHALL BE FURNISHED TO YOUR FIELD REPRESENTATIVE TO INSURE COMPLIANCE

All lease and/or unit operations are to be conducted in such a manner that full compliance is made with the applicable laws, regulations (43 CFR Part 3160), and this approved Application for Permit to Drill including Surface and Downhole Conditions of Approval. The operator is considered fully responsible for the actions of his subcontractors. A copy of the approved APD must be on location during construction, drilling, and completion operations. **This permit is approved for a two (2) year period, or until lease expiration, whichever occurs first. An additional extension, up to two (2) years, may be applied for by sundry notice prior to expiration.**

NOTIFICATION REQUIREMENTS

Construction Activity (Notify Ute Tribe Energy & Minerals Dept. and BLM Environmental Scientist)	-	The Ute Tribe Energy & Minerals Dept. and BLM Environmental Scientist shall be notified at least 48 hours in advance of any construction activity. The Ute Tribal office is open Monday through Thursday.
Construction Completion (Notify Ute Tribe Energy & Minerals Dept. and BLM Environmental Scientist)	-	Upon completion of the pertinent APD/ROW construction, notify the Ute Tribe Energy & Minerals Dept. for a Tribal Technician to verify the Affidavit of Completion. Notify the BLM Environmental Scientist prior to moving on the drilling rig.
Spud Notice (Notify BLM Petroleum Engineer)	-	Twenty-Four (24) hours prior to spudding the well.
Casing String & Cementing (Notify BLM Supv. Petroleum Tech.)	-	Twenty-Four (24) hours prior to running casing and cementing all casing strings to:blm_ut_vn_opreport@blm.gov.
BOP & Related Equipment Tests (Notify BLM Supv. Petroleum Tech.)	-	Twenty-Four (24) hours prior to initiating pressure tests.
First Production Notice (Notify BLM Petroleum Engineer)	-	Within Five (5) business days after new well begins or production resumes after well has been off production for more than ninety (90) days.

SURFACE USE PROGRAM
CONDITIONS OF APPROVAL (COAs)

CONDITIONS OF APPROVAL:

HYDROLOGIC & EROSIONAL:

7-12-3-4W:

- North drainage will be rerouted to the north.

2-5-3-3WH:

- The Ute Canal (42Dc3133) structural features (weir and culvert)will be avoided by any ground disturbing activities.

11-16-3-2W:

- The Dry Gulch canal (42Dc2704) structural features will be avoided by any ground disturbing activities.

- If rerouting the southern drainage, keep from eroding the topsoil pile.

7-13-3-4W:

- If possible shrink the pad at stake 1, and round corner 2 to keep out of the drainage, as an alternative to rerouting the western drainage around the northern side of the pad. Erosional control mitigation on corners 1 & 2.

WILDLIFE: Due to these wells being on private surface, wildlife stipulations are recommendations.

2-5-3-3WH:

- Construction and drilling is not allowed from March 1 to August 31 in order to minimize impacts during **burrowing owl nesting**. If it is anticipated that construction or drilling will occur during the given timing restriction, a BLM or qualified biologist will be notified so surveys can be conducted. Depending upon the results of the surveys, permission to proceed may or may not be granted by the BLM Authorized Officer.

- **Raptor nest** surveys must be conducted during the appropriate nesting season within the spatial buffer. If drilling or construction is proposed from January 1, to September 31, then a nest survey will be conducted by a qualified biologist. If it is determined that the nest is inactive, then permission to proceed may be granted by the BLM Authorized Officer. If the nest is determined to be active, then the timing restriction will remain in effect.

4-29-3-3WH:

- Construction and drilling is not allowed from March 1 to August 31 in order to minimize impacts during **burrowing owl nesting**. If it is anticipated that construction or drilling will occur during the given timing restriction, a BLM or qualified biologist will be notified so surveys can be conducted. Depending upon the results of the surveys, permission to proceed may or may not be granted by the BLM Authorized Officer.

7-18-3-3W, 7-13-3-4W, 7-12-3-4W, and 4-29-3-3WH:

- If sage grouse are observed from March 1 to June 15, no surface disturbing activities would occur within 2 miles of an active lek from March 1 to June 15, no surface-disturbing activities within ¼ mile of active sage grouse leks year round, no permanent facilities or structures within 2 miles of sage grouse leks when possible, and within ½ mile the best available technology will be applied to mitigate impacts.

STANDARD OPERATING PROCEDURES:

- After cessation of drilling and completion operations, any visible or measurable layer of oil must be removed from the surface of the reserve pit and the pit kept free of oil. The pit shall be free of liquids within 90 days and recountoured with 120 days.

- Pits must be free of oil and other liquid and solid wastes prior to filling. Pit liners must not be breached (cut) or filled (squeezed) while still containing fluids. The pit liner must be removed to the solids level or treated to prevent its reemergence to the surface or its interference with long-term successful revegetation.

- Reclamation will be completed in accordance with the recontouring and reseeding procedures outlined in the Newfield Exploration Company Castle Peak and Eight Mile Flat Reclamation Plan on file with the Vernal Field Office of the BLM, unless otherwise specified by the private surface owner.

- The surface conditions as set forth by the owners and/or agencies.

DOWNHOLE PROGRAM
CONDITIONS OF APPROVAL (COAs)

SITE SPECIFIC DOWNHOLE COAs:

- Gamma Ray Log shall be run from Total Depth to Surface.
- Cement for surface casing shall be circulated to surface.
- Cement for intermediate casing shall be brought to 200 ft above surface casing shoe

Variance Request

All variances granted as written in APD.

All provisions outlined in Onshore Oil & Gas Order #2 Drilling Operations shall be strictly adhered to. The following items are emphasized:

DRILLING/COMPLETION/PRODUCING OPERATING STANDARDS

- The spud date and time shall be reported orally to Vernal Field Office within 24 hours of spudding.
- Notify Vernal Field Office Supervisory Petroleum Engineering Technician at least 24 hours in advance of casing cementing operations and BOPE & casing pressure tests.
- All requirements listed in Onshore Order #2 III. E. Special Drilling Operations are applicable for air drilling of surface hole.
- Blowout prevention equipment (BOPE) shall remain in use until the well is completed or abandoned. Closing unit controls shall remain unobstructed and readily accessible at all times. Choke manifolds shall be located outside of the rig substructure.
- All BOPE components shall be inspected daily and those inspections shall be recorded in the daily drilling report. Components shall be operated and tested as required by Onshore Oil & Gas Order No. 2 to insure good mechanical working order. All BOPE pressure tests shall be performed by a test pump with a chart recorder and **NOT** by the rig pumps. Test shall be reported in the driller's log.
- BOP drills shall be initially conducted by each drilling crew within 24 hours of drilling out from under the surface casing and weekly thereafter as specified in Onshore Oil & Gas Order No. 2.
- Casing pressure tests are required before drilling out from under all casing strings set and cemented in place.
- No aggressive/fresh hard-banded drill pipe shall be used within casing.
- **Cement baskets shall not be run on surface casing.**
- The operator must report all shows of water or water-bearing sands to the BLM. If flowing water is encountered it must be sampled, analyzed, and a copy of the analyses submitted to the BLM Vernal Field Office.

- The operator must report encounters of all non oil & gas mineral resources (such as Gilsonite, tar sands, oil shale, trona, etc.) to the Vernal Field Office, in writing, within 5 working days of each encounter. Each report shall include the well name/number, well location, date and depth (from KB or GL) of encounter, vertical footage of the encounter and, the name of the person making the report (along with a telephone number) should the BLM need to obtain additional information.

- A complete set of angular deviation and directional surveys of a directional well will be submitted to the Vernal BLM office engineer within 30 days of the completion of the well.

- While actively drilling, chronologic drilling progress reports shall be filed directly with the BLM, Vernal Field Office on a weekly basis in sundry, letter format or e-mail to the Petroleum Engineers until the well is completed.

- A cement bond log (CBL) will be run from the production casing shoe to the top of cement and shall be utilized to determine the bond quality for the production casing. Submit a field copy of the CBL to this office.

- **Please submit an electronic copy of all other logs run on this well in LAS format to BLM_UT_VN_Welllogs@BLM.gov. This submission will supersede the requirement for submittal of paper logs to the BLM.**

- There shall be no deviation from the proposed drilling, completion, and/or workover program as approved. Safe drilling and operating practices must be observed. Any changes in operation must have prior approval from the BLM Vernal Field Office.

OPERATING REQUIREMENT REMINDERS:

- All wells, whether drilling, producing, suspended, or abandoned, shall be identified in accordance with 43 CFR 3162.6. There shall be a sign or marker with the name of the operator, lease serial number, well number, and surveyed description of the well.

- For information regarding production reporting, contact the Office of Natural Resources Revenue (ONRR) at www.ONRR.gov.

- Should the well be successfully completed for production, the BLM Vernal Field office must be notified when it is placed in a producing status. Such notification will be by written communication and must be received in this office by not later than the fifth business day following the date on which the well is placed on production. The notification shall provide, as a minimum, the following informational items:

    - Operator name, address, and telephone number.

    - Well name and number.

    - Well location (¼¼, Sec., Twn, Rng, and P.M.).

    - Date well was placed in a producing status (date of first production for which royalty will be paid).

    - The nature of the well's production, (i.e., crude oil, or crude oil and casing head gas, or natural gas and entrained liquid hydrocarbons).

    - The Federal or Indian lease prefix and number on which the well is located; otherwise the non-Federal or non-Indian land category, i.e., State or private.

    - Unit agreement and/or participating area name and number, if applicable.

    - Communitization agreement number, if applicable.

- Any venting or flaring of gas shall be done in accordance with Notice to Lessees (NTL) 4A and needs prior approval from the BLM Vernal Field Office.

- All undesirable events (fires, accidents, blowouts, spills, discharges) as specified in NTL 3A will be reported to the BLM, Vernal Field Office. Major events, as defined in NTL3A, shall be reported verbally within 24 hours, followed by a written report within 15 days. "Other than Major Events" will be reported in writing within 15 days. "Minor Events" will be reported on the Monthly Report of Operations and Production.

- Whether the well is completed as a dry hole or as a producer, "Well Completion and Recompletion Report and Log" (BLM Form 3160-4) shall be submitted not later than 30 days after completion of the well or after completion of operations being performed, in accordance with 43 CFR 3162.4-1. Two copies of all logs run, core descriptions, and all other surveys or data obtained and compiled during the drilling, workover, and/or completion operations, shall be filed on BLM Form 3160-4. Submit with the well completion report a geologic report including, at a minimum, formation tops, and a summary and conclusions. Also include deviation surveys, sample descriptions, strip logs, core data, drill stem test data, and results of production tests if

performed. Samples (cuttings, fluid, and/or gas) shall be submitted only when requested by the BLM, Vernal Field Office.

- All off-lease storage, off-lease measurement, or commingling on-lease or off-lease, shall have prior written approval from the BLM Vernal Field Office.

- Oil and gas meters shall be calibrated in place prior to any deliveries. The BLM Vernal Field Office Petroleum Engineers will be provided with a date and time for the initial meter calibration and all future meter proving schedules. A copy of the meter calibration reports shall be submitted to the BLM Vernal Field Office. All measurement facilities will conform to the API standards for liquid hydrocarbons and the AGA standards for natural gas measurement. All measurement points shall be identified as the point of sale or allocation for royalty purposes.

- A schematic facilities diagram as required by Onshore Oil & Gas Order No. 3 shall be submitted to the BLM Vernal Field Office within 30 days of installation or first production, whichever occurs first. All site security regulations as specified in Onshore Oil & Gas Order No. 3 shall be adhered to. All product lines entering and leaving hydrocarbon storage tanks will be effectively sealed in accordance with Onshore Oil & Gas Order No. 3.

- Any additional construction, reconstruction, or alterations of facilities, including roads, gathering lines, batteries, etc., which will result in the disturbance of new ground, shall require the filing of a suitable plan and need prior approval of the BLM Vernal Field Office. Emergency approval may be obtained orally, but such approval does not waive the written report requirement.

- No location shall be constructed or moved, no well shall be plugged, and no drilling or workover equipment shall be removed from a well to be placed in a suspended status without prior approval of the BLM Vernal Field Office. If operations are to be suspended for more than 30 days, prior approval of the BLM Vernal Field Office shall be obtained and notification given before resumption of operations.

- Pursuant to Onshore Oil & Gas Order No. 7, this is authorization for pit disposal of water produced from this well for a period of 90 days from the date of initial production. A permanent disposal method must be approved by this office and in operation prior to the end of this 90-day period. In order to meet this deadline, an application for the proposed permanent disposal method shall be submitted along with any necessary water analyses, as soon as possible, but no later than 45 days after the date of first production. Any method of disposal which has not been approved prior to the end of the authorized 90-day period will be considered as an Incident of Noncompliance and will be grounds for issuing a shut-in order until an acceptable manner for disposing of said water is provided and approved by this office.

- Unless the plugging is to take place immediately upon receipt of oral approval, the Field Office Petroleum Engineers must be notified at least 24 hours in advance of the plugging of the well, in order that a representative may witness plugging operations. If a well is suspended or abandoned, all pits must be fenced immediately until they are backfilled. The "Subsequent Report of Abandonment" (Form BLM 3160-5) must be submitted within 30 days after the actual plugging of the well bore, showing location of plugs, amount of cement in each, and amount of casing left in hole, and the current status of the surface restoration.

STATE OF UTAH
DIVISION OF OIL, GAS AND MINING
ENTITY ACTION FORM -FORM 6

OPERATOR: NEWFIELD PRODUCTION COMPANY
ADDRESS: RT. 3 BOX 3630
MYTON, UT 84052

OPERATOR ACCT. NO. N2695

ACTION CODE	CURRENT ENTITY NO.	NEW ENTITY NO	API NUMBER	WELL NAME	WELL LOCATION QQ	SC	TP	RG	COUNTY	SPUD DATE	EFFECTIVE DATE
B	99999	17400	4304752407	GMBU K-11-9-17	SWNW	12	9S	17E	UINTAH	10/12/2012	10/31/12

WELL 1 COMMENTS: GRRV BHL: S11 NESE ~~Surface well location is 9S-17E~~

ACTION CODE	CURRENT ENTITY NO.	NEW ENTITY NO.	API NUMBER	WELL NAME	WELL LOCATION QQ	SC	TP	RG	COUNTY	SPUD DATE	EFFECTIVE DATE
A	99999	18780	4301351509	LUSTY 2-11-3-3WH	NENE	11	3S	3W	DUCHESNE	9/25/2012	10/31/12

GRRV BHL: SWSE CONFIDENTIAL

ACTION B	CURRENT ENTITY NO.	NEW ENTITY NO.	API NUMBER	WELL NAME	WELL LOCATION QQ	SC	TP	RG	COUNTY	SPUD DATE	EFFECTIVE
B	99999	17400	4301351169	GMBU J-18-9-16	SWNW	17	9S	16E	DUCHESNE	10/11/2012	10/31/12

GRRV BHL: S18 NENE

ACTION CODE	CURRENT ENTITY NO.	NEW ENTITY NO.	API NUMBER	WELL NAME	WELL LOCATION QQ	SC	TP	RG	COUNTY	SPUD DATE	EFFECTIVE DATE
B	99999	17400	4304752408	GMBU N-12-9-17	SWNW	12	9S	17E	UINTAH	10/13/2012	10/31/12

GRRV BHL: NESW

ACTION CODE	CURRENT ENTITY NO.	NEW ENTITY NO.	API NUMBER	WELL NAME	WELL LOCATION QQ	SC	TP	RG	COUNTY	SPUD DATE	EFFECTIVE DATE
B	99999	17400	4301351247	GMBU X-9-9-17	NENW	16	9S	17E	DUCHESNE	10/16/2012	10/31/12

~~Surface well location is 16-9S-17E~~
GRRV BHL: S9 SWSW

ACTION CODE	CURRENT ENTITY NO.	NEW ENTITY NO.	API NUMBER	WELL NAME	WELL LOCATION QQ	SC	TP	RG	COUNTY	SPUD DATE	EFFECTIVE DATE
A	99999	18781	4301351542	UTE TRIBAL 7-12-3-4W	SWNE	12	3S	4W	DUCHESNE	10/2[illegible]/2012	10/31/12

WSTC CONFIDENTIAL

A - Establish new entity for new well (single well only)
B - Add new well to existing entity (group or unit well)
C - Re-assign well from one existing entity to another existing entity
D - Re-assign well from one existing entity to a new entity
E - Other (explain in comments section)

NOTE: Use COMMENT section to explain why each Action Code was selected.

RECEIVED
OCT 30 2012
Div. of Oil, Gas & Mining

Tasha Robison
Signature

Production Clerk

Tasha Robison

STATE OF UTAH
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS, AND MINING

FORM 9

5.LEASE DESIGNATION AND SERIAL NUMBER: 14-20-H62-6388

SUNDRY NOTICES AND REPORTS ON WELLS

Do not use this form for proposals to drill new wells, significantly deepen existing wells below current bottom-hole depth, reenter plugged wells, or to drill horizontal laterals. Use APPLICATION FOR PERMIT TO DRILL form for such proposals.

6. IF INDIAN, ALLOTTEE OR TRIBE NAME:

7.UNIT or CA AGREEMENT NAME:

1. TYPE OF WELL
Oil Well

8. WELL NAME and NUMBER:
UTE TRIBAL 7-12-3-4W

2. NAME OF OPERATOR:
NEWFIELD PRODUCTION COMPANY

9. API NUMBER:
43013515420000

3. ADDRESS OF OPERATOR:
Rt 3 Box 3630 , Myton, UT, 84052

PHONE NUMBER:
435 646-4825 Ext

9. FIELD and POOL or WILDCAT:
UNDESIGNATED

4. LOCATION OF WELL
FOOTAGES AT SURFACE:
1816 FNL 1861 FEL
QTR/QTR, SECTION, TOWNSHIP, RANGE, MERIDIAN:
Qtr/Qtr: SWNE Section: 12 Township: 03.0S Range: 04.0W Meridian: U

COUNTY:
DUCHESNE

STATE:
UTAH

11.
CHECK APPROPRIATE BOXES TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA

TYPE OF SUBMISSION	TYPE OF ACTION		
✓ NOTICE OF INTENT Approximate date work will start: 2/1/2013	☐ ACIDIZE	☐ ALTER CASING	☐ CASING REPAIR
	✓ CHANGE TO PREVIOUS PLANS	☐ CHANGE TUBING	☐ CHANGE WELL NAME
	☐ CHANGE WELL STATUS	☐ COMMINGLE PRODUCING FORMATIONS	☐ CONVERT WELL TYPE
☐ SUBSEQUENT REPORT Date of Work Completion:	☐ DEEPEN	☐ FRACTURE TREAT	☐ NEW CONSTRUCTION
	☐ OPERATOR CHANGE	☐ PLUG AND ABANDON	☐ PLUG BACK
	☐ PRODUCTION START OR RESUME	☐ RECLAMATION OF WELL SITE	☐ RECOMPLETE DIFFERENT FORMATION
☐ SPUD REPORT Date of Spud:	☐ REPERFORATE CURRENT FORMATION	☐ SIDETRACK TO REPAIR WELL	☐ TEMPORARY ABANDON
	☐ TUBING REPAIR	☐ VENT OR FLARE	☐ WATER DISPOSAL
☐ DRILLING REPORT Report Date:	☐ WATER SHUTOFF	☐ SI TA STATUS EXTENSION	☐ APD EXTENSION
	☐ WILDCAT WELL DETERMINATION	☐ OTHER	OTHER:

12. DESCRIBE PROPOSED OR COMPLETED OPERATIONS. Clearly show all pertinent details including dates, depths, volumes, etc.

Newfield Production Company respectfully requests approval to relocate the access road and pipeline corridors for the Ute Tribal 7-12-3-4W. Attached please find an updated plat package (V4) and surface use plan reflecting changes to the corridors as well as a change to cut-off corner 2 to minimize impacts to nearby ephemeral drainages. Template changes were also made to the surface use plan to make it consistent with current operational needs including many requested by the BLM. All other aspects of the proposal including the well location and existing surface use remain unchanged.

Accepted by the Utah Division of Oil, Gas and Mining
FOR RECORD ONLY
February 14, 2013

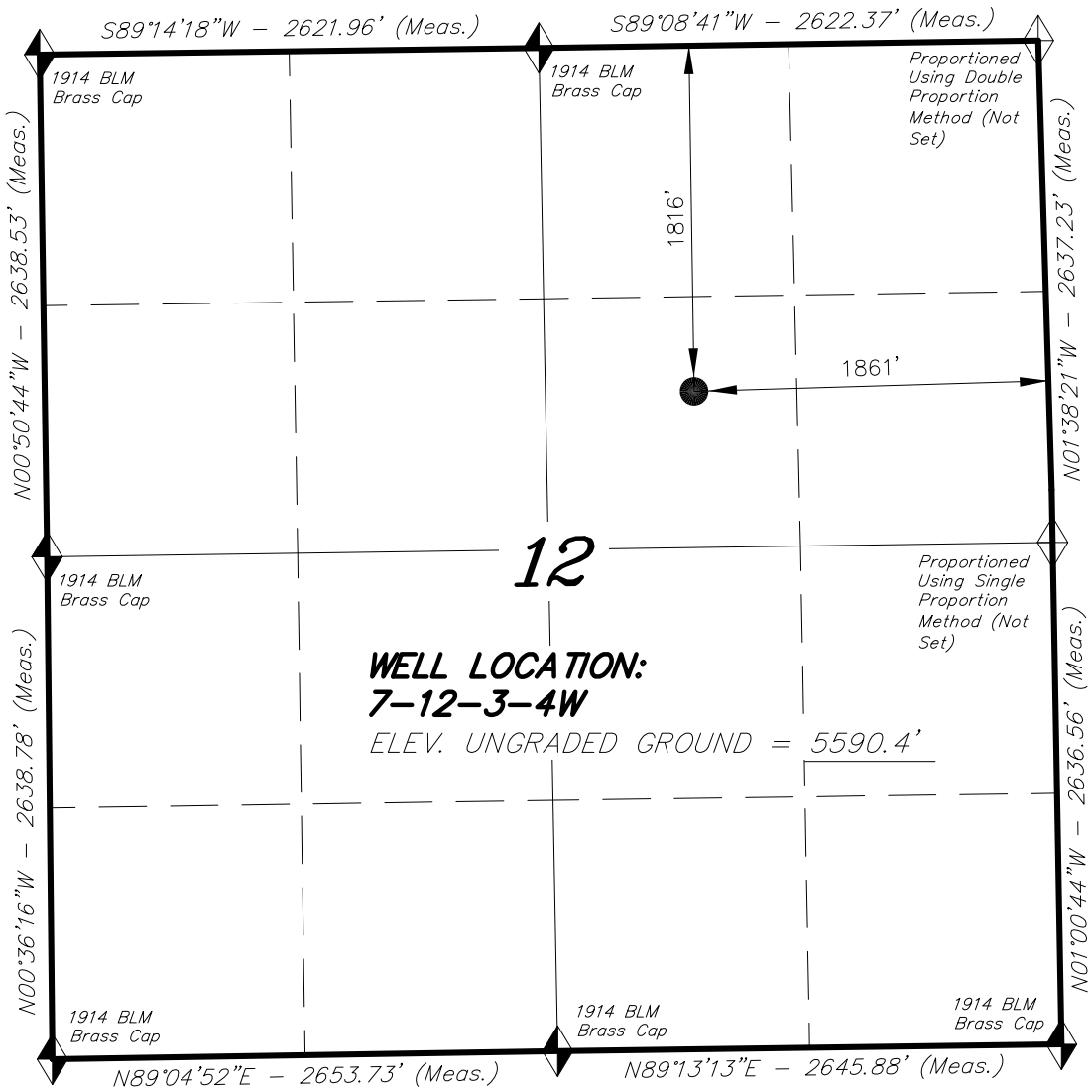
NAME (PLEASE PRINT)	PHONE NUMBER	TITLE
Don Hamilton	435 719-2018	Permitting Agent
SIGNATURE		**DATE**
N/A		1/21/2013

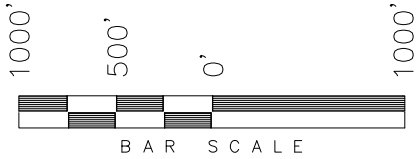
RECEIVED: Jan. 21, 2013

T3S, R4W, U.S.B.&M.

NEWFIELD EXPLORATION COMPANY

WELL LOCATION, 7-12-3-4W, LOCATED AS SHOWN IN THE SW 1/4 NE 1/4 OF SECTION 12, T3S, R4W, U.S.B.&M. DUCHESNE COUNTY, UTAH.





NOTES:

1. *Well footages are measured at right angles to the Section Lines.*
2. *Bearings are based on Global Positioning Satellite observations.*

THIS IS TO CERTIFY THAT THE ABOVE PLAT WAS PREPARED FROM FIELD NOTES OF ACTUAL SURVEYS MADE BY ME OR UNDER MY SUPERVISION AND THAT THE SAME ARE TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF.

REGISTERED LAND SURVEYOR No.189377 09-14-12 STACY W. STEWART STATE OF UTAH

STACY W. STEWART
REGISTERED LAND SURVEYOR
REGISTRATION No. [illegible]
STATE OF UTAH

= SECTION CORNERS LOCATED

BASIS OF ELEV; Elevations are based on an N.G.S. OPUS Correction. LOCATION: LAT. 40°04'09.56" LONG. 110°00'43.28" (Tristate Aluminum Cap) Elev. 5281.57'

NAD 83 (SURFACE LOCATION)
LATITUDE = 40°14'15.67"
LONGITUDE = 110°16'53.79"
NAD 27 (SURFACE LOCATION)
LATITUDE = 40°14'15.83"
LONGITUDE = 110°16'51.23"

TRI STATE LAND SURVEYING & CONSULTING
180 NORTH VERNAL AVE. - VERNAL, UTAH 84078
(435) 781-2501

DATE SURVEYED: 11-20-11	SURVEYED BY: S.H.	VERSION:
DATE DRAWN: 12-01-11	DRAWN BY: M.W.	V4
REVISED: 09-14-12 F.T.M.	SCALE: 1" = 1000'	

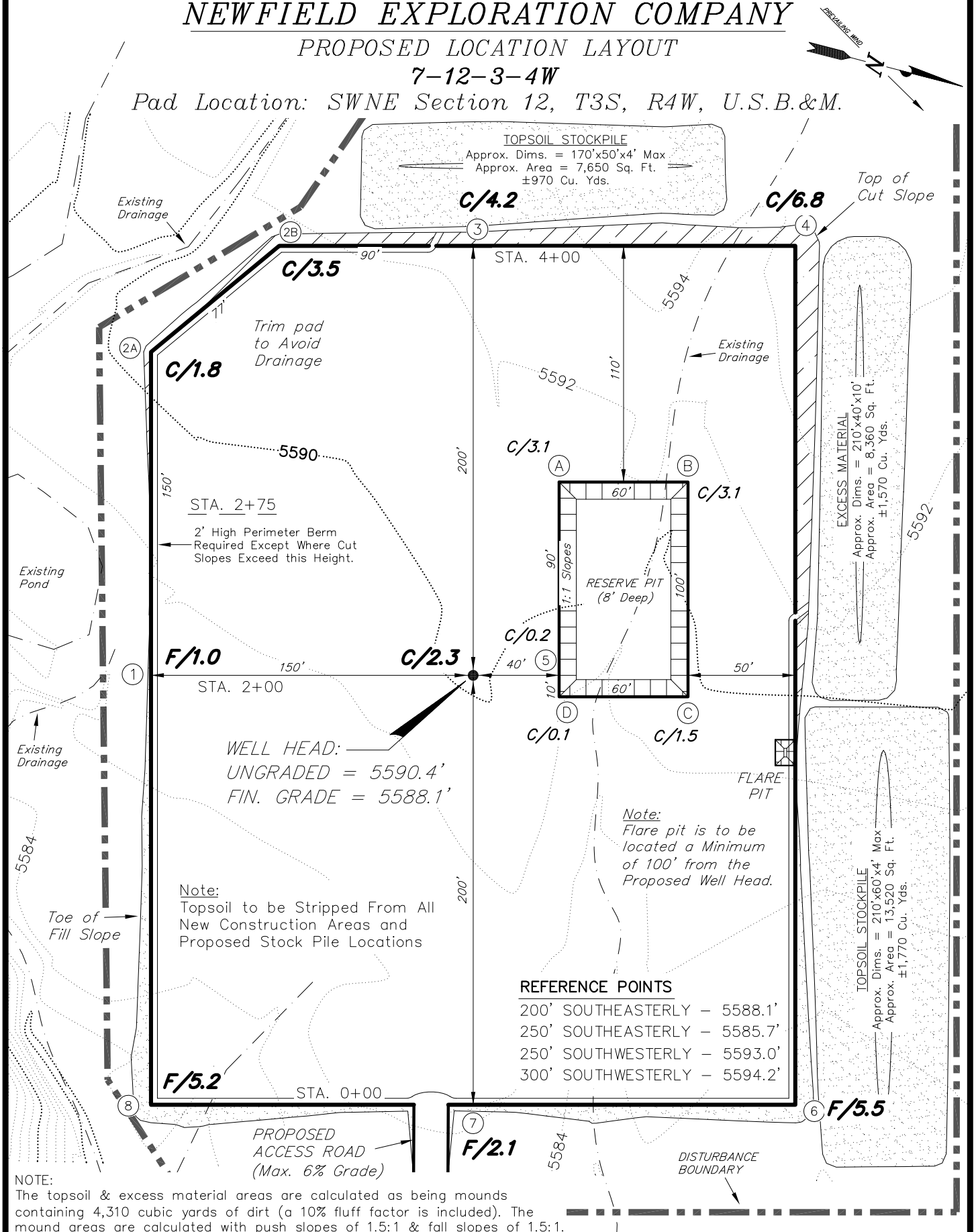
RECEIVED: Jan. 21, 2013

NEWFIELD EXPLORATION COMPANY

PROPOSED LOCATION LAYOUT

7-12-3-4W

Pad Location: SWNE Section 12, T3S, R4W, U.S.B.&M.



NOTE:
The topsoil & excess material areas are calculated as being mounds containing 4,310 cubic yards of dirt (a 10% fluff factor is included). The mound areas are calculated with push slopes of 1.5:1 & fall slopes of 1.5:1.

SURVEYED BY: S.H.	DATE SURVEYED: 11-20-11	VERSION:	Tri State Land Surveying, Inc. (435) 781-2501
DRAWN BY: M.W.	DATE DRAWN: 12-01-11	V4	180 NORTH VERNAL AVE. VERNAL, UTAH 84078
SCALE: 1" = 60'	REVISED: F.T.M. 09-14-12		

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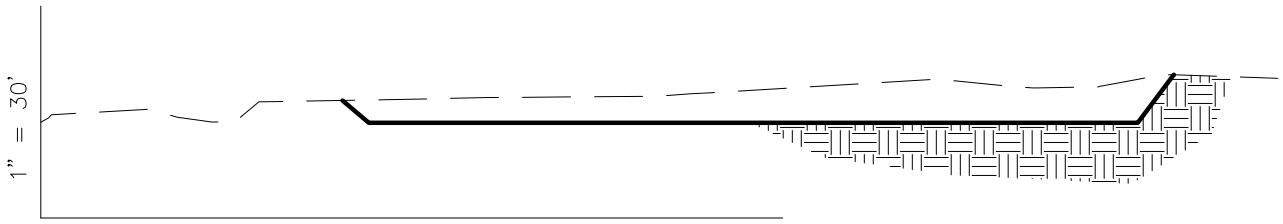
NEWFIELD EXPLORATION COMPANY

CROSS SECTIONS

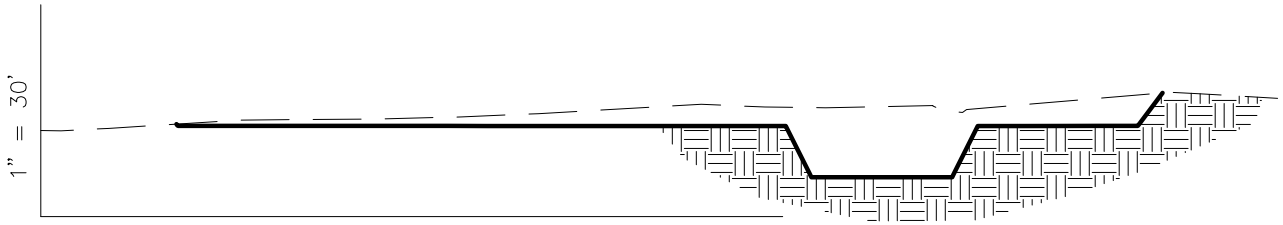
7-12-3-4W

Pad Location: SWNE Section 12, T3S, R4W, U.S.B.&M.



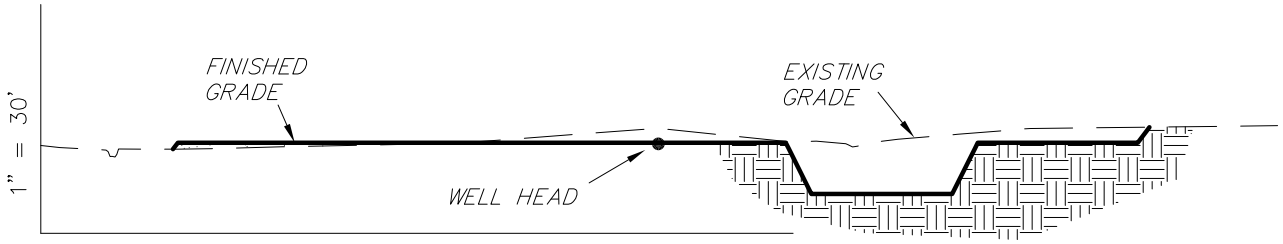
1" = 60'

STA. 4+00



1" = 60'

STA. 2+75



1" = 60'

STA. 2+00

1" = 60'

STA. 0+00

ESTIMATED EARTHWORK QUANTITIES
(No Shrink or swell adjustments have been used)
(Expressed in Cubic Yards)

ITEM	CUT	FILL	6" TOPSOIL	EXCESS
PAD	5,550	5,550	Topsoil is not included in Pad Cut Volume	0
PIT	1,420	0		1,420
TOTALS	6,970	5,550	2,490	1,420

NOTE:
UNLESS OTHERWISE
NOTED ALL CUT/FILL
SLOPES ARE AT 1.5:1

SURVEYED BY: S.H.	DATE SURVEYED: 11-20-11	VERSION:
DRAWN BY: M.W.	DATE DRAWN: 12-01-11	V4
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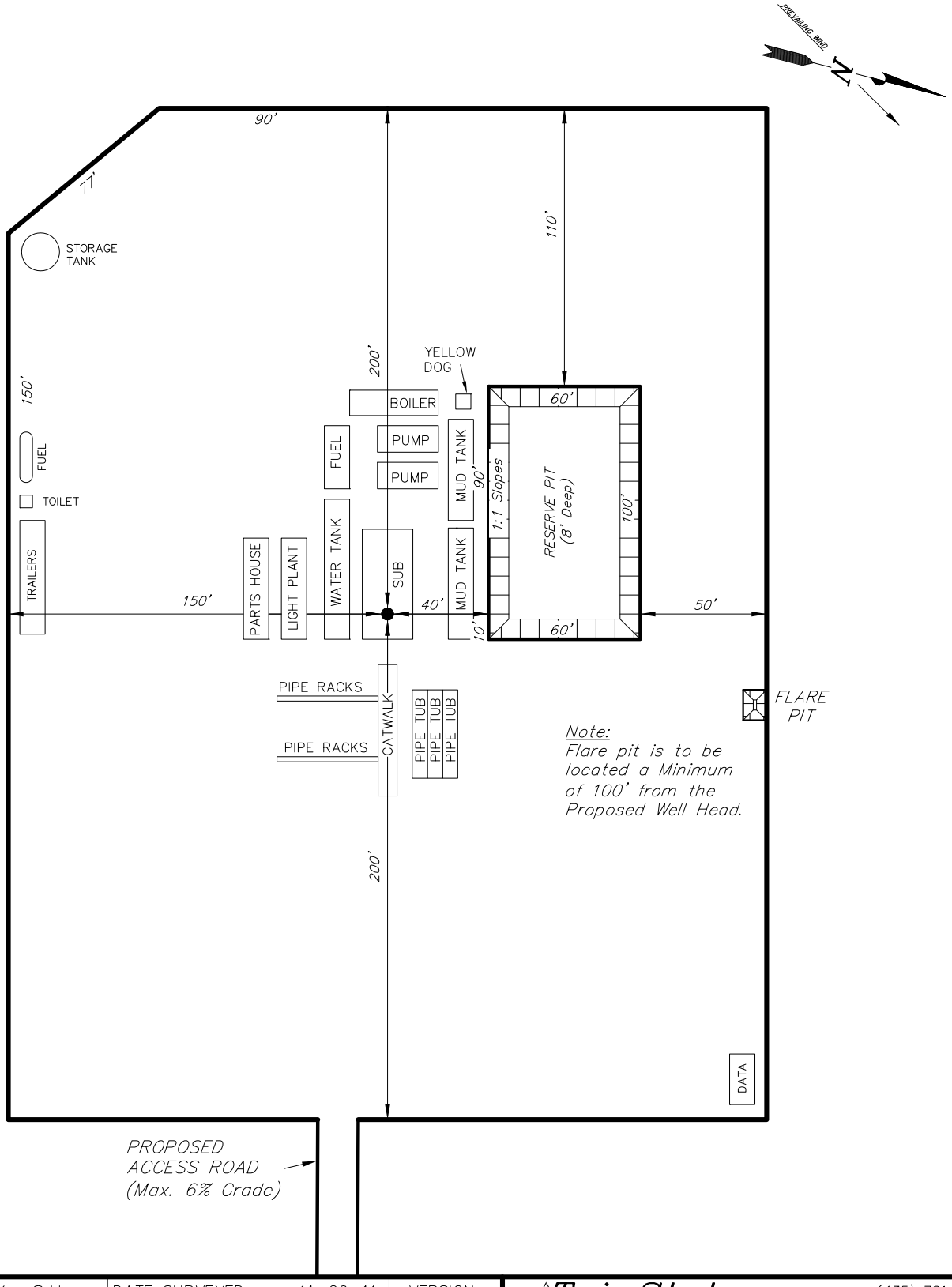
TYPICAL RIG LAYOUT

7-12-3-4W

Pad Location: SWNE Section 12, T3S, R4W, U.S.B.&M.



SURVEYED BY: S.H.	DATE SURVEYED: 11-20-11	VERSION:	Tri State Land Surveying, Inc. (435) 781-2501
DRAWN BY: M.W.	DATE DRAWN: 12-01-11	V4	180 NORTH VERNAL AVE. VERNAL, UTAH 84078
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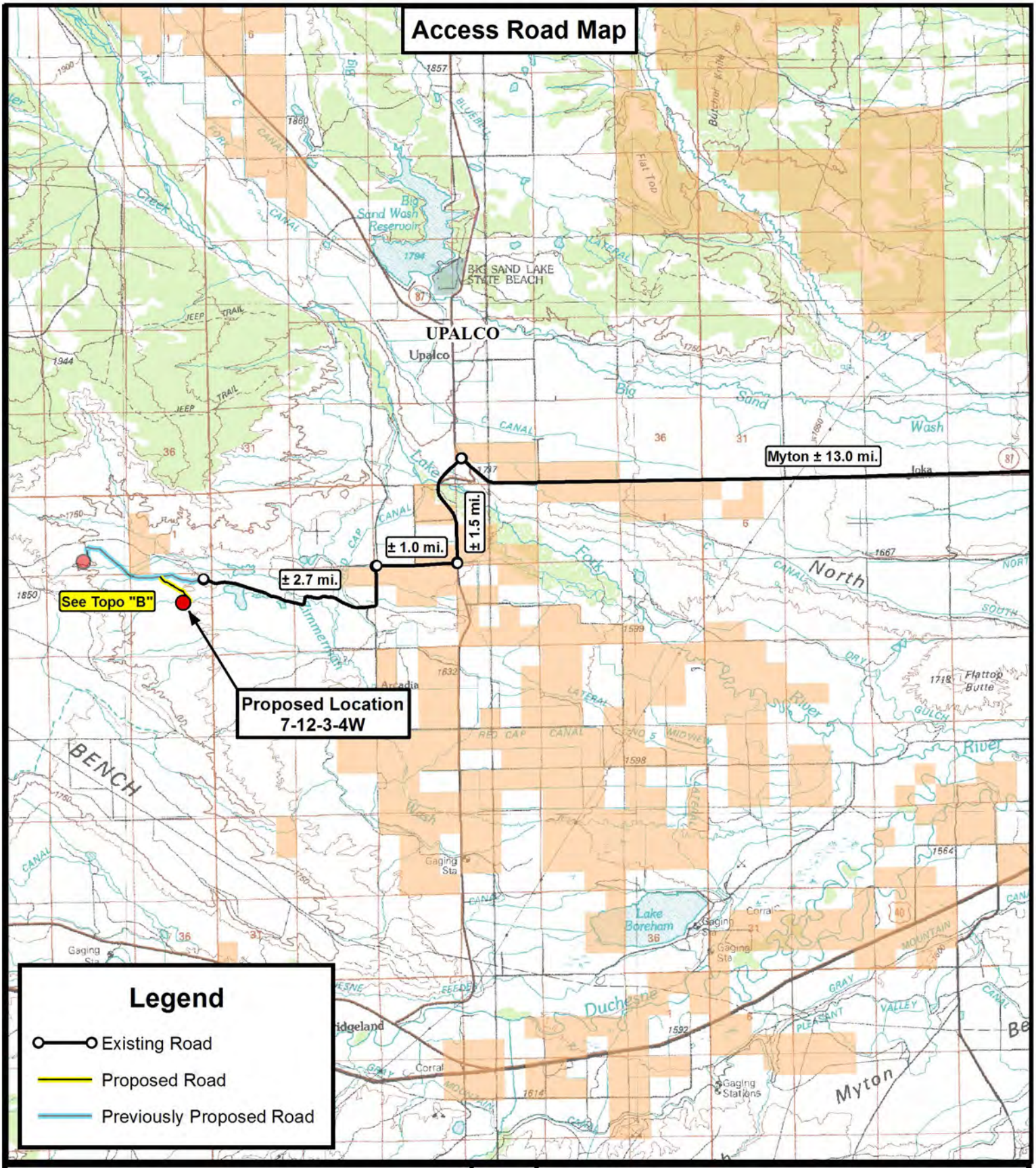

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N

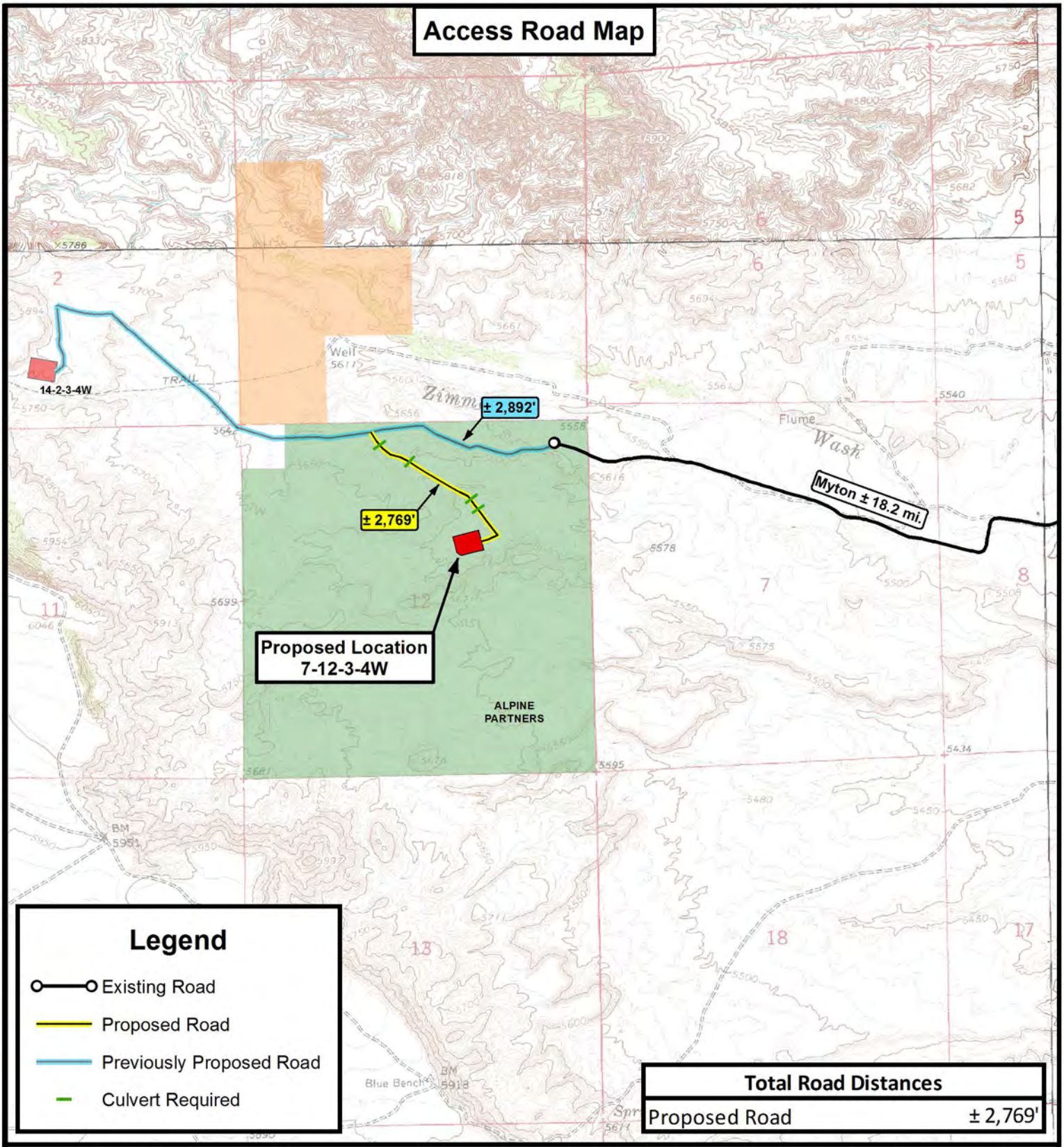
NEWFIELD EXPLORATION COMPANY
7-12-3-4W
SEC. 12, T3S, R4W, U.S.B.&M.
Duchesne County, UT.

DRAWN BY:	A.P.C.	REVISED:	09-14-12 D.C.R.	VERSION:
DATE:	12-02-2011			V4
SCALE:	1:100,000			

TOPOGRAPHIC MAP

SHEET A

Access Road Map



Legend

- Existing Road
- Proposed Road
- Previously Proposed Road
- Culvert Required

Total Road Distances	
Proposed Road	± 2,769'

THE PARCEL INFORMATION SHOWN HAS NOT BEEN SURVEYED BY TRI-STATE LAND SURVEYING, INC. - TRI-STATE DOES NOT WARRANTY PROPERTY PARCEL DATA OR ANY ASSOCIATED INFORMATION. A PROPERTY SURVEY IS REQUIRED TO DETERMINE THE ACTUAL LOCATION OF PROPERTY LINES AND SHOW ACCURATE DISTANCES ACROSS PARCELS.

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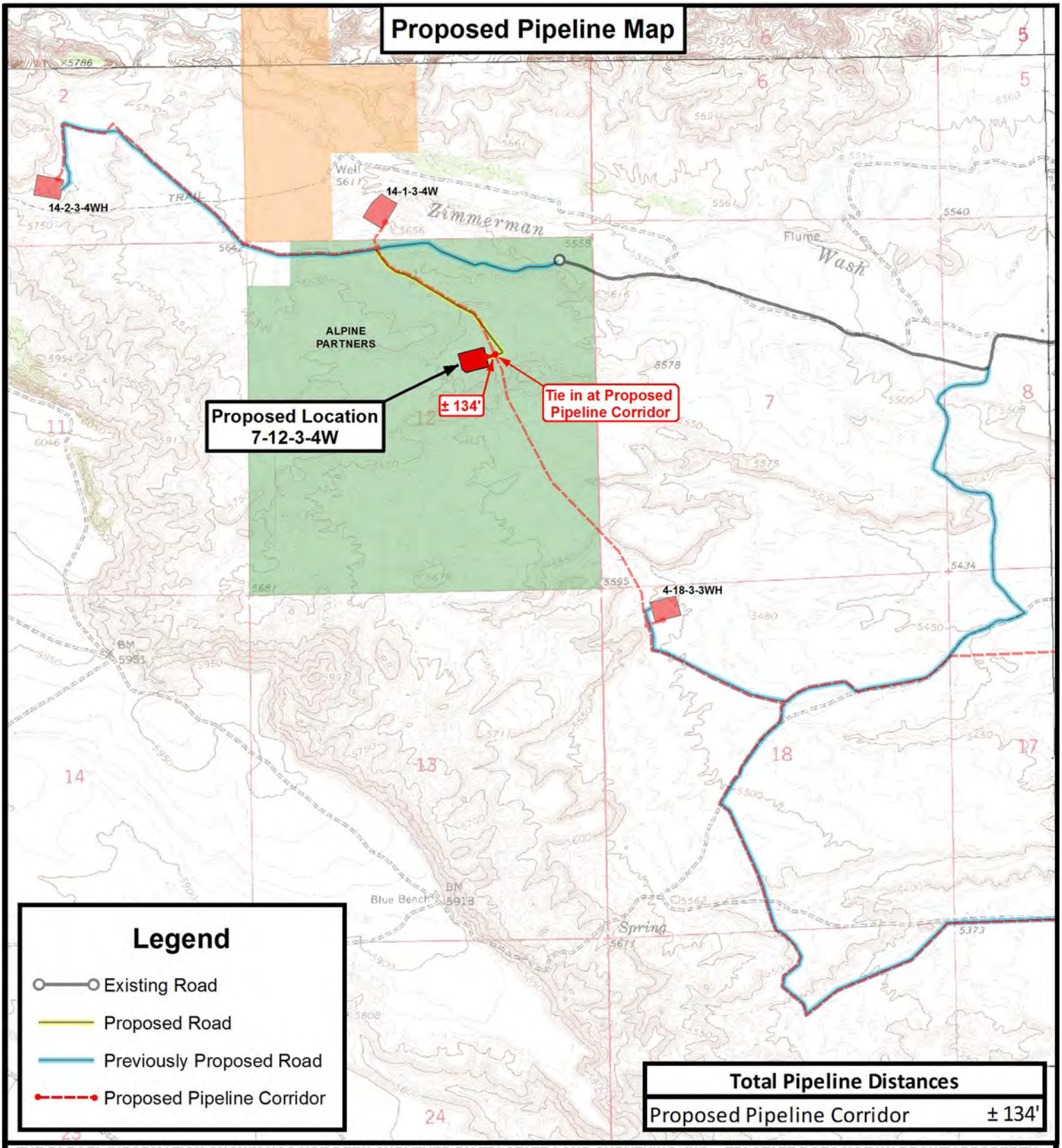
NEWFIELD EXPLORATION COMPANY
7-12-3-4W
SEC. 12, T3S, R4W, U.S.B.&M.
Duchesne County, UT.

DRAWN BY:	A.P.C.	REVISED:	09-14-12 D.C.R.	VERSION:
DATE:	12-02-2011			V4
SCALE:	1 " = 2,000 '			

TOPOGRAPHIC MAP

SHEET B



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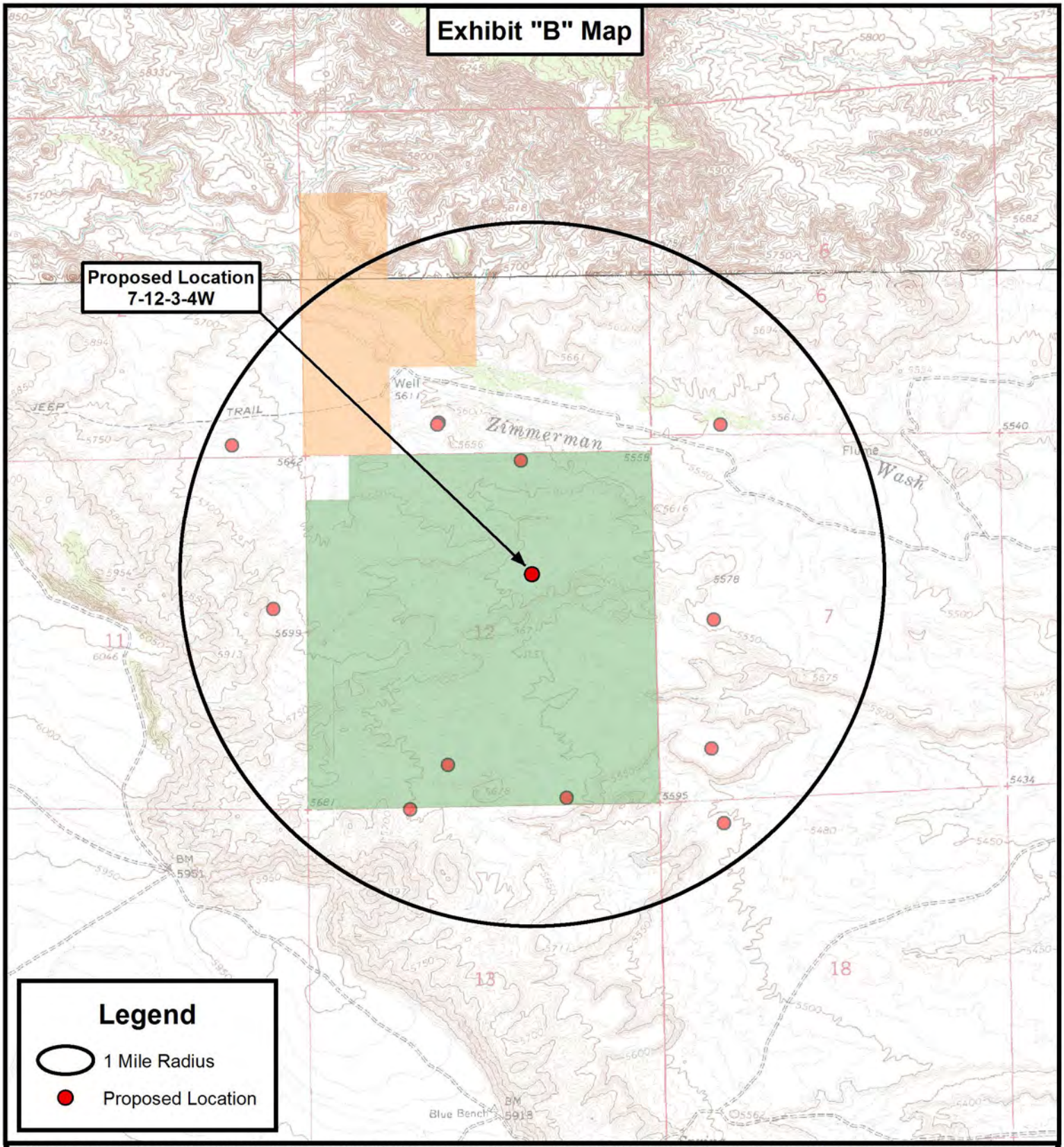
NEWFIELD EXPLORATION COMPANY

7-12-3-4W
SEC. 12, T3S, R4W, U.S.B.&M.
Duchesne County, UT.

DRAWN BY:	A.P.C.	REVISED:	09-14-12 D.C.R.	VERSION:
DATE:	12-02-2011			V4
SCALE:	1 " = 2,000 '			

TOPOGRAPHIC MAP

SHEET C



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N

NEWFIELD EXPLORATION COMPANY
7-12-3-4W
SEC. 12, T3S, R4W, U.S.B.&M.
Duchesne County, UT.

DRAWN BY:	A.P.C.	REVISED: 09-14-12 D.C.R.	VERSION:
DATE:	12-02-2011		V4
SCALE:	1 " = 2,000 '		

TOPOGRAPHIC MAP

SHEET D

Coordinate Report

Well Number	Feature Type	Latitude (NAD 83) (DMS)	Longitude (NAD 83) (DMS)
7-12-3-4W	Surface Hole	40° 14' 15.67" N	110° 16' 53.79" W

Well Number	Feature Type	Latitude (NAD 83) (DD)	Longitude (NAD 83) (DD)
7-12-3-4W	Surface Hole	40.237687	110.281608

Well Number	Feature Type	Northing (NAD 83) (UTM Meters)	Longitude (NAD 83) (UTM Meters)
7-12-3-4W	Surface Hole	4454386.140	561108.816

Well Number	Feature Type	Latitude (NAD 27) (DMS)	Longitude (NAD 27) (DMS)
7-12-3-4W	Surface Hole	40° 14' 15.83" N	110° 16' 51.23" W

Well Number	Feature Type	Latitude (NAD 27) (DD)	Longitude (NAD 27) (DD)
7-12-3-4W	Surface Hole	40.237729	110.280898

Well Number	Feature Type	Northing (NAD 27) (UTM Meters)	Longitude (NAD 27) (UTM Meters)
7-12-3-4W	Surface Hole	4454180.880	561170.806

Tri State Land Surveying, Inc.
180 NORTH VERNAL AVE. VERNAL, UTAH 84078
P: (435) 781-2501
F: (435) 781-2518

NEWFIELD EXPLORATION COMPANY

7-12-3-4W
SEC. 12, T3S, R4W, U.S.B.&M.
Duchesne County, UT.

DRAWN BY:	D.C.R.	REVISED:	
DATE:	09-14-2012		
VERSION:	V4		

COORDINATE REPORT

SHEET 1

RECEIVED: Jan. 21, 2013

NEWFIELD PRODUCTION COMPANY
UTE TRIBAL 7-12-3-4W
SWNE, SECTION 12, T3S, R4W, USB&M
DUCHESNE COUNTY, UTAH

MULTI-POINT SURFACE USE & OPERATIONS PLAN

1. EXISTING ROADS

a. To reach Newfield Production Company well location site Ute Tribal 7-12-3-4W proceed north from Myton, Utah on UDOT maintained Highway 40 for approximately 4.6 miles, turn left and proceed west 8.4 miles along UDOT maintained SR-87 (Ioka Highway), turn left and proceed 1.5 miles south along Duchesne County maintained 12000 West, turn right and proceed 1.0 miles on 4000 South, turn left and proceed 0.6 miles south on 13000 West then turn right and proceed northwest on 4500 South 2.1 miles turning left at a point where the planned access road begins.

b. The proposed location is approximately 19.3 miles northwest of Myton, Utah.

c. Existing native surface roads in the area range from clays to a sandy-clay shale material.

d. Access roads will be maintained at the standards required by UDOT, Duchesne County or other controlling agencies. This maintenance will consist of some minor grader work for road surfacing and snow removal. Any necessary fill material for repair will be purchase and hauled from private sources.

2. PLANNED ACCESS ROAD

a. Approximately 2,769 feet of access road trending southeast then southwest is planned from the proposed Ute Tribal 14-2-3-4W access road. The proposed Ute Tribal 14-2-3-4W access road continues an additional 2,892 feet east to the existing Duchesne County maintained 4500 South access road. The planned access consists of entirely new disturbance across entirely private surface. See attached Topographic Map “B”.

b. The planned access road will consist of a 20-foot permanent running surface crowned and ditched in order to handle any run-off from any precipitation events. The maximum grade will be 10% or less.

c. Four appropriately sized culverts and no low-water crossings are anticipated. Adequate drainage structures, where necessary, would be incorporated into the remainder of the road to prevent soil erosion and accommodate all-weather traffic.

d. No cattleguards or gates are anticipated at this time.

e. Construction material for this access road will be borrowed material accumulated during construction of the access road. If any additional borrow or gravel is required, it would be obtained from a local supplier having a permitted source of materials within the general area.

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3. ***LOCATION OF EXISTING WELLS***

a. Refer to Topographic Map "D".

4. ***LOCATION OF EXISTING AND/OR PROPOSED FACILITIES***

a. There are no existing facilities that will be utilized.

b. It is anticipated that this well will be a producing oil well with some associated natural gas.

c. Upon construction of a tank battery, the well pad will be surrounded by a dike of sufficient capacity to contain at minimum 110% of the largest tank volume within the facility battery.

d. Tank batteries will be built to Federal Gold Book specifications.

e. All permanent above-ground structures would be painted a flat, non-reflective covert green color, to match the standard environmental colors. All facilities would be painted the designated color at the time of installation (weather permitting). Facilities required to comply with the Occupational Safety and Health Act (OSHA) may be excluded.

f. Newfield Production Company proposes 134 feet of planned pipeline corridor trending northeast to the proposed Northwest Lateral pipeline corridor on entirely private surface. See attached Topographic Map "C".

g. Where parallel corridors exist the disturbed area will be 60 feet wide to allow for construction of the proposed access road and pipeline corridor. The pipeline corridor will consist of a 12-inch or smaller natural gas pipeline, a 6-inch or smaller fuel gas line and an 8-inch or smaller produced water pipeline.

h. The pipelines will tie in to the existing Newfield pipeline infrastructure. The proposed pipelines will be buried 4-feet deep or greater in a trench constructed with a trencher, trackhoe or backhoe for the length of the proposal. The construction phase of the planned access road, proposed pipelines will last approximately (10) days.

i. The centerline of the proposed route will be staked prior to installation. Pipelines shall be placed as close to existing roads as possible without interfering with normal road travel or road maintenance activities. Due to the proximity of existing facilities, no temporary use or construction/storage areas are anticipated.

j. Lengths of pipe will be strung out in the borrow ditch, welded together, and rolled or dragged into place with heavy equipment. For pipelines that are installed cross-country, travel along the lines will be infrequent and for maintenance needs only. No installation activities will be performed during periods when the soil is too wet to adequately support installation equipment. If such equipment creates ruts in excess of four (4) inches deep, the soil will be deemed too wet to adequately support the equipment.

k. The entire pad area may be fenced at the landowners request with a cattle guard installed where the access road enters the pad area. Cattle guards or gates will be

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installed as necessary or as requested by the landowner where existing fences are crossed along the proposed access road. Existing fences will be maintained during the construction process to insure livestock do not escape.

5. LOCATION AND TYPE OF WATER SUPPLY

a. Newfield Production will transport water by truck from nearest water source. The available water sources are as follows:

- Johnson Water District (Water Right : 43-7478)
- Maurice Harvey Pond (Water Right: 47-1358)
- Neil Moon Pond (Water Right: 43-11787)
- Newfield Collector Well (Water Right: 47-1817 - A30414DVA, contracted with the Duchesne County Conservancy District).

6. SOURCE OF CONSTRUCTION MATERIALS

a. Construction material for this access road will be borrowed material accumulated during construction of the access road. If any additional borrow or gravel is required, it would be obtained from a local supplier having a permitted source of materials within the general area.

7. METHODS FOR HANDLING WASTE DISPOSAL

a) This well may be drilled utilizing conventional, closed-loop and/or oil based mud (OBM) drilling systems.

b) A small pit (60 feet x 100 feet x 8 feet deep, or less) will be constructed inboard of the pad area. The pit will receive the processed drill cutting (wet sand, shale & rock) removed from the wellbore during drilling operations. The pit may be utilized as a reserve pit or a cuttings pit depending upon the type of drilling system utilized. If an oil based mud is not used, a conventional reserve pit will be utilized.

c) Any drilling fluids, which do accumulate in the pit as a result of shale-shaker carryover, cleaning of the sand trap, etc., will be promptly reclaimed.

d) If OBM is used, all processed OBM drill cuttings would be removed from the well bore using a closed loop system. OBM cuttings would be dried and centrifuged and then temporarily stored within a lined pit that would be constructed inboard of the pad area.

e) The pit would be lined with 16 mil (minimum) thickness polyethylene nylon reinforced liner material. The liner(s) would overlay straw, dirt and/or bentonite if rock is encountered during excavation. The liner would overlap the pit walls and be covered with dirt and/or rocks to hold them in place. No trash, scrap pipe, or other materials that could puncture the liner would be discarded in the pit, and a minimum of two feet of free board would be maintained between the maximum fluid level and the top of the pit at all times.

f) All OBM cuttings will be mechanically dried and centrifuged so that they can be easily transferred to a lined cuttings pit with little to no free fluid on them. Samples of the mechanically dried OBM cuttings will be taken for chemical analysis. The OBM cuttings will then be mixed with a chemical drying agent and the chemically dried OBM cuttings will be

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placed in a lined cuttings pit on the generating location that is separated from the water based cuttings.

g) The pit will be of sufficient size to contain all cuttings generated in the drilling process. At this point, the chemically dried OBM cuttings are ready for the Firmus® construction process or the OBM cuttings may also be transported to a state approved disposal facility.

h) A detailed report documenting the final placement of the treated cutting will be prepared and distributed to the appropriate regulatory agencies.

i) A portable toilet will be provided for human waste.

j) A trash basket will be provided for garbage (trash) and hauled away to an approved disposal site at the completion of the drilling activities.

k) After first production, if the production water meets quality guidelines, it will be transported to the Ashley, Monument Butte, Jonah, South Wells Draw and Beluga water injection facilities by company or contract trucks. Subsequently, the produced water is injected into approved Class II wells to enhance Newfield's secondary recovery project. Water not meeting quality criteria, will be disposed at Newfield's Dillman #3-17-3-2W SWD (Sec. 17; 3S 2W) or SWD 5-18-3-1W (Sec. 18; 3S; 1W), or other Federally or State approved surface disposal facilities.

l) All lease and/or unit operations will be conducted in such a manner that full compliance is made with all applicable laws and regulations, Onshore Oil and Gas Orders, the approved plan of operations and any applicable Notice to Lessees. A copy of these conditions will be furnished to the field representative to ensure compliance.

m) Newfield Production Company guarantees that during the drilling and completion of the referenced well, Newfield will not use, produce, store, transport or dispose 10,000# annually of any of the hazardous chemicals contained in the Environmental Protection Agency's consolidated list of chemicals subject to reporting under Title III Superfund Amendments and Reauthorization Act (SARA) of 1986. Newfield also guarantees that during the drilling and completion of the referenced well, Newfield will use, produce, store, transport or dispose less than the threshold planning quantity (T.P.Q.) of any extremely hazardous substances as defined in 40 CFR 355.

8. ANCILLARY FACILITIES

a. There are no ancillary facilities planned for at the present time and none foreseen in the near future.

9. WELL SITE LAYOUT

a. The well would be properly identified in accordance with 43 CFR 3162.6.

b. The pad layout, cross section diagrams and rig layout are enclosed within this APD package.

c. The pad and road designs are consistent with industry specifications.

d. The pad has been staked at its maximum size of 400 feet x 300 feet with an inboard reserve pit size of 100 feet x 60 feet x 8 feet deep.

e. Within the approved well pad location, a crawler tractor would strip whatever topsoil is present and stockpile it along the edge of the well pad for use during reclamation. Vegetation would be distributed along the sides of the well pad, as shown.

f. Fill from pit excavation would be stockpiled along the edge of the pit and the adjacent edge of the well pad.

g. Use of erosion control measures, including proper grading to minimize slopes, diversion terraces and ditches, mulching, terracing, riprap, fiber matting, temporary sediment traps, and broad-based drainage dips or low water crossings would be employed as necessary and appropriate to minimize erosion and surface runoff during well pad construction and operation. Cut and fill slopes would be constructed such that stability would be maintained for the life of the activity.

h. All cut and fill slopes would be such that stability can be maintained for the life of the activity.

i. Diversion ditches would be constructed, if necessary, around the well site to prevent surface waters from entering the well site area.

j. Water application may be implemented if necessary to minimize the amount of fugitive dust.

k. All surface disturbing activities would be supervised by a qualified, responsible company representative who is aware of the terms and conditions of the APD and specifications in the approved plans.

10. ***PLANS FOR RESTORATION OF SURFACE:***

a. A site specific reclamation plan would be submitted, if requested, within 90 days of location construction to the surface managing agency.

b. Site reclamation would be accomplished for portions of the well pad not required for the continued operation of the well on this pad within six months of completion, weather permitting.

c. The operator would control noxious weeds along access road use authorizations and well site by spraying or mechanical removal, according to the Utah Noxious Weed Act and as set forth in the approved surface damage agreements.

d. Rat and mouse holes would be filled and compacted from bottom to top immediately upon release of the drilling rig from location. Upon well completion, any hydrocarbons in the pit shall be removed in accordance with 43 CFR 3162.7-1. The reserve pit would be allowed to dry prior to the commencement of backfilling work. No attempts would be made to backfill the reserve pit until it is free of standing water. Once dry, the liner would be torn and perforated before backfilling.

e. The reserve pit and that portion of the location not needed for production facilities/operations would be recontoured to the approximate natural contours. Areas not used for production purposes would be backfilled and blended into the surrounding terrain, reseeded and erosion control measures installed. Mulching, erosion control measures and fertilization may be required to achieve acceptable stabilization. Back slopes and fore slopes would be reduced as practical and scarified

with the contour. The reserved topsoil would be evenly distributed over the slopes and scarified along the contour. Slopes would be seeded with the land owner specified seed mix.

f. Topsoil salvaged from the drill site and stored for more than one year would be placed at the location indicated on the well site layout drawing and graded to a depth optimum to maintain topsoil viability, seeded with the land owner prescribed seed mixture and covered with mulch for protection from wind and water erosion and to discourage the invasion of weeds.

11. SURFACE OWNERSHIP

a. Well site, access and pipeline corridors:
Newfield RMI - 1001 17th Street, Suite 2000, Denver, CO 80202; 303-383-4153

b. An affidavit of surface use agreement has been included within the APD package.

12. OTHER ADDITIONAL INFORMATION

a. Montgomery Archeological Consultants, Inc. has conducted a Class III archeological survey. The report has been submitted under separate cover by Montgomery Archeological Consultants, Inc. The cover page of the report has been attached to this submittal for reference. Newfield would require that their personnel, contractors, and subcontractors to comply with Federal regulations intended to protect archeological and cultural resources.

b. Outlaw Engineering Inc. has conducted a Biological Assessment survey. The report has been submitted under separate cover by Outlaw Engineering Inc. The cover page of the report has been attached to this submittal for reference.

c. Newfield Production will control noxious weeds along rights-of-way for roads, pipelines, well sites or other applicable facilities. On federal administered land it is required that a Pesticide Use Proposal shall be submitted and given approval prior to the application of herbicides or other possible hazardous chemicals.

d. A complete copy of the approved APD, if applicable, shall be on location during the construction of the location and drilling activities.

13. LESSEE'S OR OPERATOR'S REPRENSENTATIVE AND CERTIFICATION:

Name: Candice Kowalski – Regulatory Analyst

Address: Newfield Production Company
1001 17th Street, Suite 2000
Denver, Colorado 80202
Telephone: 303-382-4431
E-mail: ckowalski@newfield.com

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l

Certification:

I hereby certify that I, or someone under my direct supervision, have inspected the drill site and access route proposed herein; that I am familiar with the conditions which currently exists; that I have full knowledge of state and Federal laws applicable to this operation; that the statements made in this APD package are, to the best of my knowledge, true and correct; and that the work associated with the operations proposed herein will be performed in conformity with this APD package and the terms and conditions under which it is approved. I also certify that I, or the company I represent, am responsible for the operations conducted under this application and that bond coverage is provided under Newfield Production Company's BIA bond (RLB0010462). These statements are subject to the provisions of 18 U.S.C. 1001 for the filing of false statements.

Executed this 21st day of January, 2013.

Don Hamilton

Digitally signed by Don Hamilton
DN: cn=Don Hamilton, o=Star Point Enterprises, Inc., ou, email=starpoint@etv.net, c=US
Date: 2013.01.21 11:11:21 -07'00'

Don Hamilton - Agent 435-719-2018 (office)
Star Point Enterprises, Inc.
2580 Creekview Road,
Moab, Utah 84532
starpoint@etv.net

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Form 3160-4
(March 2012)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

FORM APPROVED
OMB NO. 1004-0137
Expires: October 31, 2014

WELL COMPLETION OR RECOMPLETION REPORT AND LOG

5. Lease Serial No.: 1420H626388

1a. Type of Well: ☑ Oil Well ☐ Gas Well ☐ Dry ☐ Other
b. Type of Completion: ☑ New Well ☐ Work Over ☐ Deepen ☐ Plug Back ☐ Diff. Resvr.,
Other: _____

6. If Indian, Allottee or Tribe Name: UINTAH AND OURAY

7. Unit or CA Agreement Name and No.:

2. Name of Operator: NEWFIELD PRODUCTION COMPANY

8. Lease Name and Well No.: UTE TRIBAL 7-12-3-4W

3. Address: ROUTE #3 BOX 3630, MYTON, UT 84052

3a. Phone No. *(include area code)*: Ph:435-646-3721

9. API Well No.: 43-013-51542

4. Location of Well *(Report location clearly and in accordance with Federal requirements)**

At surface: 1816' FNL 1861' FEL (SW/NE) SEC 12 T3S R4W

10. Field and Pool or Exploratory: UNDESIGNATED

11. Sec., T., R., M., on Block and Survey or Area: SEC 12 T3S R4W Mer UBM

At top prod. interval reported below

At total depth: 1498' FNL 1941' FEL (SW/NE) SEC 12 T3S R4W

12. County or Parish: DUCHESNE

13. State: UT

14. Date Spudded: 10/02/2012

15. Date T.D. Reached: 12/13/2012

16. Date Completed: ☐ D & A ☑ Ready to Prod. 04/21/2013

17. Elevations (DF, RKB, RT, GL)*: 5590' GL 5608' KB

18. Total Depth: MD 11035' TVD 11028'

19. Plug Back T.D.: MD 10,900' TVD

20. Depth Bridge Plug Set: MD TVD

21. Type Electric & Other Mechanical Logs Run (Submit copy of each)
DUAL IND GRD, SP, COMP. NEUTRON, GR, CALIPER, CMT BOND

22. Was well cored? ☑ No ☐ Yes (Submit analysis)
Was DST run? ☑ No ☐ Yes (Submit report)
Directional Survey? ☐ No ☑ Yes (Submit copy)

23. Casing and Liner Record *(Report all strings set in well)*

Hole Size	Size/Grade	Wt. (#/ft.)	Top (MD)	Bottom (MD)	Stage Cementer Depth	No. of Sks. & Type of Cement	Slurry Vol. (BBL)	Cement Top*	Amount Pulled
13-1/2"	9-5/8" J-55	36	0'	1032'		471 CLASS G			
8-7/8"	7" P-110	26	0'	8791'		300 CLASS G		5858'	
						910 Premlite II			
6-1/4"	4.5" P-110	11.5	8500'	11028'		302 Class G			

24. Tubing Record

Size	Depth Set (MD)	Packer Depth (MD)	Size	Depth Set (MD)	Packer Depth (MD)	Size	Depth Set (MD)	Packer Depth (MD)
2-7/8"	EOT@10587'	TA@10498'						

25. Producing Intervals / 26. Perforation Record

Formation	Top	Bottom	Perforated Interval	Size	No. Holes	Perf. Status
A) Green River	9065'	9101'	9065' - 9101' MD	0.35	21	
B) Wasatch	9648'	10,466'	9648' - 10466' MD	0.35	108	
C)						
D)						

27. Acid, Fracture, Treatment, Cement Squeeze, etc.

Depth Interval	Amount and Type of Material
9065' - 10,466' MD	Frac w/ 776,604#s of 20/40 white sand in 14,314 bbls of Lightning 17 fluid, in 5 stages.

28. Production - Interval A

Date First Produced	Test Date	Hours Tested	Test Production	Oil BBL	Gas MCF	Water BBL	Oil Gravity Corr. API	Gas Gravity	Production Method
2/3/13	2/13/13	24	→	562	337	242			GAS LIFT

Choke Size	Tbg. Press. Flwg. SI	Csg. Press.	24 Hr. Rate	Oil BBL	Gas MCF	Water BBL	Gas/Oil Ratio	Well Status
			→					PRODUCING

28a. Production - Interval B

Date First Produced	Test Date	Hours Tested	Test Production	Oil BBL	Gas MCF	Water BBL	Oil Gravity Corr. API	Gas Gravity	Production Method
			→						

Choke Size	Tbg. Press. Flwg. SI	Csg. Press.	24 Hr. Rate	Oil BBL	Gas MCF	Water BBL	Gas/Oil Ratio	Well Status
			→					

*(See instructions and spaces for additional data on page 2)

28b. Production - Interval C

Date First Produced	Test Date	Hours Tested	Test Production →	Oil BBL	Gas MCF	Water BBL	Oil Gravity Corr. API	Gas Gravity	Production Method

Choke Size	Tbg. Press. Flwg. SI	Csg. Press.	24 Hr. Rate →	Oil BBL	Gas MCF	Water BBL	Gas/Oil Ratio	Well Status

28c. Production - Interval D

Date First Produced	Test Date	Hours Tested	Test Production →	Oil BBL	Gas MCF	Water BBL	Oil Gravity Corr. API	Gas Gravity	Production Method

Choke Size	Tbg. Press. Flwg. SI	Csg. Press.	24 Hr. Rate →	Oil BBL	Gas MCF	Water BBL	Gas/Oil Ratio	Well Status

29. Disposition of Gas *(Solid, used for fuel, vented, etc.)*

30. Summary of Porous Zones (Include Aquifers):

Show all important zones of porosity and contents thereof: Cored intervals and all drill-stem tests, including depth interval tested, cushion used, time tool open, flowing and shut-in pressures and recoveries.

31. Formation (Log) Markers

GEOLOGICAL MARKERS

Formation	Top	Bottom	Descriptions, Contents, etc.	Name	Top Meas. Depth
				GARDEN GULCH MARK	7005'
				DOUGLAS CREEK	8135'
				CASTLE PEAK	9010'
				BASAL LIMESTONE	9316'
				WASATCH	9488'
				WASATCH 30	10381'

32. Additional remarks (include plugging procedure):

33. Indicate which items have been attached by placing a check in the appropriate boxes:

☐ Electrical/Mechanical Logs (1 full set req'd.) ☐ Geologic Report ☐ DST Report ☑ Directional Survey

☐ Sundry Notice for plugging and cement verification ☐ Core Analysis ☑ Other: Drilling daily activity

34. I hereby certify that the foregoing and attached information is complete and correct as determined from all available records (see attached instructions)*

Name *(please print)* Heather Calder Title Regulatory Technician

Signature Heather Calder Date 06/10/2014

Title 18 U.S.C. Section 1001 and Title 43 U.S.C. Section 1212, make it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

(Continued on page 3)

Client: NEWFIELD EXPLORATION COMPANY
Directional: PAYZONE DIRECTIONAL
Dates: 11/25/12 to 12/05/12
County/State: DUCHESNE, UTAH
Surface Location: 1816' FNL,1861' FEL
Well Name: UTE TRIBAL 7-12-3-4W
Drill Rig: PIONEER #68
Depth Reference: GL: 5590' / KB: 5608'
SPUD Date: 11/25/12
Geologists: ADAM SCHROEDER / ACLAM KPEKPASSE

Calculation Method
Proposed Azi. 0.00
Main Lateral
Target Angle = 0.00
Target TVD.= 11,020.'
BHA = 2 GTB = Null PTB= 60.00

Tool Type	BR	BRN	Survey Depth	Incl (°)	Azi (°)	CL (ft)	TVD (ft)	VS (ft)	Coordinates N/S (ft)		E/W (ft)		Closure Dist (ft)	Closure Ang (°)	DLS (°/100')	Bld Rate (°/100')	Wlk Rate (°/100')	BRN
Tie-In			974	0.50	254.10		973.94	-3.16	-3.16		3.48							
MWD	0.2	0.0	1091	0.70	251.30	117	1090.93	-3.53	-3.53	S	2.31	E	4.22	146.77	0.17	0.17	-2.39	0.0
MWD	0.2	0.0	1155	0.80	249.90	64	1154.93	-3.81	-3.81	S	1.52	E	4.10	158.21	0.16	0.16	-2.19	0.0
MWD	0.3	0.0	1249	1.10	243.40	94	1248.91	-4.44	-4.44	S	0.10	E	4.44	178.72	0.34	0.32	-6.91	0.0
MWD	0.2	0.0	1344	1.30	238.70	95	1343.89	-5.41	-5.41	S	-1.64	W	5.65	196.85	0.23	0.21	-4.95	0.0
MWD	0.0	0.0	1438	1.30	260.80	94	1437.87	-6.13	-6.13	S	-3.60	W	7.11	210.43	0.53	0.00	23.51	0.0
MWD	0.0	0.0	1533	1.30	257.20	95	1532.85	-6.54	-6.54	S	-5.72	W	8.69	221.15	0.09	0.00	-3.79	0.0
MWD	0.0	0.0	1628	1.30	258.80	95	1627.82	-6.99	-6.99	S	-7.82	W	10.49	228.22	0.04	0.00	1.68	0.0
MWD	-0.2	0.0	1723	1.10	237.90	95	1722.80	-7.68	-7.68	S	-9.65	W	12.34	231.48	0.50	-0.21	-22.00	0.0
MWD	0.0	0.0	1818	1.10	247.00	95	1817.78	-8.52	-8.52	S	-11.26	W	14.13	232.89	0.18	0.00	9.58	0.0
MWD	0.4	0.0	1913	1.50	240.40	95	1912.76	-9.49	-9.49	S	-13.19	W	16.25	234.24	0.45	0.42	-6.95	0.0
MWD	-0.3	0.0	2008	1.20	225.70	95	2007.73	-10.80	-10.80	S	-14.98	W	18.47	234.20	0.48	-0.32	-15.47	0.0
MWD	0.4	0.0	2103	1.60	237.20	95	2102.70	-12.22	-12.22	S	-16.81	W	20.78	233.98	0.51	0.42	12.11	0.0
MWD	0.2	0.0	2198	1.80	222.00	95	2197.66	-14.04	-14.04	S	-18.92	W	23.56	233.41	0.52	0.21	-16.00	0.0
MWD	-0.2	0.0	2325	1.50	233.60	127	2324.61	-16.51	-16.51	S	-21.59	W	27.18	232.59	0.35	-0.24	9.13	0.0
MWD	0.2	0.0	2388	1.60	228.00	63	2387.59	-17.59	-17.59	S	-22.91	W	28.88	232.48	0.29	0.16	-8.89	0.0
MWD	-0.5	0.0	2452	1.30	231.80	64	2451.57	-18.64	-18.64	S	-24.14	W	30.50	232.33	0.49	-0.47	5.94	0.0
MWD	0.3	0.0	2515	1.50	216.00	63	2514.55	-19.75	-19.75	S	-25.19	W	32.01	231.91	0.69	0.32	-25.08	0.0
MWD	-0.6	0.0	2578	1.10	238.50	63	2577.53	-20.73	-20.73	S	-26.19	W	33.40	231.64	1.02	-0.63	35.71	0.0
MWD	0.0	0.0	2642	1.10	225.00	64	2641.52	-21.48	-21.48	S	-27.15	W	34.62	231.64	0.40	0.00	-21.09	0.0
MWD	0.2	0.0	2705	1.20	209.20	63	2704.51	-22.49	-22.49	S	-27.90	W	35.83	231.13	0.53	0.16	-25.08	0.0
MWD	0.3	0.0	2768	1.40	226.60	63	2767.49	-23.59	-23.59	S	-28.78	W	37.21	230.65	0.70	0.32	27.62	0.0
MWD	-0.3	0.0	2832	1.20	229.10	64	2831.48	-24.57	-24.57	S	-29.85	W	38.66	230.55	0.32	-0.31	3.91	0.0
MWD	0.3	0.0	2894	1.40	210.70	62	2893.46	-25.65	-25.65	S	-30.73	W	40.03	230.15	0.74	0.32	-29.68	0.0
MWD	-0.3	0.0	2958	1.20	216.40	64	2957.44	-26.86	-26.86	S	-31.53	W	41.42	229.57	0.37	-0.31	8.91	0.0
MWD	0.8	0.0	3021	1.70	206.60	63	3020.42	-28.22	-28.22	S	-32.34	W	42.92	228.89	0.88	0.79	-15.56	0.0
MWD	-0.3	0.0	3084	1.50	200.70	63	3083.40	-29.83	-29.83	S	-33.05	W	44.52	227.93	0.41	-0.32	-9.37	0.0
MWD	0.0	0.0	3147	1.50	213.10	63	3146.38	-31.29	-31.29	S	-33.79	W	46.05	227.20	0.51	0.00	19.68	0.0
MWD	-0.2	0.0	3211	1.40	190.40	64	3210.36	-32.76	-32.76	S	-34.39	W	47.50	226.39	0.90	-0.16	-35.47	0.0
MWD	0.3	0.0	3274	1.60	186.00	63	3273.34	-34.39	-34.39	S	-34.62	W	48.80	225.19	0.37	0.32	-6.98	0.0
MWD	0.0	0.0	3337	1.60	203.40	63	3336.31	-36.08	-36.08	S	-35.06	W	50.31	224.18	0.77	0.00	27.62	0.0
MWD	-0.3	0.0	3400	1.40	192.40	63	3399.29	-37.64	-37.64	S	-35.57	W	51.79	223.39	0.56	-0.32	-17.46	0.0
MWD	0.8	0.0	3463	1.90	184.00	63	3462.26	-39.43	-39.43	S	-35.81	W	53.26	222.25	0.88	0.79	-13.33	0.0
MWD	-0.2	0.0	3526	1.80	187.80	63	3525.23	-41.45	-41.45	S	-36.02	W	54.91	220.99	0.25	-0.16	6.03	0.0
MWD	-0.3	0.0	3589	1.60	179.70	63	3588.20	-43.31	-43.31	S	-36.15	W	56.41	219.85	0.50	-0.32	-12.86	0.0
MWD	0.2	0.0	3652	1.70	170.10	63	3651.18	-45.11	-45.11	S	-35.98	W	57.70	218.58	0.47	0.16	-15.24	0.0
MWD	0.8	0.0	3716	2.20	170.20	64	3715.14	-47.26	-47.26	S	-35.61	W	59.17	217.00	0.78	0.78	0.16	0.0
MWD	-0.5	0.0	3779	1.90	174.00	63	3778.10	-49.49	-49.49	S	-35.30	W	60.78	215.50	0.52	-0.48	6.03	0.0
MWD	0.5	0.0	3842	2.20	160.70	63	3841.06	-51.67	-51.67	S	-34.79	W	62.29	213.95	0.89	0.48	-21.11	0.0
MWD	0.0	0.0	3905	2.20	179.50	63	3904.01	-54.02	-54.02	S	-34.38	W	64.03	212.47	1.14	0.00	29.84	0.0
MWD	-2.4	0.0	3968	0.70	198.70	63	3966.99	-55.59	-55.59	S	-34.49	W	65.42	211.82	2.47	-2.38	30.48	0.0
MWD	0.0	0.0	4032	0.70	219.30	64	4030.99	-56.26	-56.26	S	-34.86	W	66.19	211.78	0.39	0.00	32.19	0.0
MWD	0.0	0.0	4095	0.70	222.50	63	4093.98	-56.85	-56.85	S	-35.37	W	66.95	211.89	0.06	0.00	5.08	0.0
MWD	1.0	0.0	4158	1.30	216.80	63	4156.97	-57.70	-57.70	S	-36.05	W	68.04	212.00	0.96	0.95	-9.05	0.0
MWD	0.0	0.0	4221	1.30	199.40	63	4219.96	-58.95	-58.95	S	-36.72	W	69.45	211.92	0.62	0.00	-27.62	0.0
MWD	0.8	0.0	4284	1.80	197.80	63	4282.93	-60.56	-60.56	S	-37.26	W	71.11	211.60	0.80	0.79	-2.54	0.0
MWD	0.0	0.0	4348	1.80	194.80	64	4346.90	-62.49	-62.49	S	-37.82	W	73.05	211.18	0.15	0.00	-4.69	0.0
MWD	0.2	0.0	4411	1.90	205.60	63	4409.87	-64.39	-64.39	S	-38.53	W	75.04	210.89	0.57	0.16	17.14	0.0
MWD	0.8	0.0	4474	2.40	197.90	63	4472.82	-66.59	-66.59	S	-39.38	W	77.36	210.60	0.91	0.79	-12.22	0.0
MWD	-1.6	0.0	4537	1.40	180.20	63	4535.79	-68.61	-68.61	S	-39.79	W	79.32	210.11	1.82	-1.59	-28.10	0.0
MWD	0.5	0.0	4601	1.70	174.00	64	4599.77	-70.34	-70.34	S	-39.70	W	80.77	209.44	0.54	0.47	-9.69	0.0
MWD	0.2	0.0	4664	1.80	192.60	63	4662.74	-72.23	-72.23	S	-39.81	W	82.48	208.86	0.91	0.16	29.52	0.0
MWD	0.0	0.0	4727	1.80	196.30	63	4725.71	-74.15	-74.15	S	-40.31	W	84.40	208.53	0.18	0.00	5.87	0.0
MWD	0.6	0.0	4790	2.20	184.90	63	4788.67	-76.30	-76.30	S	-40.69	W	86.47	208.07	0.89	0.63	-18.10	0.0
MWD	-1.3	0.0	4853	1.40	200.00	63	4851.64	-78.23	-78.23	S	-41.06	W	88.35	207.69	1.47	-1.27	23.97	0.0
MWD	-0.3	0.0	4917	1.20	206.40	64	4915.62	-79.57	-79.57	S	-41.62	W	89.80	207.61	0.39	-0.31	10.00	0.0
MWD	0.2	0.0	4980	1.30	217.40	63	4978.61	-80.73	-80.73	S	-42.35	W	91.16	207.68	0.41	0.16	17.46	0.0
MWD	0.5	0.0	5043	1.60	208.40	63	5041.59	-82.07	-82.07	S	-43.20	W	92.74	207.76	0.60	0.48	-14.29	0.0
MWD	0.2	0.0	5107	1.70	207.50	64	5105.56	-83.70	-83.70	S	-44.06	W	94.59	207.77	0.16	0.16	-1.41	0.0
MWD	0.0	0.0	5173	1.70	214.80	66	5171.53	-85.37	-85.37	S	-45.07	W	96.54	207.83	0.33	0.00	11.06	0.0
MWD	0.2	0.0	5233	1.80	202.60	60	5231.50	-86.97	-86.97	S	-45.94	W	98.36	207.85	0.64	0.17	-20.33	0.0
MWD	0.0	0.0	5296	1.80	213.30	63	5294.47	-88.71	-88.71	S	-46.87	W	100.33	207.85	0.53	0.00	16.98	0.0
MWD	0.0	0.0	5359	1.80	212.40	63	5357.44	-90.37	-90.37	S	-47.94	W	102.30	207.95	0.04	0.00	-1.43	0.0
MWD	0.0	0.0	5423	1.80	203.20	64	5421.41	-92.14	-92.14	S	-48.88	W	104.30	207.94	0.45	0.00	-14.38	0.0
MWD	-0.4	0.0	5492	1.50	186.90	69	5490.38	-94.04	-94.04	S	-49.41	W	106.23	207.72	0.80	-0.43	-23.62	0.0
MWD	0.9	0.0	5549	2.00	178.80	57	5547.35	-95.77	-95.77	S	-49.48	W	107.80	207.32	0.98	0.88	-14.21	0.0
MWD	0.3	0.0	5612	2.20	178.00	63	5610.31	-98.08	-98.08	S	-49.42	W	109.82	206.74	0.32	0.32	-1.27	0.0
MWD	-0.3	0.0	5675	2.00	184.60	63	5673.27	-100.38	-100.38	S	-49.46	W	111.91	206.23	0.50	-0.32	10.48	0.0
MWD	-0.3	0.0	5738	1.80	169.90	63	5736.23	-102.45	-102.45	S	-49.38	W	113.73	205.73	0.83	-0.32	-23.33	0.0

Client: NEWFIELD EXPLORATION COMPANY
Directional: PAYZONE DIRECTIONAL
Dates: 11/25/12 to 12/05/12
County/State: DUCHESNE, UTAH
Surface Location: 1816' FNL,1861' FEL
Well Name: UTE TRIBAL 7-12-3-4W
Drill Rig: PIONEER #68
Depth Reference: GL: 5590' / KB: 5608'
SPUD Date: 11/25/12
Geologists: ADAM SCHROEDER / ACLAM KPEKPASSE

Calculation Method

Proposed Azi.	0.00
Main Lateral	
Target Angle =	0.00
Target TVD.=	11,020.'
BHA = 2	GTB = Null
PTB=	60.00

Tool Type	BR	BRN	Survey Depth	Incl (°)	Azi (°)	CL (ft)	TVD (ft)	VS (ft)	Coordinates N/S (ft)		E/W (ft)		Closure Dist (ft)	Closure Ang (°)	DLS (°/100')	Bld Rate (°/100')	Wlk Rate (°/100')	BRN
MWD	0.8	0.0	5802	2.30	179.30	64	5800.19	-104.73	-104.73	S	-49.18	W	115.70	205.16	0.94	0.78	14.69	0.0
MWD	-1.4	0.0	5865	1.40	208.40	63	5863.16	-106.67	-106.67	S	-49.53	W	117.61	204.91	2.02	-1.43	46.19	0.0
MWD	-0.2	0.0	5927	1.30	214.20	62	5925.14	-107.92	-107.92	S	-50.29	W	119.06	204.99	0.27	-0.16	9.35	0.0
MWD	-0.3	0.0	5991	1.10	221.70	64	5989.13	-108.97	-108.97	S	-51.11	W	120.36	205.13	0.40	-0.31	11.72	0.0
MWD	0.8	0.0	6054	1.60	213.60	63	6052.11	-110.16	-110.16	S	-52.00	W	121.81	205.27	0.85	0.79	-12.86	0.0
MWD	0.0	0.0	6117	1.60	198.40	63	6115.09	-111.73	-111.73	S	-52.76	W	123.56	205.28	0.67	0.00	-24.13	0.0
MWD	0.9	0.0	6181	2.20	200.00	64	6179.05	-113.73	-113.73	S	-53.46	W	125.67	205.18	0.94	0.94	2.50	0.0
MWD	-0.8	0.0	6244	1.70	205.10	63	6242.02	-115.71	-115.71	S	-54.27	W	127.81	205.13	0.84	-0.79	8.10	0.0
MWD	-1.0	0.0	6307	1.10	193.40	63	6305.00	-117.15	-117.15	S	-54.81	W	129.33	205.07	1.05	-0.95	-18.57	0.0
MWD	0.0	0.0	6371	1.10	204.80	64	6368.99	-118.30	-118.30	S	-55.21	W	130.55	205.02	0.34	0.00	17.81	0.0
MWD	0.5	0.0	6434	1.40	188.80	63	6431.97	-119.61	-119.61	S	-55.58	W	131.89	204.92	0.73	0.48	-25.40	0.0
MWD	0.3	0.0	6497	1.60	193.00	63	6494.95	-121.23	-121.23	S	-55.90	W	133.49	204.75	0.36	0.32	6.67	0.0
MWD	0.2	0.0	6560	1.70	203.90	63	6557.92	-122.94	-122.94	S	-56.47	W	135.29	204.67	0.52	0.16	17.30	0.0
MWD	0.3	0.0	6624	1.90	198.30	64	6621.89	-124.81	-124.81	S	-57.19	W	137.29	204.62	0.42	0.31	-8.75	0.0
MWD	-0.2	0.0	6687	1.80	189.20	63	6684.86	-126.78	-126.78	S	-57.68	W	139.29	204.46	0.49	-0.16	-14.44	0.0
MWD	0.3	0.0	6750	2.00	202.60	63	6747.82	-128.77	-128.77	S	-58.26	W	141.34	204.34	0.77	0.32	21.27	0.0
MWD	-1.3	0.0	6814	1.20	183.60	64	6811.80	-130.47	-130.47	S	-58.73	W	143.08	204.23	1.48	-1.25	-29.69	0.0
MWD	-0.9	0.0	6878	0.60	145.40	64	6875.79	-131.42	-131.42	S	-58.58	W	143.88	204.02	1.28	-0.94	-59.69	0.0
MWD	0.5	0.0	6941	0.90	168.60	63	6938.79	-132.18	-132.18	S	-58.29	W	144.46	203.80	0.67	0.48	36.83	0.0
MWD	0.2	0.0	7004	1.00	191.30	63	7001.78	-133.20	-133.20	S	-58.30	W	145.40	203.64	0.61	0.16	36.03	0.0
MWD	1.3	0.0	7068	1.80	189.10	64	7065.76	-134.74	-134.74	S	-58.57	W	146.92	203.50	1.25	1.25	-3.44	0.0
MWD	0.3	-0.1	7131	2.00	184.40	63	7128.72	-136.81	-136.81	S	-58.81	W	148.92	203.26	0.40	0.32	-7.46	-0.1
MWD	0.2	-0.1	7194	2.10	209.90	63	7191.68	-138.91	-138.91	S	-59.47	W	151.11	203.18	1.44	0.16	40.48	-0.1
MWD	0.3	-0.1	7257	2.30	212.20	63	7254.64	-140.98	-140.98	S	-60.72	W	153.50	203.30	0.35	0.32	3.65	-0.1
MWD	-0.5	-0.1	7320	2.00	207.60	63	7317.59	-143.02	-143.02	S	-61.91	W	155.85	203.40	0.55	-0.48	-7.30	-0.1
MWD	0.2	-0.1	7383	2.10	206.00	63	7380.55	-145.04	-145.04	S	-62.92	W	158.10	203.45	0.18	0.16	-2.54	-0.1
MWD	0.2	-0.1	7446	2.20	205.60	63	7443.51	-147.16	-147.16	S	-63.95	W	160.46	203.49	0.16	0.16	-0.63	-0.1
MWD	0.3	-0.1	7509	2.40	196.90	63	7506.46	-149.52	-149.52	S	-64.86	W	162.98	203.45	0.64	0.32	-13.81	-0.1
MWD	0.0	-0.1	7573	2.40	196.70	64	7570.40	-152.08	-152.08	S	-65.63	W	165.64	203.34	0.01	0.00	-0.31	-0.1
MWD	0.8	-0.1	7636	2.90	195.50	63	7633.33	-154.88	-154.88	S	-66.44	W	168.53	203.22	0.80	0.79	-1.90	-0.1
MWD	-0.5	-0.1	7699	2.60	195.00	63	7696.26	-157.80	-157.80	S	-67.23	W	171.52	203.08	0.48	-0.48	-0.79	-0.1
MWD	0.2	-0.1	7762	2.70	192.60	63	7759.19	-160.63	-160.63	S	-67.92	W	174.40	202.92	0.24	0.16	-3.81	-0.1
MWD	0.2	-0.1	7825	2.80	194.70	63	7822.12	-163.56	-163.56	S	-68.64	W	177.38	202.77	0.23	0.16	3.33	-0.1
MWD	0.6	-0.1	7888	3.20	182.40	63	7885.04	-166.81	-166.81	S	-69.10	W	180.55	202.50	1.20	0.63	-19.52	-0.1
MWD	-0.6	-0.1	8015	2.40	198.50	127	8011.89	-172.87	-172.87	S	-70.09	W	186.54	202.07	0.88	-0.63	12.68	-0.1
MWD	0.3	-0.1	8079	2.60	194.50	64	8075.82	-175.55	-175.55	S	-70.88	W	189.32	201.99	0.41	0.31	-6.25	-0.1
MWD	0.3	-0.1	8142	2.80	186.10	63	8138.75	-178.46	-178.46	S	-71.40	W	192.22	201.81	0.70	0.32	-13.33	-0.1
MWD	0.2	-0.1	8205	2.90	182.60	63	8201.68	-181.58	-181.58	S	-71.64	W	195.20	201.53	0.32	0.16	-5.56	-0.1
MWD	-0.2	-0.1	8269	2.80	182.90	64	8265.60	-184.76	-184.76	S	-71.79	W	198.22	201.23	0.16	-0.16	0.47	-0.1
MWD	0.8	-0.1	8332	3.30	183.00	63	8328.51	-188.11	-188.11	S	-71.97	W	201.40	200.94	0.79	0.79	0.16	-0.1
MWD	-0.3	-0.1	8396	3.10	180.40	64	8392.41	-191.68	-191.68	S	-72.07	W	204.78	200.61	0.39	-0.31	-4.06	-0.1
MWD	0.5	-0.1	8459	3.40	176.40	63	8455.31	-195.25	-195.25	S	-71.97	W	208.09	200.23	0.60	0.48	-6.35	-0.1
MWD	0.2	-0.1	8512	3.50	182.40	53	8508.21	-198.43	-198.43	S	-71.94	W	211.07	199.93	0.71	0.19	11.32	-0.1
MWD	0.0	-0.1	8586	3.50	183.20	74	8582.07	-202.94	-202.94	S	-72.16	W	215.39	199.57	0.07	0.00	1.08	-0.1
MWD	0.5	-0.2	8649	3.80	180.00	63	8644.95	-206.95	-206.95	S	-72.27	W	219.21	199.25	0.58	0.48	-5.08	-0.2
MWD	0.3	-0.2	8712	4.00	185.30	63	8707.80	-211.23	-211.23	S	-72.47	W	223.31	198.94	0.65	0.32	8.41	-0.2
MWD	-0.5	-0.2	8840	3.30	181.70	128	8835.54	-219.35	-219.35	S	-72.99	W	231.18	198.40	0.58	-0.55	-2.81	-0.2
MWD	-1.6	-0.1	8903	2.30	184.00	63	8898.46	-222.43	-222.43	S	-73.13	W	234.14	198.20	1.60	-1.59	3.65	-0.1
MWD	1.1	-0.1	8966	3.00	190.60	63	8961.40	-225.31	-225.31	S	-73.52	W	237.00	198.07	1.21	1.11	10.48	-0.1
MWD	-0.5	-0.1	9030	2.70	182.50	64	9025.32	-228.46	-228.46	S	-73.90	W	240.12	197.92	0.78	-0.47	-12.66	-0.1
MWD	-0.2	-0.1	9093	2.60	180.40	63	9088.25	-231.37	-231.37	S	-73.97	W	242.91	197.73	0.22	-0.16	-3.33	-0.1
MWD	-0.6	-0.1	9156	2.20	180.00	63	9151.19	-234.01	-234.01	S	-73.98	W	245.43	197.54	0.64	-0.63	-0.63	-0.1
MWD	0.0	-0.1	9219	2.20	179.20	63	9214.15	-236.43	-236.43	S	-73.97	W	247.73	197.37	0.05	0.00	-1.27	-0.1
MWD	-0.5	-0.1	9282	1.90	178.40	63	9277.11	-238.68	-238.68	S	-73.92	W	249.87	197.21	0.48	-0.48	-1.27	-0.1
MWD	0.0	-0.1	9345	1.90	178.10	63	9340.07	-240.77	-240.77	S	-73.86	W	251.84	197.05	0.02	0.00	-0.48	-0.1
MWD	0.0	-0.1	9409	1.90	172.10	64	9404.04	-242.88	-242.88	S	-73.67	W	253.81	196.87	0.31	0.00	-9.38	-0.1
MWD	0.5	-0.1	9472	2.20	169.80	63	9467.00	-245.11	-245.11	S	-73.32	W	255.84	196.65	0.49	0.48	-3.65	-0.1
MWD	-0.3	-0.1	9535	2.00	170.40	63	9529.95	-247.38	-247.38	S	-72.92	W	257.90	196.42	0.32	-0.32	0.95	-0.1
MWD	0.8	-0.2	9598	2.50	180.30	63	9592.91	-249.84	-249.84	S	-72.74	W	260.21	196.23	1.00	0.79	15.71	-0.2
MWD	-0.3	-0.2	9661	2.30	178.70	63	9655.85	-252.48	-252.48	S	-72.72	W	262.74	196.07	0.33	-0.32	-2.54	-0.2
MWD	0.0	-0.2	9724	2.30	176.60	63	9718.80	-255.00	-255.00	S	-72.62	W	265.14	195.90	0.13	0.00	-3.33	-0.2
MWD	0.3	-0.2	9787	2.50	184.60	63	9781.74	-257.63	-257.63	S	-72.65	W	267.68	195.75	0.62	0.32	12.70	-0.2
MWD	-0.8	-0.2	9850	2.00	192.40	63	9844.70	-260.08	-260.08	S	-73.00	W	270.13	195.68	0.93	-0.79	12.38	-0.2
MWD	0.2	-0.2	9914	2.10	187.00	64	9908.66	-262.33	-262.33	S	-73.38	W	272.40	195.63	0.34	0.16	-8.44	-0.2
MWD	0.3	-0.2	9978	2.30	186.40	64	9972.61	-264.77	-264.77	S	-73.67	W	274.83	195.55	0.31	0.31	-0.94	-0.2
MWD	0.3	-0.3	10041	2.50	191.60	63	10035.55	-267.37	-267.37	S	-74.09	W	277.45	195.49	0.47	0.32	8.25	-0.3
MWD	0.2	-0.3	10104	2.60	194.80	63	10098.49	-270.10	-270.10	S	-74.73	W	280.25	195.46	0.28	0.16	5.08	-0.3
MWD	0.0	-0.3	10167	2.60	189.70	63	10161.43	-272.89	-272.89	S	-75.33	W	283.10	195.43	0.37	0.00	-8.10	-0.3
MWD	0.0	-0.3	10230	2.60	186.10	63	10224.36	-275.72	-275.72	S	-75.73	W	285.93	195.36	0.26	0.00	-5.71	-0.3

Client: NEWFIELD EXPLORATION COMPANY
Directional: PAYZONE DIRECTIONAL
Dates: 11/25/12 to 12/05/12
County/State: DUCHESNE, UTAH
Surface Location: 1816' FNL,1861' FEL
Well Name: UTE TRIBAL 7-12-3-4W
Drill Rig: PIONEER #68
Depth Reference: GL: 5590' / KB: 5608'
SPUD Date: 11/25/12
Geologists: ADAM SCHROEDER / ACLAM KPEKPASSE

Calculation Method
Proposed Azi. 0.00
Main Lateral
Target Angle = 0.00
Target TVD.= 11,020.'
BHA = 2 GTB = Null PTB= 60.00

Tool Type	BR	BRN	Survey Depth	Incl (°)	Azi (°)	CL (ft)	TVD (ft)	VS (ft)	Coordinates N/S (ft)		E/W (ft)		Closure Dist (ft)	Closure Ang (°)	DLS (°/100')	Bld Rate (°/100')	Wlk Rate (°/100')	BRN
MWD	0.6	-0.4	10293	3.00	185.60	63	10287.29	-278.78	-278.78	S	-76.04	W	288.97	195.26	0.64	0.63	-0.79	-0.4
MWD	-0.3	-0.4	10356	2.80	190.90	63	10350.20	-281.93	-281.93	S	-76.49	W	292.13	195.18	0.53	-0.32	8.41	-0.4
MWD	-0.3	-0.4	10419	2.60	187.90	63	10413.13	-284.86	-284.86	S	-76.98	W	295.08	195.12	0.39	-0.32	-4.76	-0.4
MWD	0.5	-0.5	10482	2.90	187.10	63	10476.06	-287.86	-287.86	S	-77.37	W	298.07	195.04	0.48	0.48	-1.27	-0.5
MWD	0.0	-0.6	10546	2.90	182.30	64	10539.98	-291.08	-291.08	S	-77.64	W	301.26	194.93	0.38	0.00	-7.50	-0.6
MWD	0.0	-0.7	10609	2.90	184.50	63	10602.90	-294.26	-294.26	S	-77.83	W	304.38	194.81	0.18	0.00	3.49	-0.7
MWD	0.5	-0.9	10672	3.20	189.00	63	10665.81	-297.59	-297.59	S	-78.23	W	307.70	194.73	0.61	0.48	7.14	-0.9
MWD	0.2	-1.1	10735	3.30	186.10	63	10728.71	-301.13	-301.13	S	-78.69	W	311.24	194.65	0.31	0.16	-4.60	-1.1
MWD	0.0	-1.5	10799	3.30	182.90	64	10792.60	-304.80	-304.80	S	-78.98	W	314.87	194.53	0.29	0.00	-5.00	-1.5
MWD	-0.3	-1.9	10862	3.10	185.30	63	10855.50	-308.31	-308.31	S	-79.23	W	318.32	194.41	0.38	-0.32	3.81	-1.9
MWD	0.2	-3.1	10925	3.20	187.50	63	10918.41	-311.75	-311.75	S	-79.62	W	321.75	194.33	0.25	0.16	3.49	-3.1
MWD	0.0	-7.3	10983	3.20	183.90	58	10976.32	-314.97	-314.97	S	-79.94	W	324.95	194.24	0.35	0.00	-6.21	-7.3
PROJ	0.0	38.8	11035	3.20	183.90	52	11028.24	-317.86	-317.86	S	-80.14	W	327.81	194.15	0.00	0.00	0.00	38.8

Daily Activity Report

Format For Sundry

UTE TRIBAL 7-12-3-4W

12/1/2012 To 4/28/2013

12/20/2012 Day: 1 **Completion**

Rigless on 12/20/2012 - NU tbg head, 10K HCR Frac valve and run GR with RPM log. - Conduct PJSM, MIRU Baker WLU. SICP: 0 psi. open well and RIH with RPM logging tool, tag PBTD at 10,876'. PU and re-tag at same depth (10,876') 3 times. Log up to 8,400' with RPM and continue to GR log up to surface. 23:00 WL bump up and RD. SI and secure well. SDFN - Conduct PJSM, MIRU B&G crane and install Cameron 10K 7 1/16" Tbg head with dual 4 1/16" outlet valves on cross. Test void 5000 psi. Test wing valves 250 psi low and 5,000 psi high. 5min and 10 min. all tested good. Install FMC 10k HCR frac valve. All test charted on file.
Daily Cost: $0
Cumulative Cost: $24,142

1/4/2013 Day: 2 **Completion**

Rigless on 1/4/2013 - MIRU FMC 10K 7 1/16" Frac stack and test. - Conduct PJSM, Test 250 low and 10,000 psi high per NFX proceedures. - - Conduct PJSM, MIRU JW Crane, FMC test unit and FMC 10K 7 1/16" Frac stack consisting of 10K 7 1/16" HCR valve (allready installed), 10K 7 1/16" spacer spool, 10K 7 1/16" manua valvel, 7 1/16" X 4 1/16" double valved flow cross and 10K 7 1/16" manual Frac valve. NU 7 1/16" 10K night cap On top. We had minor issues with the HCR and Manual valves operating correctly due to weather. We were able to MI well head heater and functioned tested good.
Daily Cost: $0
Cumulative Cost: $61,216

1/10/2013 Day: 4 **Completion**

Rigless on 1/10/2013 - RU JW WL, Baker Hugh, Weatherford to test lubricator. Establish injection rate several time w/no results. TIH w/dump bailer w/15% HCL acid - Conduct PJSM, RU Baker pump truck To test 7" 26# casing & 4.5 13.5#liner . Test to 7979 psi held 30min w/ bleed off @7854. RD baker pump truck. - Held safety meeting Before Arming 2 3/4" x 2' gun. RU Lubricator w/ hydrocrane . RU weatherford test truck. Test lubricator & BOPE to 4800psi . RD weatherford test truck. RIH w/ 2 3/4 "X2' exp gun 3 SPF 16gm charge scalloped. Perf 4.5" 13.5# liner @ 10464' to 10466'. POOH w/ shot 2 3/4" x 2' gun . RD Lubricator w/ crane. ND shooting flange . NU 7" 10000# cap . RDMO JW wire line. - Held safety meeting Before Arming 2 3/4" x 2' gun. RU Lubricator w/ hydrocrane . RU weatherford test truck. Test lubricator & BOPE to 4800psi . RD weatherford test truck. RIH w/ 2 3/4 "X2' exp gun 3 SPF 16gm charge scalloped. Perf 4.5" 13.5# liner @ 10464' to 10466'. POOH w/ shot 2 3/4" x 2' gun . RD Lubricator w/ crane. ND shooting flange . NU 7" 10000# cap . RDMO JW wire line. - RU Baker pump truck . Test hardline to 9000 psi. Started pumping fresh water w/ 2-gal Claycare gpt & Alpha 452 @2GPT. Pumped 9bbls @3bpm to 8000psi. Held for 5 min bleed down 7830 psi. Made call to Inform Newfield couldn't get break down on perforations. Instructed by NFX make three attempt's to get break down.started pumping 2nd attempt @3.2bpm to 8000psi held for 5min bleed pressure down to 0psi. Pumped 3rd attempt @4.2 bpm to 8000psi held for 5 min. no break down. Bleed down to 0psi. Pumped 4th attempt @ 7 bpm to 7520psi w/ no break down. Bleed down to 3000psi. Shut in Master valve. Bleed down hard line. Contacted NFX that break down was not successful. RD Baker pump truck. Rewraped heater tarp on well head . SDSIFN. - RU Baker pump truck . Test hardline to 9000 psi. Started pumping fresh water w/ 2-gal Claycare gpt & Alpha 452 @2GPT. Pumped 9bbls

@3bpm to 8000psi. Held for 5 min bleed down 7830 psi. Made call to Inform Newfield couldn't get break down on perforations. Instructed by NFX make three attempt's to get break down.started pumping 2nd attempt @3.2bpm to 8000psi held for 5min bleed pressure down to 0psi. Pumped 3rd attempt @4.2 bpm to 8000psi held for 5 min. no break down. Bleed down to 0psi. Pumped 4th attempt @ 7 bpm to 7520psi w/ no break down. Bleed down to 3000psi. Shut in Master valve. Bleed down hard line. Contacted NFX that break down was not successful. RD Baker pump truck. Rewraped heater tarp on well head . SDSIFN. - Conduct PJSM, MIRU JW WL, Weatherford test unit and Baker pump. - Conduct PJSM, MIRU JW WL, Weatherford test unit and Baker pump. - Started to Establish injection rate @ 1.5 BPM and pressure increased to 7,800 psi w/5.3 bbl. BD casing pressure to 0 psi. SICP=3,077 psi. Attempt a second injection rate @ 1.5 BPM and pressure increased to 7,800 psi. BO pressure. RD Baker - Started to Establish injection rate @ 1.5 BPM and pressure increased to 7,800 psi w/5.3 bbl. BD casing pressure to 0 psi. SICP=3,077 psi. Attempt a second injection rate @ 1.5 BPM and pressure increased to 7,800 psi. BO pressure. RD Baker - RU & PU JW 5-1/2" 5K lubricator. MU 3-1/2" OD x 20' long Dump bailer w/8 (gal) 15% HCL acid, 3-1/8" OD x 2.50' long CCL & 1-11/16" OD x 1' long cable head. PU tool string inside lubricator and RU on well. RU Weatherford test unit, pressure test lubricator to 4,800 psi for 5 min. Test OK. BO pressure to 3,500 psi, - RU & PU JW 5-1/2" 5K lubricator. MU 3-1/2" OD x 20' long Dump bailer w/8 (gal) 15% HCL acid, 3-1/8" OD x 2.50' long CCL & 1-11/16" OD x 1' long cable head. PU tool string inside lubricator and RU on well. RU Weatherford test unit, pressure test lubricator to 4,800 psi for 5 min. Test OK. BO pressure to 3,500 psi, - open well. TIH w/Dump bailer. - Conduct PJSM, RU Baker pump truck To test 7" 26# casing & 4.5 13.5#liner . Test to 7979 psi held 30min w/ bleed off @7854. RD baker pump truck. - Conduct PJSM, Run CBL/N/CCL Bond log .7" 26# casing & 4.5 13.5# liner Tag well @ 10650' Correlated w/ RPM log tied to flag Joint @8789' . Run CBL 10650' to surface. Removed lubricator w/ hydro crane . LD logging tools. - Conduct PJSM, Run CBL/N/CCL Bond log .7" 26# casing & 4.5 13.5# liner Tag well @ 10650' Correlated w/ RPM log tied to flag Joint @8789' . Run CBL 10650' to surface. Removed lubricator w/ hydro crane . LD logging tools. - Held saftey meeting JSA w/ all contractors on location . Spot in JW wireline . Rig up Lubricator w/ hydro Crane . Rig up weatherford test truck .Pessure test lubricator & bop @250psi low 5000 psi high.Rig down weatherford test truck. - open well. TIH w/Dump bailer. - Held saftey meeting JSA w/ all contractors on location . Spot in JW wireline . Rig up Lubricator w/ hydro Crane . Rig up weatherford test truck .Pessure test lubricator & bop @250psi low 5000 psi high.Rig down weatherford test truck.

Daily Cost: $0

Cumulative Cost: $121,633

1/11/2013 Day: 5 **Completion**

Rigless on 1/11/2013 - Failed attempt DFIT - Continue TIH w/dump bailer, correlate off TOL @ 8,511?. Continue TIH in hole to 10,214? ?WLM? and set down. Made several attempt to get down w/no results. POOH. - OOH w/WL. SWI. LD tools string and found that dump bailer was full of drilling mud. Made call to Orson and discussed the issue. It was decided to TIH w/WL and re-Perf at 10,464-66?. - Started pumping to Establish injection rate @ 1.5 bpm, 5,299 psi w/6.2 bbl. treated water. Pump 2 bbl., ramp up to 3 bpm, 7,800 psi and kick out pump w/.8 bbl. Total of 9 bbl. pumped. BO pressure to 2,074 psi. Started pumping injection rate @ 1.5 bpm, pressure increased to 7,800 psi w/6.7 bbl. of treated water. Held pressure for 5 min, holding at 7,762 psi. SWI. Made call in to Orson and discussed the issue, was decided to RDMO all vendors. - RDMO JW WL, Crane, Baker Hugh, Weatherford Test Unit & 4-C vacuum truck. Left DFIT monitor on casing - Waiting on order. No Activity - PU lubricator, Pulled tool string inside lubricator, RU on well head. RU Weatherford to pressure test lubricator to 2,000 psi for 5 min. Test OK. Open well. TIH w/2-7/8" x 3' expand gun, 3 SPF, 16gm charge scalloped, CCL 3-1/8? x 2.5?, Wt. bar 3-1/8? X 5?, Wt. bar 2-3/4? x 5? & cable head 1-11/16? x 1?. (Total length 16.5?). Perf 4.5" 13.5# liner @ 10464' to 10466'. POOH w/1 expended gun . RD Lubricator w/ crane. ND shooting flange . NU 7" 10000# cap .

Daily Cost: $0
Cumulative Cost: $139,269

1/12/2013 Day: 6 **Completion**

Rigless on 1/12/2013 - MIRU CTU, Flow control and Frac tanks for clean out - Conduct PJSM, MIRU Cudd CTU. AT 10:30 the PTO on Cudd crane went out. Will replace PTO today and resume in the A.M. Well is still SI and secured. - Conduct PJSM, MIRU hot oiler and heat fluid in Frac tanks for clean out. 07:00 Conduct PJSM, MIRU Pure Energy Flow control equipment.
Daily Cost: $0
Cumulative Cost: $142,874

1/13/2013 Day: 7 **Completion**

Rigless on 1/13/2013 - RU Cudd CTU and test coil stack. RIH for clean out. - Conduct PJSM. RU Cudd 2? CTU, fluid pump and crane. (Note: Make sure all stack components are rated for min. of 10K) - Finished Testing: Opened well with SICP 0 Psi. Started in hole with Wash Nozzle (2.875?OD), .50?, ?? circ sub, 7/8? ball disconnect, motor assembly (2.875 OD) 3.55?, RIH at 45 fpm, ? bpm at 40? in hole, RIH to 6,000?, picked up to check pipe wt, continued in to 8,000? checked pipe wt again 17,500# down, 23,000# up, RIH to liner top with no indication of tagging liner top (8,500?) with coil, RIH to 12,712?, tagged with coil with little weight loss and pressure increase, then back to normal weight and pump pressure, picked up and increased pump rate from ? bpm to 3.2 bpm and washed down with no noticeable weight loss or pressure increase, Washed to 10,905?, Circulating bottom up with 10 bbl sweep, and will pump one more volume and sweep after first sweep hit surface, 10,905? pipe wt 23,100# down, 31,400# up, circ 3 bpm at 4,790 psi, 15 Psi well head, Circulating well two well volumes with 640 bbls, Pumping sweeps wile circulating. - Test well control stack components to 250 psi low and 8,000 psi high per NFX test procedure. PU Weatherford 2.875" OD Dual BPV, 2.88" OD 7/8" Disconnect, 3/4" circ sub ball, 2.88" OD High Velocity Wash Nozzle. Test Dual BPV to 250 psi low and 4500 psi high. Perform shell test to 250 psi low and 8,000 psi high. - PU Weatherford 2.875" OD Slip type coil tubing connector, Pull test to 25,000 lbs. Pressure test coil tubing and coil connector to 250 psi low and 8,000 psi high.
Daily Cost: $0
Cumulative Cost: $150,614

1/14/2013 Day: 8 **Completion**

Rigless on 1/14/2013 - Complete clean out and RDMO CTU. Conduct DFIT. - Conduct PJSM, SI well and secure. Baker RDMO. Well is on DFIT. - Baker pump on location. Conduct PJSM, MIRU. Proceed with DFIT injection test on perfs 10,464?-10,466?: Load hole with 3 bbls treated water (Corrosion inhib and alpha) continue to pump in well at 3 bpm to 7,850 psi. with 10 bbls. SD and let pressure drop to 5,150 psi in 5 min. Resume pumpping at 1.5 bpm and well broke at 7,356 psi. Increase rate to 5.3 bpm and pressure leveled out at 6,569 psi. Pumped additional 8 bbls after pressure lined out. ISIP 5,860 psi, 5 min. 5,147 psi., 10 min. 5,121 psi, 15 min. 5,121 psi. - Conduct PJSM, CUDD CTU, Weatherford and Cudd crane RDMO. Well has been shut in and secured. - CT crane is froze up, thaw out in order to RD. - Out of hole with coil and BHA in lubricator, Blow coil dry with N2, Lay down Weatherford?s Wash Nozzle (2.875?OD), .50?, ?? circ sub, 7/8? ball disconnect, motor assembly (2.875 OD) 3.55?, RDMO Cudd?s 2? coil tubing unit. - Continue to circulate and POH with coil tubing from 10,905? to surface. - Contine to circulate with two well volumes of fluid. - Stand by for Baker DFIT pump to arrive. They are having some issues with deck engine and are making sure it runs before coming out to location.
Daily Cost: $0

Cumulative Cost: $236,661

1/26/2013 Day: 9 **Completion**

Rigless on 1/26/2013 - Prep location for Frac operations filling frac Tanks and sand Kings - ITL continut Filling Water Tanks - Arrive on location, Conduct walk around and safety hazard asessment. Review updated stimulation procedure. 35 frac tanks and 3 flowback tanks on location and spotted. 2 BJ sand kings on location, currently filling frac tanks w/ F/W and sand kings w/ prop for stim ops. Will begin bleaching tanks, 1/28 and heating frac tanks on 1/28 in the am. Baker Frac fleet will mobilize to location to R/U on 1/29 @ noon.
Daily Cost: $0
Cumulative Cost: $318,598

1/27/2013 Day: 10 **Completion**

Rigless on 1/27/2013 - Prep Well for frac - Conduct safety hazard assessment,Sanded location road due to weather , 22 frac tanks full of F/W, 13 tanks empty, 6500 bbls short for frac. Continue hauling F/W , respot accumulator.Plan: ITL continuing to fill frac tanks (13 empty), Begin, heating and bleaching tanks in am and mobilize gate guard and shack to location. (01/28)
Daily Cost: $0
Cumulative Cost: $325,976

1/28/2013 Day: 11 **Completion**

Rigless on 1/28/2013 - Prep well for frac - Prep well for Frac, Gate Guard mobilized to location. Currently heating and bleaching tanks. Total F/W on Location: 16,500 bbls. 300 bbls of brine water. Pure energy, JW wireline, will mobilize to location in the am. BJ Frac will MIRU @ 12:00. All vendors have been notified. - HSM, JSA. Review PPE, trip and falls, heating water. SD operation. No JSA, safety glasses. Wait for High Desert Services to bring JSA form, safety glasses. - High Desert continue heating frac water. - Two Preferred super heater on location. HSM w/ JSA icy location, trip and fall. PPE. One employee didn't have FRC pants. Stayed in truck until FRC was delivered to location by employee.
Daily Cost: $0
Cumulative Cost: $345,428

1/29/2013 Day: 12 **Completion**

Rigless on 1/29/2013 - Prep for Frac - No Activity - RU Baker Hugh 7-1/16" 10K frac head and WL frac cap. Weatherford torque all bolts. MIRU Weatherford test unit. Test frac head and WL frac cap to 8,000 psi for 10 min w/chart. Test OK. BO pressure. RDMO Weatherford test unit. Plan is to start frac stg #1 at 0600 in the a.m. - RU JW WL. PU 2-3/4" perf guns loaded with 3 spf, 15 holes, 120 deg phasing, 16 gram Titan charges. PU tool string and MU lubricator. Pressure test lubricator to 5000 psi for 5 minutes, OK. RIH, Perf stage #1 at 10,370 - 71', 10,350 - 51', 10,325 - 26', 10,306 - 07' & 10,282 - 83'. POOH. SWI. LD guns. All shots fired. RD lubricator. SWI. FB testing complete. NOTE: FB sand king does not have insection tag on valve, lines. - . All vendors have mobilized to location, PJSM- Topics: Hospital/Emerg. Driver, PPE, Buddy System, Pressurized lines, Line of fire, Crane cert. verified with BJ and JW crane truck operator. BJ rigging up trucks on location, MIRU JW Wireline for CCL/JB/GR(3.75?) run. Tool String: 1 11/16 Cablehead 1.00 long/ 3 1/8 OD Weight Bar 6.00 long/ 2 ? OD Weight Bar 5.00 long/ 3 1/8 OD CCL 2.50 long/ 3 1/8 OD J/B 5.88 long/ 3 ? OD G/R .17 long. Total Length: 20.54/Total Weight: 336.00 . Test Lubricator w/ Weatherford test pump to 4,900 psi

hold for 5 minutes(charted). Bleed pressure back to 3900psi to equalize W/H. Open W/H and RIH w/ CCL/GR/JB (3.75). Tie into 10? short joint, @ 8,790?-8,800? correlate w/ previous log. RIH to 10,442?. POOH w/ W/L. OOH w/ W/L SIW, Prepare to R/U perf guns for Stage 1 perfs. - MIRU Pure FMC flowback iron, Move wellhead heaters 75' from wellbore. - Removed DFIT gauges & T, Press before removal 3935 psi. - Continue heating frac water w/High Desert & two Preferred super heater. DFIT pressure 3,922 psi. 05:30 Heat 35 of 35 frac tanks w/100 to 110* - Continue heating frac water w/High Desert & two Preferred super heater. 04:30 DFIT pressure 3,922 psi. 05:30 Heat 34 of 35 frac tanks w/100 to 110*. RDMO Preferred super heater.
Daily Cost: $0
Cumulative Cost: $373,680

1/30/2013 Day: 13 **Completion**

Rigless on 1/30/2013 - Frac stg #1, Plug/Perf stg #2, Frac stg #2, Plug/perf stg #3 - PJSM, Topics Discussed: Pinch Points, PPE, Line of Fire, Pressurized Lines, Slips Trips and Falls, Certified iron. Baker Hughes on location. RU Frac Standpipe on W/H. - Packing out on pump. Did not have tools to change out packing. Currently waiting on packing puller to repair pump. Could not repair pump. SD, wait for replacement pump. ETA 3 to 4 hrs. - (Downtime) pressure test failed 4 check valves leaking on pumps and cap leaking. All check valves are being replaced along w/ cap, Go back into press test, test t/ 9125 psi, Test good, Open well & start pumping stage #1 as follows. Hydraulic Fracture stage 1 as follows: Break down 4.6 bpm @ 6,480 psi. Avg rate: 47 bpm, Avg press: 6,7675 psi, Max rate: 58 bpm, Max press: 7,965 Psi. ISIP: 4,825 PSI, 5 MIN ISDP: 4,870 psi, 10 MIN: 4,825 psi, 15 MIN ISDP: 4,805 psi. Total 20/40 SLC: 150,440 lbs, Total 15% FE acid 630 gal. Avg HHP: 8,860 Total load to recover 2,823 bbls. (Had to work to get rate est. but saw good press relief when acid reached perf's. Shutdown during 1ppg sand stage, leak at WH wireline bleed off needle valve failed. Down approx. 30 mins. Had to drop rate thru flush to keep under max press. - RU WL to RIH. Test to 8500 Psi. OK. RIH to Perforate Stage 2 at; 10,204 - 06', 10,151 - 53', 10,101 - 03', 10,062 - 064' & 10,041 - 43'. guns at 120 degrees, 3 spf, 15 holes. POOH. All shots fired. Hand well over to Baker Hughes frac.(WL- CHD 1 11/16" 1.0'x1.44" O.D. 3#,CCL 3 1/8 Tekco ccl 2.5'x 3.12", 5 shots @ 4.0'x 2.75" 60#16g, 0.34 EH, 21.00 pen, Baker #10 setting tool 5.0'x 2.75" 70#, 4.5" Halliburton 10k Obsidian caged ball flow through, Total length 35.50'x573# 3.62" O.D. - Currently shut down waiting on a new inline densitometer. Current inline not reading correctly. Estimated time of arrival on location 18:00hrs per BJ Frac Supervisor. Will install new densitometer, retest and begin Stage #2 stimulation. - Location Safety Mtg. Prime pumps and test lines to 8,600 psi, OK. Hydraulic Fracture stage #2 as follows: Break down 2.2 bpm @ 4,995 psi. Avg rate: 54 bpm, Avg press: 6,394 psi, Max rate: 62 bpm, Max press 7,232 Psi. FG .973, ISIP: 5,460 PSI, 5 MIN 4,991 psi, 10 MIN: 4,841 psi. 15 MIN: 4,771 psi. Total 20/40 SLC: 155,400 lbs. Total Prop 155,400 Total 15% HCL Acid 15 bbls. Avg HHP: 8,510. Total load to recover 2,878 bbls. - No Activity - Held PJSM. RU WL. Test to 8,000 Psi. OK. RIH. Set HES 10K Obsidian plug at 10,023', Perforate Stage #3 at (9,972 - 74'), (9,939 - 41'), (9,887 - 89'), (9,881 - 82'), (9,850 - 51') & (9,822 - 23'). Final pressure of 4,533 psi. 2 3/4" guns at 120 degrees, 3 spf, 27 holes. POOH. SWI. LD guns. All Guns Fired. Prep To Hydraulic Fracture Stage #3.
Daily Cost: $0
Cumulative Cost: $413,921

1/31/2013 Day: 14 **Completion**

Rigless on 1/31/2013 - Frac stg #3, Plug/perf stg #4, frac stg #4, Plug /perf stg #5, frac stg #5, Set kill plug, RDMO Baker Hugh & JW WL, ND FMC manual frac valves and flow cross. NU Knight 5K 7-1/16" BOP stack. - Held PJSM. MIRU Weatherford crane. RD Pure FB line off flow cross, ND FMC 7-1/16" 10K "Crown" manual frac valve, 7-1/16" 10K flow cross w/dual gate

valves, "Upper" manual frac valves. - 20:45 Currently NU Knight BOP stack consisting of: 10K x 5K 7-1/16? DSA on top of FMC 10K 7-1/16? HCR valve, 5K 7-1/16? blind BOP and double 2-1/16? manual gate valve outlets w/10K 2? blind flange on the other side, 5K 7-1/6? pipe BOP with 2-3/8? rams, 5K 7-1/16? flow cross w/dual, double 2-1/16? manual gate valve outlets, 5K 7-1/16? pipe BOP with 2-3/8? rams & 5K 7-1/16? Annular BOP. Plan is to NU BOP stack, test same, test FB equipment, all valves on choke manifold. - Continue RDMO Baker Hugh frac equipment. - Held PJSM. RU WL. Test to 8,000 Psi. OK. RIH. Set HES 10K Obsidian Kill plug #1 (CBP) at 9,000'. Bled down well slowly while POOH w/WL to 0 psi. SWI. LD wt bars & setting tool. Held 30 min negative test. Test good. RDMO JW WL & crane. RDMO Baker Hugh frac equipment. - Held PJSM. Prime pumps and test lines to 9,220 psi, OK. Hydraulic Fracture stage #5 as follows: Break down 2.8 bpm @ 6,368 psi. Avg rate: 54 bpm, Avg press: 6,394 psi, Max rate: 62 bpm, Max press 7,232 Psi. FG .973, ISIP: 5,460 PSI, 5 MIN 4,991 psi, 10 MIN: 4,841 psi. 15 MIN: 4,771 psi. Total 20/40 SLC: 155,400 lbs. Total Prop 155,400 Total 15% HCL Acid 15 bbls. Avg HHP: 8,510. Total load to recover 2,878 bbls. - Held PJSM. RU WL. Test to 8,000 Psi. OK. RIH. Set HES 10K Obsidian plug at 9,161', Perforate Stage #5 at (9,098 - 01'), (9,071 - 73'), (9,065 - 67'). Final pressure of 4,533 psi. 2 3/4" guns at 120 degrees, 3 spf, 21 holes. POOH. SWI. LD guns. All Guns Fired. Prep To Hydraulic Fracture Stage #5. - Held PJSM. Prime pumps and test lines to 9,220 psi, OK. Hydraulic Fracture stage #4 as follows: Break down 2.8 bpm @ 6,368 psi. Avg rate: 54 bpm, Avg press: 6,394 psi, Max rate: 62 bpm, Max press 7,232 Psi. FG .973, ISIP: 5,460 PSI, 5 MIN 4,991 psi, 10 MIN: 4,841 psi. 15 MIN: 4,771 psi. Total 20/40 SLC: 155,400 lbs. Total Prop 155,400 Total 15% HCL Acid 15 bbls. Avg HHP: 8,510. Total load to recover 2,878 bbls. - Held PJSM. RU WL. Test to 8,000 Psi. OK. RIH. Set HES 10K Obsidian plug at 9,808', Perforate Stage #4 at (9,792 - 94'), (9,756 - 58'), (9,734 - 36'), (9,708 - 10') & (9,648 - 50'). Final pressure of 4,533 psi. 2 3/4" guns at 120 degrees, 3 spf, 30 holes. POOH. SWI. LD guns. All Guns Fired. Prep To Hydraulic Fracture Stage #4. - Held PJSM. Prime pumps and test lines to 9,220 psi, OK. Hydraulic Fracture stage #3 as follows: Break down 2.8 bpm @ 6,368 psi. Avg rate: 58 bpm, Avg press: 6,070 psi, Max rate: 62 bpm, Max press 7,291 Psi. FG .922, ISIP: 4,838 PSI, 5 MIN 4,480 psi, 10 MIN: 4,413 psi. 15 MIN: 4,380 psi. Total 20/40 SLC: 149,840 lbs. Total Prop 155,400 Total 15% HCL Acid 14 bbls. Avg HHP: 8,614. Total load to recover 2,956 bbls. - MIRU Weatherford test unit. Dead Head the testing unit to 5,000 psi for 5 minutes. Test OK. BO pressure. Pressure test bottom pipe Hydraulic Chamber close to 1,500 psi, for 5 min. Test OK. BO pressure. Pressure test bottom pipe Hydraulic Chamber open to 1,500 psi, for 5 min. Test OK. BO pressure. - Could not repair pump w/packing out. Waiting on a replacement pump. 02:45 Replacement pump on location. Currently spotting and rigging in pump. Plan is to rig in pump and PT & frac stg #3

Daily Cost: $0

Cumulative Cost: $514,992

2/1/2013 Day: 15 **Completion**

Rigless on 2/1/2013 - Pressure testing BOP stack, FB equipoment. MIRU Mountain States Completion rig. Unload tbng and talley. Rih tag kill pug. Fix pwr swivel. Finish rigging up Swivel. - Continue testing. Pressure test blind Hydraulic Chamber close to 1,500 psi, for 5 min. Test OK. BO pressure. Pressure test blind Hydraulic Chamber open to 1,500 psi, for 5 min. Test OK. BO pressure. Pressure test top pipe Hydraulic Chamber close to 1,500 psi, for 5 min. Test OK. BO pressure. Pressure test top pipe Hydraulic Chamber open to 1,500 psi, for 5 min. Test OK. BO pressure. Close the locking system engaged and the operating pressures on the blind ram vented to zero to 250 psi for low, for 5 min. Test OK. BO pressure. Close the locking system engaged and the operating pressures on the blind ram vented to zero to 5,000 psi for high, for 10 min. Test OK. BO pressure. Close the locking system engaged and the operating pressures on the bottom 2-3/8" pipe ram vented to zero to 250 psi for low, for 5 min. Test OK. BO pressure. Close the locking system engaged and the operating pressures on the bottom 2-3/8" pipe ram vented to zero to 5,000 psi for high, for 10 min. Test OK. BO pressure. - Close the locking system engaged and the operating pressures on the top 2-3/8"

pipe ram vented to zero to 250 psi for low, for 5 min. Test OK. BO pressure. Close the locking system engaged and the operating pressures on the top 2-3/8" pipe ram vented to zero to 5,000 psi for high, for 10 min. Test OK. BO pressure. Pressure test Annular BOP to 250 psi for low, for 5 min. Test OK. BO pressure. Test same to 3,500 psi (70%) for high, for 10 min. Test OK. BO pressure. Shell test to 250 psi w/the outside valve closed and the inside valve open for low, for 5 min. Test OK. BO pressure. Test same to 5,000 psi for high, for 10 min. Test OK. BO pressure. Open outside valves, closed inside valves. Pressure test to 250 for low, for 5 min. Test OK. BO pressure. Test same to 5,000 psi for high, for 10 min. Test OK. BO pressure. - PJSM, Pressure test Pure Energy flowback iron to 9000psi and hold for 10 min. MIRU Mountain States Workover Rig. 169 jnts of 2 3/8 L-80 delivered to location from C-tap. 195 jnts of 2 3/8 L-80 delivered to location from Runners. QT Casing Inspection on location, cleaned and drifted all pipe. Upon completion of pipe inspection 4 bad jnts(pins) found.Total Jnts:(360), Tally all pipe, M/U 3 ?? .35? concave hurricane mill & 2 3/8? EUEx 2 3/8? reg X-over, DFY-POBS w/ double flapper check valve, 1 jt 2 3/8? tbg 31.19?, XN nipple 1.14?x 2 3/8?. TIH w/th L-80 - Continue rih w/ 2-3/8" L-80 tbng. 169 jts of 2-3/8" tbng in well. EOT-5230.58. - Break circulation took 7.2 bbls of fluid to fill tbng. Load pipe racks with tbng and talley. - Continue rih w/ 2-3/8" L-80 tbng. Tagged top of liner on Jt# 276 at 8519 tbng measurement. Worked chomp bit through slowly. Continue tripping in well w/ 2-3/8" tbng. 289 jts of 2-3/8" tbng in well. EOT-8931.37 - Load pipe racks with tbng. Prepare to to pick up 3 jts to tag kill plug.Tagged plug on jt 292. 1'stick up. Tbng measurement depth-9022.67 - Rig up Basic power swivel. Dead battery on swivel.Got swivel started. Finish rigging up swivel. - PJSM Change crews. ,EOT-3809.(123 jts of 2-3/8" L-80 tbng) Break circulation took 15 bbls of fluid to fill tbng.
Daily Cost: $0
Cumulative Cost: $571,624

2/2/2013 Day: 16 **Completion**

WWS #3 on 2/2/2013 - DO plugs, Circuate well clean, LD tbg, land tbg hanger w/TWCV, ND KOT BOP stack, FMC HCR valve, NU Cameron 10K Production Tree, test same, RD Mt States WOR, Pump off bit sub, Released all vendor equipment. Police Location. - 0220 Thru frac plug #4 0155 Tag frac plug #4 EOT 9,161 W/297 jts. 3 bpm in/3.25 bpm out. Csg 3100 psi. Tbg 4200 Psi. Drilling torque 1700, 120 RPM. FS 1,100 RPM. PU WT 40K, SO WT 36K, NURT WT. 38K. 77 bbl to mill plug. WOB 3-4K. 25 min to drill plug. 23/64? Choke. PU 21 jts. RIH with tbg to tag frac plug #3 at 9808' W/jt #318 - 0110 Thru Kill plug #1 0100 Tag kill plug #1 EOT 9,022' W/292 jts. 3 bpm in -3-1/4 bpm out. Csg 3,000 psi. Tbg 4200 Psi. Drilling torque 120 RPM. FS 1,100 RPM. PU WT 40K, SO WT 34K, NURT WT. 36K. 98 bbl to mill plug. WOB 3-4K. 10 min to drill plug. 23/64? Choke. PU 5 jts. RIH with tbg to tag frac plug #4. EOT- 9161' w/jt #297 - 0450 Thru frac plug #2 0435 Tag frac plug #2 EOT 10,023' W/325 jts. 3 bpm in/3.25 bpm out. Csg 3750 psi. Tbg 4800 Psi. Drilling torque 1800, 120 RPM. FS 1,100 RPM. PU WT 42K, SO WT 34K, NURT WT. 38K. 75 bbl to mill plug. WOB 3-4K. 15 min to drill plug. 11/64? Choke. PU 7 jts. RIH with tbg to tag frac plug #1 at 10,244 W/jt #332. tagged sand at 10,000'. Washed down to top of plug at 10,023. Getting light sand, oil and parafin back in returns. - 0530 Thru frac plug #1 0520 Tag frac plug #1 EOT 10,244 W/333 jts 1'ft in. 3 bpm in/3 bpm out. Csg 3700 psi. Tbg 4800 Psi. Drilling torque 1800, 120 RPM. FS 1,000 RPM. PU WT 44K, SO WT 36K, NURT WT. 40K. 75 bbl to mill plug. WOB 3-4K. 35 min to drill plug. 16/64? Choke. PU 23 jts. Wash down with tbg to tag PBTD at 10,900' W/jt #352. - P/U 15? and circulate 2 annular volumes (606 bbls) along w/th (2) 15 bbl sweeps @ 3.0 bpm in/3.2 bpm out. Csg 2750 psi, Tbg 4650 psi, Tq 1800, 120 RPM. - L/D 55jnts of L-80.(9030?), Land tubing hangar, Test hanger using void to 9K. ND 7-1/16" HCR and BOP stack. NU Cameron production tree and test same to 250 psi low /9500 psi high. Pull dual BPV. R/D Mountain States Workover Rig. Consult w/ office and obtain authorization to pump off bit sub in morning. Once bit is pumped off, mobilize Rig to Snake Pete 10-23-3-3W for C/O operations - - Crew change. HSM, JSA. PPE, FRC requirement, smoking, Trip and fall, RD WOR in the dark. - Finish NU Cameron 10K Production Tree. Test void to 10K for 10 min. Test OK. BO pressure.

- MIRU Weatherford test unit. Did a dead head test against test unit for 5 min. Test OK. BO pressure. Shell test Production Tree to 250 psi for low, for 5 min w/chart. Test OK. BO pressure. Test same to 10,000 psi for high, for 10 min w/chart. Test OK. BO pressure. RDMO Weatherford test unit. Cameron retrieved TWCV for tbg hanger. Drop ball down tbg. RDMO Cameron. Currently RD Mt States WOR. Western on location to load Knight BOP stack and return to KOT yard, load FMC HCR valve and accumulator and return to FMC yard. - RD Mt States WOR. Western on location to load Knight BOP stack and return to KOT yard, load FMC HCR valve and accumulator and return to FMC yard. Hammer on location to load 68 good jts, 4 bad jts (2,087') 2-3/8", 4.7#, EUE L-80 tbg, return to Runners yard. - RU Weatherford pump line o top of Production tree. Pressure test pump lines to 8,000 psi. Test OK. BO pressure. Open well. Started pumping down tbg at 1.2 bpm, pressure increased to 4,800 psi, released bit sub w/1.2 Bbls of 70* FW. Increased rate to 3.7 bpm, 5,100 psi. Pumped 70 bbls of 70* FW. ISIP 3,300 psi. 5 min 3,300 psi. 10 min 3,250 psi. 15 min psi. RD Weatherford pump. Istall night cap on Production Tree. SWI. Place trap over well head w/force heat. - Police location. Move Basic power swivel, Hydraulic catwalk over to Snake Pete. Released Man lift, light plants, Trash trailer will move off location in the a.m.. Move 2 set of Hammer Pipe rack over to Snake Pete location. Released Gate Guard at 23:45. Weatherford will move pump over to the Snake Pete w/Mt States WOR & equipment. Pure RD FB equipment, Will move FB equipment off location in the a.m.. There is approx. 400 bbls of FW left on location. - 0355 Thru frac plug #3 0335 Tag frac plug #3 EOT 9,808' W/318 jts. 3 bpm in/3.25 bpm out. Csg 3200 psi. Tbg 4200 Psi. Drilling torque 1800, 120 RPM. FS 1,100 RPM. PU WT 42K, SO WT 34K, NURT WT. 38K. 76 bbl to mill plug. WOB 3-4K. 20 min to drill plug. 20/64" Choke. PU 7 jts. RIH with tbg to tag frac plug #2 at 10,023 W/jt #325
Daily Cost: $0
Cumulative Cost: $687,488

2/3/2013 Day: 17 **Completion**

WWS #3 on 2/3/2013 - MO Mt States WOR, equipment, Weatherford 10K pump, Released all vendor equipment, Police location. Turn location over to Production 2/3/13 0700 hrs - No activity,Pure energy loading out FB equip, 4c Hauling 380 bbls fresh water to the SNAKE PETE 10-23-3-3W, Energy operators onsite plumbing well in to treater, Preferred hot oil coordinating with energy operators on cleaning oil out of FB tanks. Outback set to release equip in the a.m. - No Activity, Still hauling off FB water out of FB tamks.
Daily Cost: $0
Cumulative Cost: $697,841

3/3/2013 Day: 21 **Completion**

Rigless on 3/3/2013 - Enter costs in DCR - Enter costs in DCR
Daily Cost: $0
Cumulative Cost: $1,308,153

2/15/2013 Day: 1 **Formation Testing**

Rigless on 2/15/2013 - Run production logs w/ Halliburton Wireline. - Run production log to 10,580'. - Spot & RU Halliburton WL. Cut wax on 2/14 & tag fill @ 10,708'. - RD & MO wlreline.
Daily Cost: $0
Cumulative Cost: $16,528

2/28/2013 Day: 2 **Formation Testing**

Rigless on 2/28/2013 - Run Production Logs - PJSM with HES wireline services. Make up lubricator and tools, test. Equalize well over and begin rih. Ran in well to 270'. Pull back up. Work tools through wax. Continue. RIH. On depth. Begin production log. DN30. Speed-30 Direction-Down. Temp-210. Pressure-3473. Spinner-3.46. Time 0942. Tension-1180. Up-30. Speed-30. Direction-up. Temp-231. Pressure-4046. Spinner-2.41. Time-1035. Tension-1614. DN60. Direction-down. Temp-210. Pressure-3466. Spinner-5.62. Time-1126. Tension-1179. Up60. Speed-60up. Temp-232. Pressure-4036. Spinner--5.65. Time-1152. Tension-1579. Dn90. Speed-90 down. Temp-210. Pressure-3462. Spinner-8.14. Time-1219. Tension-1175. Up90. Speed-90up. Temp-231. Pressure-4024. Spinner--8.24. Time-1237. Tension-1609. Dn120. Direction-down120. Temp-211. Pressure-3463. Spinner-10.29. Time-1254. Tension-1169. Up120. Direction-120up. Temp-231. Pressure-4018. Spinner- -10.15. Time-1308. Tension-1628. Stage1. Depth-10260. Temp-222. Pressure-3897. Spinner-1.04. Density-.96. GHT rate-18616. Time-1329. Tension-1416. Stage 2. Depth-10020. Temp-220. Pressure-3801. Spinner-.71. Density-.86. GHT rate-18191. Time-1337. Tension-1391. - Stage 3. Depth-9690. Temp-217. Pressure-3681. Spinner-.88. Density-.76. GHT rate-17731. Time-1345. Tension-1308. Stage 4. Depth-9630. Temp-216. Pressure-3660. Spinner-.96. Density-.80. GHT rate-17838. Time-1350. Tension-1284. Stage 5. Depth-9050. Temp-211. Pressure-3466. Spinner-1.11. Density-.78. GHT rate-17828. Time-1359. Tension-1221. Finished log. Pooh with wireline. Rig down logging truck and crane. Release HES.
Daily Cost: $0
Cumulative Cost: $34,030

3/8/2013 Day: 3 **Formation Testing**

Rigless on 3/8/2013 - Run production logs w/ Halliburton Wireline. - Cut wax w/ SL. Hold safety meeting. Review JSA. MIRU HES WL truck & crane. Rig up & function test Lubricator. - 08:45 - RIH w/ PL tools to 9000?. Log from 9050? to 10,580?. DN 30' - Temp 210 Pressure @ 3572 PSI, RPS @ 3.4. Up 30' - Temp @ 232, Pressure @4253 PSI, RPS -2.68. Stage# 2 - DN 60' - Temp 209, Pressure @ 3681 PSI, RPS 5.34. Up 60' ? Temp 231, Pressure @ 4292 PSI, RPS -5.12. Stage #3 DN 90' - Temp 210, Pressure @ 3706 PSI, RPS 8.54. UP 90' - Temp 231, Pressure @ 4306 PSI, RPS -8.62. Stage #4 DN 120' - Temp 210, Pressure @ 3726 PSI, RPS 11.08. UP 120' - Temp 231, Pressure @ 4322 PSI, RPS 10.46. - 14:00 - Started Station Logs: Stage #1 10,260' Temp 223, Pressure @ 4208, RPS 0.00, Density 0.93, GHT rate 18,483. Stage #2 10,020' Temp 221, Pressure @ 4111, RPS 0.00, Density 0.93, GHT rate 18,145. Stage #3 9,690' Temp 217, Pressure @ 3983, RPS 0.42, Density 0.88, GHT rate 17,996. Stage #4 9,630' Temp 216, Pressure @ 3962, RPS 1.31, Density 0.87, GHT rate 17,857. Stage #5 9,050' Temp 210, Pressure @ 3748, RPS 1.27, Density 0.91, GHT rate 17,988. - POOH w/PL tools. - 15:15 ? Shut in crown valve. RD tool. LD Lubricator. RD crane. 16:30 ? All equipment & personnel off location. Return well to production.
Daily Cost: $0
Cumulative Cost: $51,501

4/16/2013 Day: 4 **Pariffin Problems**

Rigless on 4/16/2013 - Cut wax. RIH & tag fill @ 10,888?. Total fill: 12 feet. - 11:30 ? MIRU R&B Slickline. 11:45 ? JSA & safety meeting. 12:00 ? Cut wax. 13:45 ? RIH & tag fill @ 10,888?. Total fill: 12 feet. POOH w/ SL. 15:00 ? RD & release SL truck.
Daily Cost: $0
Cumulative Cost: $54,220

4/17/2013 Day: 5 **Downhole Pump Setup,Removal**

Nabors #1420 on 4/17/2013 - NDWH. NUBOP & test. Unseat tubing. LD hanger. POOH w/ 60 jt tubing. - 11:00 ? H/O pump 70 bbls of produced water heated to 250 degrees down tubing. Followed by 70 bbls of brine water heated to 150 degrees. 14:30 - Install TWC valve. NDWH. 15:00 ? NUBOP stack. Hydro test BOP to 250 psi low & 5000 psi high on gate valves, blind rams & pipe rams. Test annular BOP to 2500 psi. - 06:30 ? JSA & safety meeting. 07:00 ? SITP ? 183 psi. SICP ? 134 psi. Spot TEE seals. Spot & RU Nabors rig #1420. H/O broke down from 07:00 to 11:00. Pressure test hydraulics on BOP. - 17:00 ? Remove TWC valve. Unseat tubing hanger & remove. POOH w/ 60 jts 2 3/8? L80 EUE tubing. 18:15 ? Install & close TIW valve. Close & lock pipe rams. Secure well, rig & location. SDFN. 18:30 ? All personnel off location.
Daily Cost: $0
Cumulative Cost: $66,494

4/18/2013 Day: 6 **Downhole Pump Setup,Removal**

Nabors #1420 on 4/18/2013 - POOH w/ tubing. Stop w/ 56 jts left in well. Kill well w/ brine water. Well continue to flow. RIH w/ 17 stds tubing. Secure well. SDFN. - 18:45 ? TIH w/ 17stds. EOT @ 2777?. 19:15 ? Install & close TIW valve. Close & lock pipe rams. Flow well back on 16 choke. Secure well, rig & location. SDFN. - 12:15 ? 28 stds tubing in well. RU hot oiler. Pump 60 bbls 10# brine water heated to 150 degrees down casing. 13:15 ? Bleed down tubing & casing. Well continues to flow. 13:45 - SI well. RU & pump 10 bbls 10# brine water heated to 150 degrees down casing. 14:00 ? Well continues to flow. SI tubing. RU to casing. Pump 65 bbls 10# brine water heated to 150 degrees down casing. Pressure @ 400 spi. 16:00 ? SD pump. Bleed down casing. Well continues to flow. 16:30 ? Pump 40 bbls 10# brine water heated to 150 degrees down casing. 17:00 - Bleed down tubing & casing. Tubing on vac. Casing continues to flow. - 06:30 ? JSA & safety meeting. 07:00 ? SITP ? 670 psi. SICP ? 190 psi. Pump 60 bbls down tubing heated to 150 degrees. Tubing on vac. Install Washington rubber. 09:00 ? Bleed down casing. Well flowing @ 15 psi. POOH 180 jts of tubing.
Daily Cost: $0
Cumulative Cost: $81,807

4/19/2013 Day: 7 **Downhole Pump Setup,Removal**

Nabors #1420 on 4/19/2013 - SITP ? 240 psi. SICP ? 125 psi. Kill tubing w/ brine water. RIH to 7500'. Pump 300 bbls brine water to kill well. - 17:00 ? OOH. LD pup jt & POBS. RIH w/ Purge valve, 1 jt ? 2 3/8? L80 EUE tubing, desander, 1 ea ? 4? X 2 3/8? L80 EUE tubing pup, 1 jt - 2 3/8? L80 EUE tubing, 4.5? TAC, 54 jts - 2 3/8? L80 EUE tubing. Tubing started to flow. Install TIW valve. 18:00 ? Put on Washington rubber. Pump 10 bbls of brine water heated to 125 degrees down tubing. - 13:45 ? SD pump. Switch lines to pump down tubing. Pump 50 bbls of brine water heated to 30 degrees down tubing. 14:30 ? SD pump. Tubing on vac. POOH w/ tubing. - 06:30 ? JSA & safety meeting. 07:00 ? SITP ? 700 psi. SICP ? 130 psi. Pump 60 bbls down tubing heated to 150 . 08:30 ? RIH w/ 216 jts tubing. - 18:45 ? RIH w/ 106 jts tubing. EOT @ 5015?. 19:45 - Install & close TIW valve. Close & lock pipe valves. Secure well, rig & location. SDFN. 20:00 ? All personnel off location.
Daily Cost: $0
Cumulative Cost: $94,883

4/20/2013 Day: 8 **Downhole Pump Setup,Removal**

Nabors #1420 on 4/20/2013 - RIH w/ 184 jts 2 3/8? L80 EUE tubing. Set tubing anchor @ 10,498? w/ 20,000 lbs pull. EOT @ 10,587?. PU rod pump & rods. SDFN. - 06:30 ? JSA & safety meeting. 07: 00 ? SITP ? 200 psi. SICP ? 435 psi. Pump 60 bbls brine water heated to 150 degrees down tubing. - 08:00 ? RIH w/ 184 jts 2 3/8? L80 EUE tubing. 09:30 ? Well

started to flow. Pump 10 bbls brine water heated to 150 degrees down tubing. 10:00 - PU & RIH w/ 48 jts 2 3/8? L80 EUE tubing. 11:00 ? Set tubing anchor @ 10,498? w/ 20,000 lbs pull. EOT @ 10,587?, Seating nipple @ 10,530?, PBTD @ 10,888?. 300? of rathole. - 11:30 ? RD power tongs, slips & rig floor. NDBOP stack. 12:30 ? Remove 6? tubing sub. Reland tubing. Run in & lock down tubing hanger lock down pins. 13:00 ? NUWH. 13:30 ? Flush tubing w/ 50 bbls produced water heated to 250 degrees & 50 bbls brine water heated to 150 degrees. Change over handling tools from tubing to rods. - 15:15 ? PU & prime rod pump w/ diesel. RIH w/ 2? X 1 ?? X 39? RHBC pump, left hand ON/OFF tool 14 ea ? 7/8? slick rods, 26 ea ? 7/8? 4 per rods & 118 ea ? ?? 4 per rods. 19:45 ? Install polish rod. Secure well, rig & location. SDFN. 20:00 - All personnel off location.
Daily Cost: $0
Cumulative Cost: $114,374

4/21/2013 Day: 9 **Downhole Pump Setup,Removal**

Nabors #1420 on 4/21/2013 - Run rods. RDMOSU. - 06:30 ? JSA & safety meeting. 07: 00 ? SITP ? 200 psi. SICP ? 425 psi. B/O pressure. - 08:00 ? LD polish rod. PU & RIH w/ 120ea ? ?? 4 per rods, 139 ea ? 7/8? 4 per rods, 1 ea ? 8?, 6?, 4?, & 2? pony rood, & 1 ea ? 1 ?? 40? polish rod. Hang off rods. 14:00 ? Load tubing w/ 4 bbls produced water. Stroke test pump to 800 psi. B/O pressure. - 14:30 ? RDMOSU. 15:30 ? Move ROTO flex into position. 16:00 - Job complete. Rig released. Return well to production. **Finalized**
Daily Cost: $0
Cumulative Cost: $344,049

Pertinent Files: Go to File List