District I
1625 N. French Dr., Hobbs, NM 88240
District II
1301 W. Grand Avenue, Artesia, NM 88210
District III
1000 Rio Brazos Road, Aztec, NM 87410
District IV
1220 S. St. Francis Dr., Santa Fe, NM 87505

State of New Mexico
Energy Minerals and Natural Resources

Oil Conservation Division
1220 South St. Francis Dr.
Santa Fe, NM 87505

Form C-101
May 27, 2004

Submit to appropriate District Office

OCT 11 2007

OCD-ARTESIA

☐ AMENDED REPORT

APPLICATION FOR PERMIT TO DRILL, RE-ENTER, DEEPEN, PLUGBACK, OR ADD A ZONE

[1] Operator Name and Address	[2] OGRID Number
OGX Resources, LLC POB 2064 Midland, TX 79702	217955
	[3] API Number 30 - 015 - 35868

[5] Property Code	[5] Property Name	[6] Well No.
31938	State GQ Com	002

[9] Proposed Pool 1	[10] Proposed Pool 2
Salt Draw; Morrow, West (Gas)	

[7] Surface Location

UL or lot no	Section	Township	Range	Lot Idn	Feet from the	North/South line	Feet from the	East/West line	County
P	7	25S	28E	P	660	South	660	East	Eddy

[8] Proposed Bottom Hole Location If Different From Surface

UL or lot no.	Section	Township	Range	Lot Idn	Feet from the	North/South line	Feet from the	East/West line	County

Additional Well Information

[11] Work Type Code	[12] Well Type Code	[13] Cable/Rotary	[14] Lease Type Code	[15] Ground Level Elevation
N	Gas		State	3052'
[16] Multiple	[17] Proposed Depth	[18] Formation	[19] Contractor	[20] Spud Date
N/A	13,000'	Morrow		11/15/2007

Depth to Groundwater 113'	Distance from nearest fresh water well >5280'	Distance from nearest surface water >5280'

Pit: Liner: Synthetic ☒ 12 mils thick Clay ☐ Pit Volume: 28,000 bbls Drilling Method:

Closed-Loop System ☐ Fresh Water ☒ Brine ☐ Diesel/Oil-based ☐ Gas/Air ☐

[21] Proposed Casing and Cement Program

Hole Size	Casing Size	Casing weight/foot	Setting Depth	Sacks of Cement	Estimated TOC
17 ½"	13 3/8"	54.5	520	700	0
12 ¼"	9 5/8"	36	2460	860	0
8 3/4"	7	26	9500	1050	0
6 1/8"	4 1/2"	11.6	13000	875	9200
	4 ½"	11.6	11000	875	0

[22] Describe the proposed program. If this application is to DEEPEN or PLUG BACK, give the data on the present productive zone and proposed new productive zone. Describe the blowout prevention program, if any. Use additional sheets if necessary.

13 3/8" casing J-55, 54.5 ppf, set depth is 520', mud wt. 8.6-8 8, vis. 36-38, pH 9.0-10.0, FL-N/C, 1st Lead slurry: 200 sx Premium Plus + 94 lbs/sk Premium cmt. + 1% CaCl + 10 lbs/sk Gilsonite + 0.25 lbs/sk Poly-E-Flake, 2nd Lead slurry: 300 sx Lt. Premium Plus cmt = 1% CaCl + 0.25% lbs/sk Poly-E-Flake, Tail slurry: 200 sx Premium Plus cmt. = 94 lbs/sk Premium Plus cmt. + 1% CaCl. 9 5/8" casing, J-55 36 ppf, set depth is 2460', mud wt. 10.0-10.1, vis 29-30, FL-N/C, Lead slurry: 660 sx 50/50 POZ Premium Plus cmt. + 10% Bentonite + 5% Salt + 5 lbs/sk Gilsonite + 0.25 lbs/sk D-AIR 3000, Tail slurry: 200 sx Premium Plus cmt = 94 lbs/sk Premium Plus cmt. + 1% CaCl. 7" casing P-110 26 ppf, set depth 9500', mud wt. 8.4-10.0, vis. 28-29, pH 9.0-10.0,FL-N/C, Lead slurry: 850 sx 50/50 POZ Premium cmt. + 10% Bentonite + 0.3% Halad-9, + 5% Salt + 0.125 lbs/sk Poly-E-Flake, Tail slurry: 200 sx Premium cmt. = 94 lbs/sk Premium cmt. + 0.5% Halad-9. 4 ½" casing, P-110, 11.6 ppf, set depth is 13,000', from 9500' – 11,000' mud wt. will be 10.0-13.5, vis. 38-45, pH 9-10, FL-N/C, from 11,000'-13,000' mud wt will be 10-13.5, vis. 38-45, pH 9-10, FL-10-6cc. Liner will be set @ 9200' and cemented w/ 875 sx Premium cmt. = 94 lbs/sk Premium cmt. + 1% LAP-1 + 03% CFR-3 + 0.25 lbs/sk D-AIR 3000.

[23] I hereby certify that the information given above is true and complete to the best of my knowledge and belief. **I further certify that the drilling pit will be constructed according to NMOCD guidelines ☒, a general permit ☐, or an (attached) alternative OCD-approved plan ☐.**

Signature: Angela Lightner

Printed name: Angela Lightner

Title: Consultant

E-mail Address: angela@rkford.com

Date: 10-11-2007 Phone: 432-682-0440

OIL CONSERVATION DIVISION

Approved by: BRYAN G. ARRANT

Title: DISTRICT II GEOLOGIST

Approval Date: OCT 12 2007 Expiration Date: OCT 12 2008

Conditions of Approval Attached ☐

DISTRICT I
1625 N. French Dr., Hobbs, NM 88240

DISTRICT II
1301 W. Grand Avenue, Artesia, NM 88210

DISTRICT III
1000 Rio Brazos Rd., Aztec, NM 87410

DISTRICT IV
1220 S. St. Francis Dr., Santa Fe, NM 87505

State of New Mexico
Energy, Minerals and Natural Resources Department

OIL CONSERVATION DIVISION
1220 South St. Francis Dr.
Santa Fe, New Mexico 87505

Form C-102
Revised October 12, 2005

Submit to Appropriate District Office
State Lease - 4 Copies
Fee Lease - 3 Copies

☐ AMENDED REPORT

WELL LOCATION AND ACREAGE DEDICATION PLAT

API Number	Pool Code	Pool Name
	96819	Salt Draw Morrow West (Gas)

Property Code	Property Name	Well Number
31938	STATE GQ COM	2

OGRID No.	Operator Name	Elevation
217955	OGX RESOURCES, L.L.C.	3052'

Surface Location

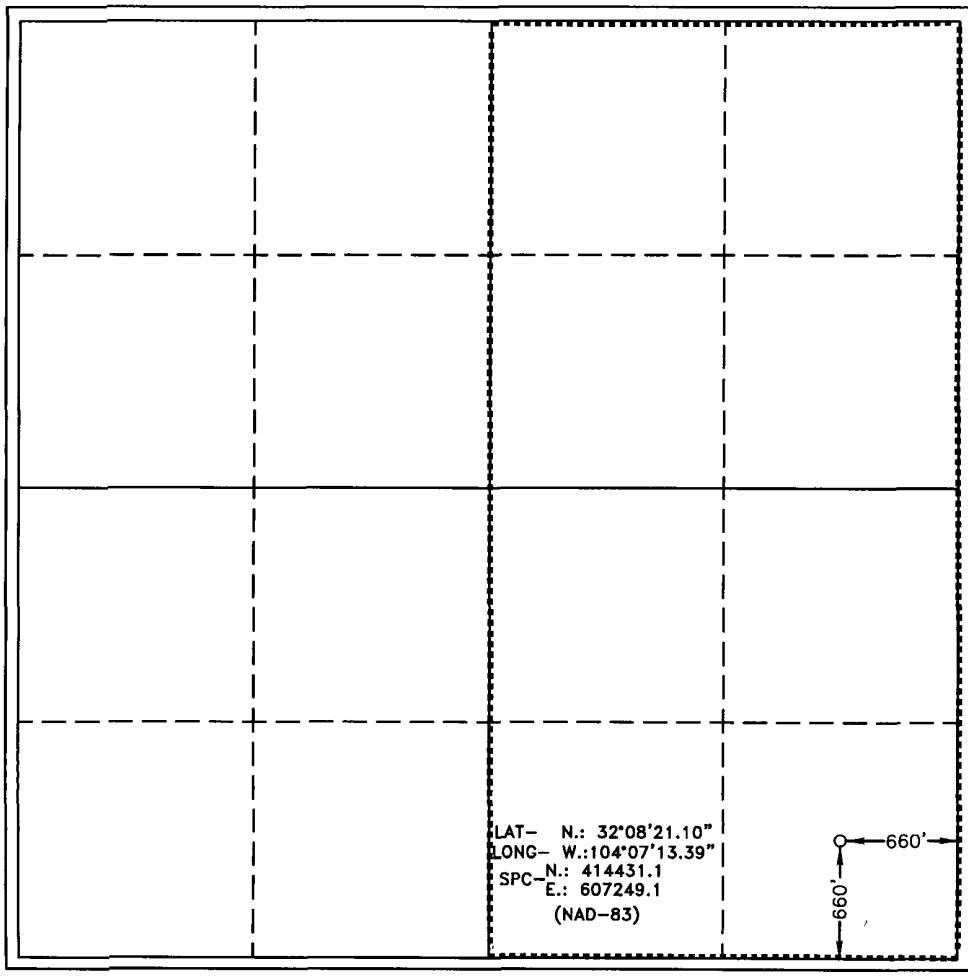
UL or lot No.	Section	Township	Range	Lot Idn	Feet from the	North/South line	Feet from the	East/West line	County
P	7	25 S	28 E		660	SOUTH	660	EAST	EDDY

Bottom Hole Location If Different From Surface

UL or lot No.	Section	Township	Range	Lot Idn	Feet from the	North/South line	Feet from the	East/West line	County

Dedicated Acres	Joint or Infill	Consolidation Code	Order No.
320			

NO ALLOWABLE WILL BE ASSIGNED TO THIS COMPLETION UNTIL ALL INTERESTS HAVE BEEN CONSOLIDATED OR A NON-STANDARD UNIT HAS BEEN APPROVED BY THE DIVISION



OPERATOR CERTIFICATION

I hereby certify that the information contained herein is true and complete to the best of my knowledge and belief, and that this organization either owns a working interest or unleased mineral interest in the land including the proposed bottom hole location pursuant to a contract with an owner of such a mineral or working interest, or to a voluntary pooling agreement or a compulsory pooling order heretofore entered by the division.

Angela Lightner 9-7-07
Signature Date

Angela Lightner
Printed Name

SURVEYOR CERTIFICATION

I hereby certify that the well location shown on this plat was plotted from field notes of actual surveys made by me or under my supervison, and that the same is true and correct to the best of my belief.

AUGUST 30, 2007
Date Surveyed

Signature & Seal of Professional Surveyor

W.O.

Certificate No. Gary L. Jones 7977

BASIN SURVEYS

R. K. FORD & ASSOCIATES
Engineering, Drilling & Completion

415 West Wall
Suite 1700 • Wilco Building
Midland, Texas 79701

(432) 682-0440
Fax (432) 682-0441
e-mail: randell@rkford.com

September 11, 2007

Oil Conservation Division
1301 W. Grand Avenue
Artesia, NM 88210

Subject: State GQ Com #2

You will find enclosed 3 copies of the APD for said well. The State GQ Com #1 and the State GQ Com #2 are in the same quarter quarter. Behind the C-101, I have included a copy of the sundry notice where the State GQ #1 has been plugged back to the Salt Draw Bone Springs formation.

Please submit this APD for OGX Resources, LLC. If you need further information, regarding this well, please email or call me.

Thank you,

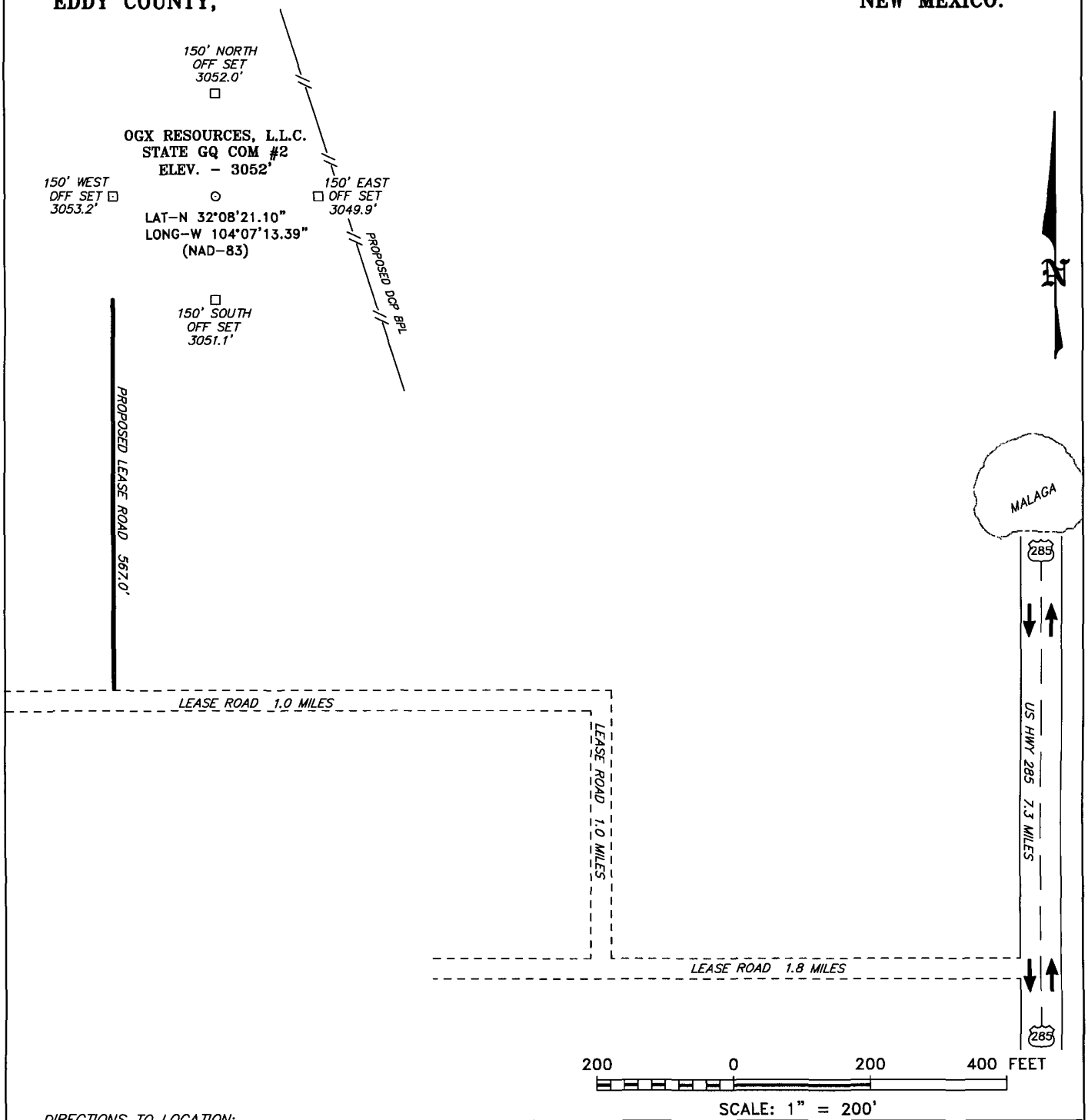
Angela Lightner

Angela Lightner

Enclosures/al

SECTION 7, TOWNSHIP 25 SOUTH, RANGE 28 EAST, N.M.P.M.,

EDDY COUNTY, **NEW MEXICO.**



DIRECTIONS TO LOCATION:

FROM MALAGA, GO SOUTH 7.3 MILES ON US HWY 285 TO LEASE ROAD, ON LEASE ROAD GO WEST 1.8 MILES TO LEASE ROAD, ON LEASE ROAD GO NORTH 1.0 MILES TO LEASE ROAD, ON LEASE ROAD GO WEST 1.0 MILES TO PROPOSED LEASE ROAD.

BASIN SURVEYS P.O. BOX 1786 – HOBBS, NEW MEXICO

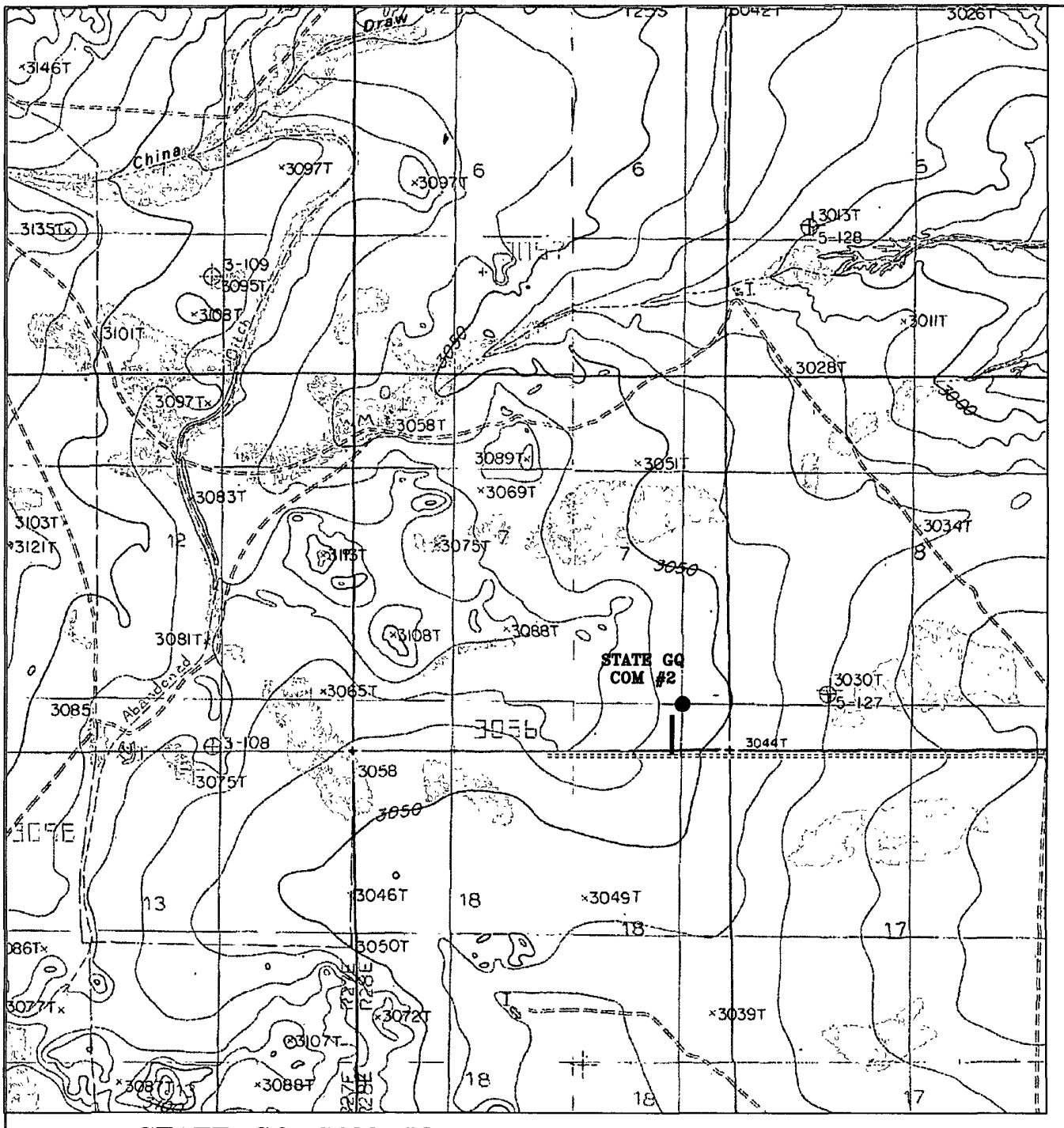
W.O. Number: 18494	Drawn By: J. M. SMALL
Date: 08-31-2007	Disk: JMS 18494W

OGX RESOURCES, L.L.C.

REF: STATE GQ COM #2 / Well Pad Topo

THE STATE GQ COM #2 LOCATED 660' FROM THE SOUTH LINE AND 660' FROM THE EAST LINE OF SECTION 7, TOWNSHIP 25 SOUTH, RANGE 28 EAST, N.M.P.M., EDDY COUNTY, NEW MEXICO.

Survey Date: 08-30-2007	Sheet 1 of 1 Sheets



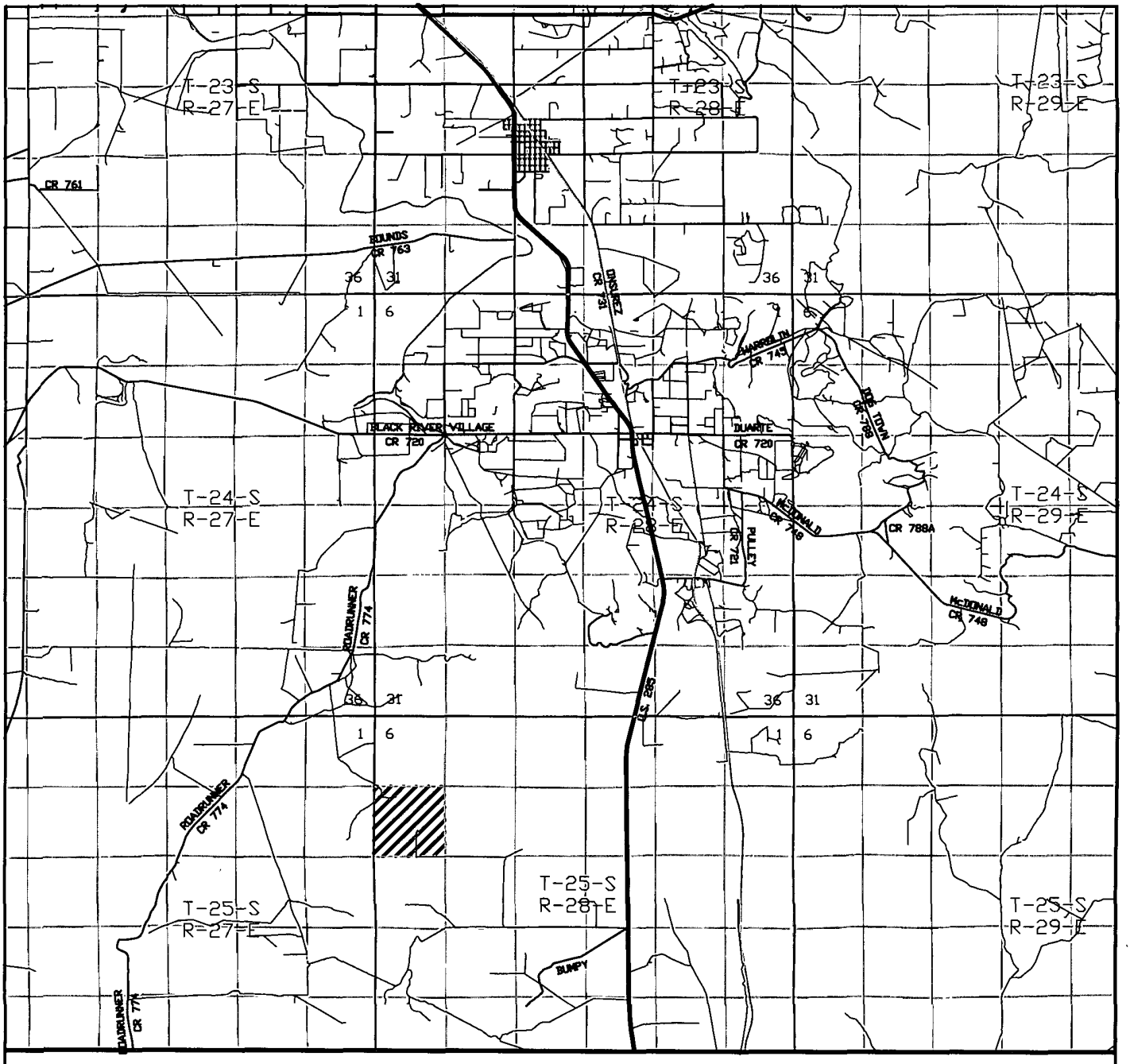
STATE GQ COM #2
Located at 660' FSL and 660 FEL
Section 7, Township 25 South, Range 28 East,
N.M.P.M., Eddy County, New Mexico.

basin surveys
focused on excellence in the oilfield

P.O. Box 1786
1120 N. West County Rd.
Hobbs, New Mexico 88241
(505) 393-7316 - Office
(505) 392-3074 - Fax
basinsurveys.com

W.O. Number:	18494T
Survey Date:	08-30-2007
Scale:	1" = 2000'
Date:	08-31-2007

OGX RESOURCES, L.L.C.



STATE GQ COM #2
Located at 660' FSL and 660 FEL
Section 7, Township 25 South, Range 28 East,
N.M.P.M., Eddy County, New Mexico.

basin surveys
focused on excellence in the oilfield

P.O. Box 1786
1120 N. West County Rd.
Hobbs, New Mexico 88241
(505) 393-7316 - Office
(505) 392-3074 - Fax
basinsurveys.com

W.O. Number:	JMS 18494TR
Survey Date:	08-30-2007
Scale:	1" = 2 MILES
Date:	08-31-2007

OGX RESOURCES, L.L.C.

HALLIBURTON

OGX Resources LLC
PO Box 11148
Midland, Texas 79702

State GQ Com 2

Eddy County, New Mexico
United States of America
S:7 T:25S R:28E

Cementing Recommendation

Prepared for: Randy Ford
September 7, 2007
Version: 1

Submitted by:
Dennis Page

Halliburton Energy Services
4000 N. Big Spring, Ste. 200
Midland, Texas 79705
432.683.0210

HALLIBURTON

Halliburton appreciates the opportunity to present this proposal and looks forward to being of service to you.

Foreword

Halliburton Energy Services is pleased to have this opportunity to present this proposal for your consideration. We earnestly request the service work to be performed on this well.

These Service Coordinators can be reached in our District, at the following phone numbers:

MIDLAND SALES OFFICE
1-800-844-8451

ODESSA DISTRICT
1-800-417-5096

CEMENTING:
Scott Kerby / Joe Briseno
BJ Wheeler

STIMULATION:
Mel Holt / Larry Staples
Basil Hacker

LOGGING &
PERFORATING
Allen Avera / Keith Drake
Daryl Nations

COILED TUBING
& NITROGEN
Michael Ybaben

TOOLS & TESTING,
PROD. SVCS., TCP,
COMPL. PRODUCTS
Steve Engleman

BAROID
Fernando Arizpe

HOBBS DISTRICT
1-800-416-6081

CEMENTING
Pete Garza / Ronald Arnold
Jaime Gonzales

STIMULATION:
Freddy Casillas / Jerry Thurman
Travis Laman

LOGGING &
PERFORATING
Darrell Merrell / Vernon Reever

TOOLS & TESTING,
PROD. SVCS., TCP,
COMPL. PRODUCTS
Mike McWilliams

BAROID
Freddy Redmon

PREPARED BY: Bruce Day

We look forward to working with you to provide the very best quality services available in the Permian Basin.

Dennis Page, Sr. Technical Advisor

Cementing Best Practices

1. **Cement quality and weight:** You must choose cement slurry that is designed to solve the problems specific to each string of pipe.

2. **Waiting time:** You must hold the cement slurry in place and under pressure until it hardens. A cement slurry is a time-dependent liquid and must be allowed to undergo a hydration reaction to produce a competent cement sheath. A fresh cement slurry can be worked (thickening or pump time) as long as it is plastic, and the initial set of cement occurs during the rapid reaction stage. If the cement is not allowed to hydrate; it will be subject to changes in density, dilution, settling, water separation, and gas cutting that can lead to lack of zonal isolation with resultant bridging in the annulus.

3. **Pipe movement**: Pipe movement may be one of the single most influential factors in mud removal. Reciprocation and/or rotation mechanically breaks up gelled mud and constantly changes the flow patterns in the annulus for better cement bonding.

4. **Mud properties:** Plastic viscosity (PV) should be less than 15 centipoise (cp), and less than 10 cp, if possible, yield point (YP) should be less than 10 pound/100-square feet (lb/100ft^2) decreasing down to about 5 lb/100 ft^2.

5. **Mud gel strength**: A nonthixotropic mud is desirable for good mud removal. Mud left in the hole prior to running casing should have 10-second/10-minute/30-minute gel strength such that the 10-minute is less than double the 10-second and the 30-minute is less than 20 lb/100 ft^2). Sufficient shear strength may not be achieved on a primary cement job to remove mud left in the hole should the mud develop more than 25 lb/100 ft^2.

6. **Mud fluid loss:** Decreasing the filtrate loss into a permeable zone enhances the creation of a thin filter cake. This increases the fluid mud in the hole, which is more easily removed. Generally, an API fluid loss of 7 or 8 milliliter (ml) is sufficient with high-temperature/high-pressure fluid loss (HTHP) no more than double this amount.

7. **Circulation**: Circulate bottoms up twice, or until well conditioned mud is being returned to the surface. There should be no cutting in the mud returns. An annular velocity of 260 feet per minute is optimum (SPE/IADC 18617), if possible.

8. **Flow rate**: Turbulent flow is more desirable flow regime for mud removal. If turbulence cannot be achieved, better mud removal is found when maximum flow energy is used. The maximum pump rate should be determined to obtain the best flow regime.

9. **Hole size**: The optimum hole size recommended for good mud removal is 1.5 to 2 inches larger than the casing or liner size. Hole sizes larger than 2 inches annular space can be dealt with, but those that are smaller than 1.5 inches present difficult problems.

10. **Pipe Centralization**: This helps to create a uniform flow area perpendicular to flow direction. Cement will take the path of least resistance so that centralization is important in keeping the pipe off the walls of the hole. At least a 70 percent standoff should be achieved for centralization.

11. **Rat hole**: When applicable, a weighted viscous pill in the rat hole prevents cement from swapping with lighter weight mud when displacement stops.

12. **Shoe joint**: A shoe joint is recommended on all primary casings and liners. The length of the shoe joint will vary, although the absolute minimum length is one joint of pipe. If conditions exist, such as not running a bottom plus, two joints should be the minimum lengths.

State GQ Com	2
17-1/2" Hole	0 - 520 ft (MD)
Inner Diameter	17.500 in
Job Excess	100 %
Surface Casing	0 - 520 ft (MD)
Outer Diameter	13.375 in
Inner Diameter	12.715 in
Linear Weight	48 lbm/ft

Install floating equipment, run casing to bottom, and circulate a minimum of 2-3 hole volumes prior to cementing as follows:

Fluid Instructions

Fluid 1: Pump 20 bbl
Fresh Water — Fluid Volume: 20 bbl

Fluid 2: Pump 1500 gallons
MUD FLUSH — Fluid Volume: 35.71 bbl

Fluid 3: Pump 10 bbl
Fresh Water — Fluid Volume: 10 bbl

Fluid 4: Scavenger Cement - 200 sks
Premium Cement

94 lbm/sk	Premium Cement (Cement)	Fluid Weight	14.60 lbm/gal
1 %	Calcium Chloride (Accelerator)	Slurry Yield:	1.40 ft^3/sk
10 lbm/sk	Gilsonite (Lost Circulation Additive)	Total Mixing Fluid:	5.77 Gal/sk
0.25 lbm/sk	Poly-E-Flake (Lost Circulation Additive)	Volume:	49.98 bbl
		Proposed Sacks:	200 sks

Fluid 5: Lead with 300 sks
Halliburton Light Premium Plus

1 %	Calcium Chloride (Accelerator)	Fluid Weight	12.70 lbm/gal
0.25 lbm/sk	Poly-E-Flake (Lost Circulation Additive)	Slurry Yield:	1.88 ft^3/sk
		Total Mixing Fluid:	10.27 Gal/sk
		Volume:	100.61 bbl
		Proposed Sacks:	300 sks

Fluid 6: Tail-in with 200 sks
Premium Plus Cement

94 lbm/sk	Premium Plus Cement (Cement)	Fluid Weight	14.80 lbm/gal
1 %	Calcium Chloride (Accelerator)	Slurry Yield:	1.34 ft^3/sk
		Total Mixing Fluid:	6.36 Gal/sk
		Volume:	47.59 bbl
		Proposed Sacks:	200 sks

State GQ Com	2
Surface Casing	0 - 520 ft (MD)
Outer Diameter	13.375 in
Inner Diameter	12.715 in
Linear Weight	48 lbm/ft
12-1/4" Hole	520 - 2460 ft (MD)
Inner Diameter	12.250 in
Job Excess	175 %
1st Intermediate Casing	0 - 2460 ft (MD)
Outer Diameter	9.625 in
Inner Diameter	8.921 in
Linear Weight	36 lbm/ft
Thread	LTC
Casing Grade	J-55

Install floating equipment, run casing to bottom, and circulate a minimum of 2-3 hole volumes prior to cementing as follows:

Fluid Instructions

Fluid 1: Pump 10 bbl			
Fresh Water		Fluid Volume:	10 bbl
Fluid 2: Pump 1500 gallons			
MUD FLUSH		Fluid Volume:	35.71 bbl
Fluid 3: Pump 10 bbl			
Fresh Water		Fluid Volume:	10 bbl
Fluid 4: Lead with 660 sks			
50/50 Poz Premium Plus		Fluid Weight	11.80 lbm/gal
10 % total	Bentonite (Light Weight Additive)	Slurry Yield:	2.50 ft^3/sk
5 %	Salt (Salt)	Total Mixing Fluid:	14.04 Gal/sk
5 lbm/sk	Gilsonite (Low Fluid Loss Control)	Volume:	291.45 bbl
0.25 lbm/sk	D-AIR 3000 (Defoamer)	Proposed Sacks:	660 sks
Fluid 5: Tail-in with 200 sks			
Premium Plus Cement		Fluid Weight	14.80 lbm/gal
94 lbm/sk	Premium Plus Cement (Cement)	Slurry Yield:	1.34 ft^3/sk
1 %	Calcium Chloride (Accelerator)	Total Mixing Fluid:	6.36 Gal/sk
		Volume:	47.59 bbl
		Proposed Sacks:	200 sks

Job Information — 2nd Intermediate Casing

State GQ Com	2
1st Intermediate Casing	0 - 2460 ft (MD)
Outer Diameter	9.625 in
Inner Diameter	8.921 in
Linear Weight	36 lbm/ft
Thread	LTC
Casing Grade	J-55
8-1/2" Hole	2460 - 9500 ft (MD)
Inner Diameter	8.500 in
Job Excess	130 %
2nd Intermediate Casing	0 - 9500 ft (MD)
Outer Diameter	7.000 in
Inner Diameter	6.276 in
Linear Weight	26 lbm/ft
Thread	LTC
Casing Grade	P-110

Install floating equipment, run casing to bottom, and circulate a minimum of 2-3 hole volumes prior to cementing as follows:

Fluid Instructions

Fluid 1: Pump 10 bbl
Fresh Water — Fluid Volume: 10 bbl

Fluid 2: Pump 1500 gallons
MUD FLUSH — Fluid Volume: 35.71 bbl

Fluid 3: Pump 10 bbl
Fresh Water — Fluid Volume: 10 bbl

Fluid 4: Lead with 850 sks
50/50 Poz Premium

10 % total	Bentonite (Light Weight Additive)	Fluid Weight	11.80 lbm/gal
0.3 %	Halad®-9 (Low Fluid Loss Control)	Slurry Yield:	2.50 ft^3/sk
5 %	Salt (Salt)	Total Mixing Fluid:	14.60 Gal/sk
0.125 lbm/sk	Poly-E-Flake (Lost Circulation Additive)	Volume:	378.17 bbl
		Proposed Sacks:	850 sks

Fluid 5: Tail-in with 200 sks
Premium Cement

94 lbm/sk	Premium Cement (Cement)	Fluid Weight	15.60 lbm/gal
0.5 %	Halad®-9 (Low Fluid Loss Control)	Slurry Yield:	1.19 ft^3/sk
		Total Mixing Fluid:	5.35 Gal/sk
		Volume:	42.46 bbl
		Proposed Sacks:	200 sks

State GQ Com	2
2nd Intermediate Casing	0 - 9500 ft (MD)
Outer Diameter	7.000 in
Inner Diameter	6.276 in
Linear Weight	26 lbm/ft
Thread	LTC
Casing Grade	P-110
6-1/8" Hole	9500 - 16100 ft (MD)
Inner Diameter	6.125 in
Job Excess	50 %
Drill Pipe	0 - 9100 ft (MD)
Production Liner	9100 - 16100 ft (MD)
Outer Diameter	4.500 in
Inner Diameter	4.000 in
Linear Weight	11.60 lbm/ft
Casing Grade	N-80
Lap	400 ft (MD)
Cap	300 ft (MD)
Mud Type	Water Based Mud
Mud Weight	11 lbm/gal
BHST	210 degF

Install floating equipment, run casing to bottom, and circulate a minimum of 2-3 hole volumes prior to cementing as follows:

Fluid Instructions

Fluid 1: Prepare 500 gallons
TUNED SPACER III

180 lbm/bbl	Barite (Heavy Weight Additive)	Fluid Density:	12 lbm/gal
0.4 gal/bbl	Dual Spacer Surfactant B (Surfactant)	Fluid Volume:	11.90 bbl
0.7 gal/bbl	Musol® A (Mutual Solvent)		
0.5 gal/bbl	SEM-7 (Emulsifier)		
3 lbm/bbl	Fe-2 (Buffer)		
0.12 gal/bbl	D-AIR 3000L (Defoamer)		

Fluid 2: Mix and pump 875 sks
Premium Cement

94 lbm/sk	Premium Cement (Cement)	Fluid Weight	15.60 lbm/gal
1 %	LAP-1 (Low Fluid Loss Control)	Slurry Yield:	1.20 ft^3/sk
0.3 %	CFR-3 (Dispersant)	Total Mixing Fluid:	5.31 Gal/sk
0.25 lbm/sk	D-AIR 3000 (Defoamer)	Top of Fluid:	8800 ft
		Calculated Fill:	7300 ft
		Volume:	185.58 bbl
		Calculated Sacks:	870.48 sks
		Proposed Sacks:	875 sks

State GQ Com	2
2nd Intermediate Casing	0 - 9500 ft (MD)
Outer Diameter	7.000 in
Inner Diameter	6.276 in
Linear Weight	26 lbm/ft
Thread	LTC
Casing Grade	P-110
6-1/8" Hole	9500 - 16100 ft (MD)
Inner Diameter	6.125 in
Job Excess	50 %
Production Liner	9100 - 16100 ft (MD)
Outer Diameter	4.500 in
Inner Diameter	4.000 in
Linear Weight	11.60 lbm/ft
Casing Grade	N-80
Drill Pipe	0 - 9100 ft (MD)
Lap	400 ft (MD)
Cap	300 ft (MD)
Mud Type	Water Based Mud
Mud Weight	11 lbm/gal
BHST	210 degF

Install floating equipment, run casing to bottom, and circulate a minimum of 2-3 hole volumes prior to cementing as follows:

Fluid Instructions

Fluid 1: Prepare 500 gallons TUNED SPACER III		Fluid Density:	12 lbm/gal
180 lbm/bbl	Barite (Heavy Weight Additive)	Fluid Volume:	11.90 bbl
0.4 gal/bbl	Dual Spacer Surfactant B (Surfactant)		
0.7 gal/bbl	Musol® A (Mutual Solvent)		
0.5 gal/bbl	SEM-7 (Emulsifier)		
3 lbm/bbl	Fe-2 (Buffer)		
0.12 gal/bbl	D-AIR 3000L (Defoamer)		

Fluid 2: Mix and pump 400 sks			
Premium Acid Soluable Cement		Fluid Weight	15 lbm/gal
10 lbm/sk	Silicalite 50/50 Blend (Light Weight Additive)	Slurry Yield:	2.63 ft3/sk
1 %	Halad®-344 (Low Fluid Loss Control)	Total Mixing Fluid:	11.37 Gal/sk
0.3 %	Super CBL (Gas Migration Control)	Top of Fluid:	8800 ft
0.25 lbm/sk	D-AIR 3000 (Defoamer)	Calculated Fill:	7300 ft
0.7 %	HR-601 (Retarder)	Volume:	187.47 bbl
		Calculated Sacks:	400.53 sks
		Proposed Sacks:	400 sks

Conditions

NOTE

The cost in this analysis is good for the materials and/or services outlined within. These prices are based on Halliburton being awarded the work on a first call basis. Prices will be reviewed for adjustments if awarded on 2nd or 3rd call basis and/or after 30 days of this written analysis. This is in an effort to schedule our work and maintain a high quality of performance for our customers.

The unit prices stated in the proposal are based on our current published prices. The projected equipment, personnel, and material needs are only estimates based on information about the work presently available to us. At the time the work is actually performed, conditions then existing may require an increase or decrease in the equipment, personnel, and/or material needs. Charges will be based upon unit prices in effect at the time the work is performed and the amount of equipment, personnel, and/or material actually utilized in the work. Taxes, if any, are not included. Applicable taxes, if any, will be added to the actual invoice.

It is understood and agreed between the parties that with the exception of the subject discounts, all services performed and equipment and materials sold are provided subject to Halliburton's General Terms and Conditions contained in our current price list, (which include LIMITATION OF LIABILITY and WARRANTY provisions), and pursuant to the applicable Halliburton Work Order Contract (whether or not executed by you), unless a Master Service and/or Sales Contract applicable to the services, equipment, or materials supplied exists between your company and Halliburton, in which case the negotiated Master Contract shall govern the relationship between the parties. A copy of the latest version of our General Terms and Conditions is available from your Halliburton representative or at: http://www.halliburton.com/hes/general_terms_conditions.pdf for your convenient review, and we would appreciate receiving any questions you may have about them. Should your company be interested in negotiating a Master Contract with Halliburton, our Law Department would be pleased to work with you to finalize a mutually agreeable contract. In this connection, it is also understood and agreed that Customer will continue to execute Halliburton usual field work orders and/or tickets customarily required by Halliburton in connection with the furnishing of said services, equipment, and materials.
Any terms and conditions contained in purchase orders or other documents issued by the customer shall be of no effect except to confirm the type and quantity of services, equipment, and materials to be supplied to the customer.
If customer does not have an approved open account with Halliburton or a mutually executed written contract with Halliburton, which dictates payment terms different than those set forth in this clause, all sums due are payable in cash at the time of performance of services or delivery of equipment, products, or materials. If customer has an approved open account, invoices are payable on the twentieth day after date of invoice.

Customer agrees to pay interest on any unpaid balance from the date payable until paid at the highest lawful contract rate applicable, but never to exceed 18% per annum. In the event Halliburton employs an attorney for collection of any account, customer agrees to pay attorney fees of 20% of the unpaid account, plus all collection and court costs.

Newpark Drilling Fluids, LLC

DRILLING FLUIDS PROGRAM

PREPARED FOR:

State GQ Com #2

Section 7, T-25-S, R-28-E
Eddy County, New Mexico

SUBMITTED TO:

Mr. Kip Agar

OGX Resources, LLC
P.O. Box 2064
Midland, Texas 79702

PREPARED BY:

Mike Davis

Newpark Drilling Fluids, LLC

September 6, 2007

Mr. Kip Agar
OGX Resources, LLC
P.O. Box 2064
Midland, Texas 79702

Dear Mr. Agar,

Enclosed are our drilling fluids recommendations for your State GQ Com #1 well in section 7, T-25-S, R-28-E, Eddy County, New Mexico. They are derived from information from your office, offset well data, and our knowledge of the area.

Estimated mud cost is $ 220,000.00 to $230,000.00 based on 35 to 39 total days with ideal conditions. Severe losses, excessive pressure, stuck pipe or extended days on the well could raise the estimate considerably. Offset wells in this area have experienced abnormal pressures in the 12.5-13.5 pound per gallon range.

***Calcium Carbonate will be used as the weighting agent in all pipe slugs and mud weight increases. ABOSULTLEY NO BARITE WILL BE USED. If weights are needed above 12.0 ppg, Barite will only be used after a thorough discussion with the operator.**

For questions or comments call (800) 592-4627 or (432) 697-8661. Both are 24-hour numbers.

Sincerely,

Mike Davis

Newpark Drilling Fluids, LLC

OGX Resources, LLC
State GQ Com #2
Section 7, T-25-S, R-28-E
Eddy County, New Mexico

PROGRAM HIGHLIGHTS:

TOTAL DEPTH	:	**12,800'**
CASING REQUIREMENTS	:	**Interval 1: 17-1/2" hole to 520', set 13-3/8" casing.**
	:	**Interval 2: 12-1/4" hole to 2,460', set 9-5/8" casing.**
	:	**Interval 3: 8-3/4" hole to 9,500', set 7" casing.**
	:	**Interval 4: 6-1/8" hole to 12,800', set 4-1/2" liner.**
MUD WEIGHT REQUIREMENTS	:	**8.6 – 8.8 ppg @ 520'**
	:	**10.0 – 10.1 ppg @ 2,460'**
	:	**8.4 – 10.0 ppg @ 9,500'**
	:	**10.0 – 13.5 ppg @ 12,800'**
DAYS TO REACH TD	:	**35 – 39**
COST ESTIMATE	:	**$220,000.00 to $230,000.00**
WAREHOUSE	:	**Midland, Texas** (800) 592-4627
		David Volz, Distribution Manager
PERMIAN BASIN PERSONNEL	:	**Midland, Texas** (800) 592-4627
	:	**Joe Henderson**, Permian Basin Business Unit Manager
	:	**Al Boudreaux**, Sales Manager
	:	**Doug Thomas**, Sales
	:	**Ken Anthony**, Technical Engineer
	:	**Mike Davis**, Technical Engineer

MUD PROPERTIES SUMMARY:

Depth (feet)	Weight (ppg)	Viscosity (sec/1000cc)	Fluid Loss (cc/30min)	PV (cps)	YP ($lb/100ft^2$)	Mud Type
0' – 520' Set 13-3/8" Casing	8.6 – 8.8	36 – 38	N/C	6 – 10	6 – 20	**Spud Mud**
520' – 2,460' Set 9-5/8" Casing	10.0 – 10.1	29 – 30	N/C	0 – 1	0 – 1	**Brine**
2,460' – 9,500' Set 7" Liner	8.4 – 10.0	28 – 29	N/C	0 – 1	0 – 1	**Fresh Water to Brine**
9,500' – 11,000' -	8.4 – 10.0	28 – 29	N/C	0 – 1	0 – 1	**Fresh Water to Brine**
11,000' – 12,800' Set 4-1/2"	10.0 – 13.5	38 – 45	10 – 6	6 – 20	14 – 24	**Dynazan / Starch *Calcium Carbonate**

Note: The mud weight schedule is intended as a guideline only. Actual mud weights used should be determined by hole conditions and drilling parameters.

***Calcium Carbonate will be used as the weighting agent in all pipe slugs and mud weight increases.**
ABOSULTLEY NO BARITE WILL BE USED. If weights are needed above 12.0 ppg, Barite will only be used after a thorough discussion with the operator.

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State GQ Com #2
Section 7, T-25-S, R-28-E
Eddy County, New Mexico

PROGRAM HIGHLIGHTS (CONT'D):

HOLE & CASING DESIGN:

INTERVAL	DEPTH (feet)	BIT SIZE	CASING (OD)	ANTICIPATED MUD WT. (ppg)
INTERVAL 1	520'	17-1/2"	13-3/8"	8.6 – 8.8
INTERVAL 2	2,460'	12-1/4"	9-5/8"	10.0 – 10.1
INTERVAL 3	9,500'	8-3/4"	7"	8.4 – 10.0
INTERVAL 4	12,800'	6-1/8"	4-1/2"	10.0 – 13.5

SOLIDS CONTROL:

INTERVAL	RECOMMENDED SOLIDS CONTROL EQUIPMENT
INTERVAL 1	Two linear motion shale shakers and one desander.
INTERVAL 2	Reserve.
INTERVAL 3	Reserve.
INTERVAL 4	Reserve.
INTERVAL 5	Two linear motion shale shakers and centrifuges.

ESTIMATED FORMATION TOPS:

FORMATION	DEPTH
Lamar LM	2,460'
Delaware Sand	2,510'
Cherry Canyon	3,460'
Brushy Canyon	4,775'
Lower Brushy Canyon	5,780'
Bone Spring	6,065'
1st Bone Spring Sand	7,040'
2nd Bone Spring Sand	7,730'
3rd Bone Spring Sand	8,975'
Wolfcamp	9,320'
Middle Wolfcamp	10,560'
Strawn	11,565'
Atoka	11,760'
Morrow	12,250'
Middle Morrow	12,575'
Total Depth	**12,800'**

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State GQ Com #2
Section 7, T-25-S, R-28-E
Eddy County, New Mexico

Interval 1: **17-1/2" Hole**
Interval: **0' – 520'**
Casing: **13-3/8**
Days: **2**

Drilling Fluid Properties:

Depth (feet)	Weight (ppg)	Viscosity (sec/1000cc)	PV (cps)	YP ($lb/100ft^2$)	pH (value)	Fluid Loss (cc/30min)	LG Solids (%)
0' – 520'	8.6 – 8.8	36 – 38	6-10	6-20	9.0-10.0	No Control	<6

Drilling Fluid Recommendations:

A non-dispersed **NewGel** system is recommended for this interval, with pre-hydrated **NewGel** and **Soda Ash** as the primary system components for rheological control. Utilize **Paper** sweeps to aid in seepage control. If losses occur batch treat with 12-15 ppb **Fiber Seal** in a 50 bbl premix with 36-38 sec/1000cc viscosity.

At total depth sweep the hole with 100-barrels of fresh water and **New Gel** for a 80-90 sec/1000cc viscosity with 0.25-ppb **Super Sweep**. Circulate hole clean prior to running casing.

Materials Consumption

175	sx	New Gel
10	sx	Soda Ash
10	sx	Paper
1	bx	Super Sweep

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State GQ Com #2
Section 7, T-25-S, R-28-E
Eddy County, New Mexico

Maintenance Procedure: Interval 1

Fluid Loss - Fluid loss control is unnecessary through this interval.

Mud Weight - Run water and premixes as needed to maintain volume and weight as specified.

Rheology - Solids content is the primary factor that will affect rheology. Maintain viscosity as needed for this interval.

Alkalinity - Maintain pH in the 9.0-10.0 range with **Soda Ash**.

Solids Control - Maintain low gravity solids at <6% by volume. The shakers should be equipped with the finest mesh screens that will handle the circulating volume.

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State GQ Com #2
Section 7, T-25-S, R-28-E
Eddy County, New Mexico

Interval 2: **12-1/4" Hole**
Interval: **520' – 2,460'**
Casing: **9-5/8"**
Days: **5**

Drilling Fluid Properties:

Depth (feet)	Weight (ppg)	Viscosity (sec/1000cc)	PV (cps)	YP ($lb/100ft^2$)	pH (value)	Fluid Loss (cc/30min)	LG Solids (%)
520' – 2,460'	10.0 – 10.1	29 – 30	0-1	0-1	9.0-10.0	No Control	<6

Drilling Fluid Recommendations:

Drill out from the 13-3/8" casing with brine water circulating a controlled portion of the reserve pit for gravitational solids control. Utilize **Paper** sweeps to aid in seepage control. The pH should be maintained at 9.0-10.0 with additions of **Caustic Soda**. Utilize **New-55** sweeps (2-3 quarts per connection) to aid in cuttings removal. Sweep the hole with 100 barrels of fresh water and **New Gel** for a 80-90 sec/1000cc viscosity and 0.25-lbs of **Super Sweep** every 500 feet drilled to aid in cuttings removal. If losses occur batch treat with 12-15 ppb **Fiber Seal** in a 50 bbl premix with 36-40 sec/1000cc viscosity.

At total depth sweep the hole with 100-barrels of fresh water and **New Gel** for a 80-90 sec/1000cc viscosity with 0.25-ppb **Super Sweep**. Circulate hole clean prior to running casing.

Materials Consumption

150	sx	New Gel
30	sx	Paper
20	sx	Caustic Soda
4	pl	New-55
2	bx	Super Sweep

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State GQ Com #2
Section 7, T-25-S, R-28-E
Eddy County, New Mexico

Maintenance Procedure: Interval 2

Fluid Loss - Fluid loss control is unnecessary through this interval.

Mud Weight - Maintain minimum fluid densities.

Alkalinity - Maintain pH in the 9.0-10.0 range with **Caustic**.

Mud Losses Down hole - Loss of circulation is a possibility through this interval. Use **Fiber Plug** and **Fiber Seal**. Keep the hole full at all times and avoid excessive swabbing and/or surge actions when tripping pipe. Bring pumps on the hole gradually anytime circulation has been interrupted, increasing pump strokes only after full returns are established.

Solids Control - Maintain low gravity solids at <6% by volume. Circulating the reserve will provide gravitational solids control.

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State GQ Com #2
Section 7, T-25-S, R-28-E
Eddy County, New Mexico

Interval 3: **8-3/4" Hole**
Interval: **2,460' – 9,500'**
Casing: **7"**
Days: **16**

Drilling Fluid Properties:

Depth	Weight	Viscosity	PV	YP	pH	Fluid Loss	LG Solids
(feet)	(ppg)	(sec/1000cc)	(cps)	($lb/100ft^2$)	(value)	(cc/30min)	(%)
2,460' – 9,500'	8.4 – 10.0	28 – 29	0 –1	0 – 1	9.0-10.0	N/C	<6

Drilling Fluid Recommendations:

Drill out from the 9-5/8" casing with Fresh water circulating the remaining portion of the reserve. The pH should be maintained at 9.0-10.0 with additions of **Caustic Soda**. Sweep the hole with 100 barrels of fresh water and **New Gel** for a 80-90 sec/1000cc viscosity and 0.25-lbs of **Super Sweep** every 500 feet drilled to aid in cuttings removal. If losses occur batch treat with 12-15 ppb **Fiber Seal** in a 50 bbl premix with 36-40 sec/1000cc viscosity.

Maintain sufficient brine on location to raise the mud weight in the event of abnormal pressure in the Bone Springs. At total depth fill premix pit with 100 barrels of fresh water and **New Gel** for a 80-90 sec/1000cc viscosity and add 0.25-lbs of **Super Sweep.** Sweep prior to casing operations.

***Calcium Carbonate will be used as the weighting agent in all pipe slugs and mud weight increases. ABOSULTLEY NO BARITE WILL BE USED. If weights are needed above 12.0 ppg, Barite will only be used after a thorough discussion with the operator.**

Materials Consumption

200	sx	New Gel
60	sx	Paper
40	sx	Caustic Soda
2	bx	Super Sweep

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State GQ Com #2
Section 7, T-25-S, R-28-E
Eddy County, New Mexico

Maintenance Procedure: Interval 3

Fluid Loss - Fluid loss control is unnecessary through this interval.

Mud Weight - Run water and premixes as needed to maintain volume and weight as specified. Drilling with a minimum amount of overbalance will reduce the possibility of losing returns and/or of differentially sticking the drill string.

Alkalinity - Maintain pH in the 9.0-10.0 range with **Caustic**.

Hole Cleaning - Optimum hydraulics and rheological properties should be maintained to provide maximum hole cleaning and minimize washout of the well bore. Sweep the hole with fresh water mud pills made of **New Gel** for a 80-90 sec/1000cc viscosity and 0.25 ppb of **Super Sweep** every 500'.

Mud Losses Down hole - Loss of circulation is a possibility through this interval. Use **Fiber Plug** and **Fiber Seal**. Keep the hole full at all times, and avoid excessive swabbing and/or surge actions when tripping pipe. Bring pumps on the hole gradually anytime circulation has been interrupted, increasing pump strokes only after full returns are established.

Solids Control - Maintain low gravity solids at <6% by volume. Circulating the reserve will provide gravitational solids control.

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State GQ Com #2
Section 7, T-25-S, R-28-E
Eddy County, New Mexico

Interval 4: 6-1/8" Hole
Interval: 9,500' – 11,000'
Casing: -
Days: 5

Drilling Fluid Properties:

Depth	Weight	Viscosity	PV	YP	HPHT Fluid Loss	pH	LG Solids
(feet)	(ppg)	(sec/1000cc)	(cps)	($lb/100ft^2$)	(cc/30min)	(value)	(%)
9,500' – 11,000'	8.4 – 10.0	29 – 30	0 – 1	0 – 1	N/C	9 – 10	<6

Drilling Fluid Recommendations:

Drill out from the 7" casing with existing fluid and continue circulating the remaining portion of the reserve. The pH should be maintained at 9.0-10.0 with additions of **Caustic Soda**. Sweep the hole with 100 barrels of fresh water with **New Gel** for a 80-90 sec/1000cc viscosity and 0.25-lbs of **Super Sweep** every 500 feet drilled to aid in cuttings removal. If losses occur batch treat with 12-15 ppb **Fiber Seal** in a 50 bbl premix with 36-40 sec/1000cc viscosity

***Calcium Carbonate will be used as the weighting agent in all pipe slugs and mud weight increases. ABOSULTLEY NO BARITE WILL BE USED. If weights are needed above 12.0 ppg, Barite will only be used after a thorough discussion with the operator.**

Materials Consumption

300	sx	NewGel
30	sx	Paper
15	sx	Caustic Soda
1	bx	Super Sweep

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State GQ Com #2
Section 7, T-25-S, R-28-E
Eddy County, New Mexico

Maintenance Procedure: Interval 4

Fluid Loss - Fluid loss control is unnecessary through this interval.

Mud Weight - Maintain minimum fluid densities.

Alkalinity - Maintain pH in the 9.0-10.0 range with **Caustic**.

Hole Cleaning - Optimum hydraulics and rheological properties should be maintained to provide maximum hole cleaning and minimize washout of the well bore. Sweep the hole with fresh water mud pills made of **New Gel** for a 80-90 sec/1000cc viscosity and 0.25 ppb of **Super Sweep** every 500'.

Mud Losses Down hole - Loss of circulation is a possibility through this interval. Use **Fiber Plug** and **Fiber Seal**. Keep the hole full at all times, and avoid excessive swabbing and/or surge actions when tripping pipe. Bring pumps on the hole gradually anytime circulation has been interrupted, increasing pump strokes only after full returns are established.

Solids Control - Maintain low gravity solids at <6% by volume. Circulating the reserve will provide gravitational solids control.

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Section 7, T-25-S, R-28-E
Eddy County, New Mexico

Interval 5: **6-1/8" Hole**
Interval: **11,000' – 12,800'**
Casing: **4-1/2"**
Days: **10**

Drilling Fluid Properties:

Depth	Weight	Viscosity	PV	YP	HPHT Fluid Loss	pH	LG Solids
(feet)	(ppg)	(sec/1000cc)	(cps)	(lb/100ft^2)	(cc/30min)	(value)	(%)
11,000' – 12,800'	10.0 – 13.5	38 – 45	6 – 20	14 – 24	10 – 6 cc	9 – 10	<6

Drilling Fluid Recommendations:

At **11,000'** , or prior to drilling the **Strawn** Formation confine circulation to steel pits. Displace system with 10 ppb Brine water. Treat the system with **Newcide** to prevent bacterial degradation of organic materials. Adjust and maintain pH with **Caustic Soda**. Add **Starch** (White) to control API filtrate at <10cc. Mix **Dynazan** to increase the viscosity to 38-40 sec/1000cc. Use **S-10 Defoamer** to reduce foaming. If abnormal pressures are encountered mix **Calcium Carbonate** to increase mud weight and raise viscosity to 45+ sec/1000cc with **Dynazan**.

At **12,200'**, prior to drilling Morrow, reduce API filtrate to <6cc with **Starch** (White). If abnormal pressures are encountered mix **Calcium Carbonate** to increase mud weight and raise viscosity to 45+ sec/1000cc with **Dynazan**.

***Calcium Carbonate will be used as the weighting agent in all pipe slugs and mud weight increases. ABOSULTLEY NO BARITE WILL BE USED. If weights are needed above 12.0 ppg, Barite will only be used after a thorough discussion with the operator.**

Materials Consumption:

185 tn Calcium Carbonate (bulk)
150 sx White Starch
100 tn Barite (bulk)
100 sx Dyna Fiber
80 sx Dynazan
40 sx Caustic Soda
30 cn S-10 Defoamer
25 cn Newcide

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State GQ Com #2
Section 7, T-25-S, R-28-E
Eddy County, New Mexico

Maintenance Procedure: Interval 5

Fluid Loss - Fluid loss control should be maintained with **Starch** (White)

Mud Weight - Maintain minimum fluid densities. Run water and premixes as needed to maintain volume and weight as specified. Drilling with a minimum amount of overbalance will reduce the possibility of losing returns and/or of differentially sticking the drill string.

Alkalinity - Maintain pH in the 9.0-10.0 range with **Caustic**.

Hole Cleaning - Optimum hydraulics and rheological properties should be maintained to provide maximum hole cleaning and minimize washout of the well bore. Sweeping the hole with fresh water mud pills made of **New Gel** for a 80-90 sec/1000cc viscosity and 0.25 ppb of **Super Sweep** every 500' will provide additional hole cleaning.

Mud Losses Down hole - Loss of circulation is a possibility through this interval. Use **Fiber Plug** and **Fiber Seal**. Keep the hole full at all times, and avoid excessive swabbing and/or surge actions when tripping pipe. Bring pumps on the hole gradually anytime circulation has been interrupted, increasing pump strokes only after full returns are established.

Solids Control - Maintain low gravity solids at <6% by volume. Circulating the reserve will provide gravitational solids control.

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State GQ Com #2
Section 7, T-25-S, R-28-E
Eddy County, New Mexico

ENGINEER / WAREHOUSE INFORMATION

WELL NAME: *State GQ Com #2*

LOCATION: *Section 7, T-25-S, R-28-E*

Eddy County, New Mexico

MUD ENGINEER: *Wally Pearson* *Artesia, New Mexico*

Lynn Pearson *Carlsbad, New Mexico*

(800) 592-4627 or (432) 697-8661. Both 24 hours.

WAREHOUSE: *Artesia & Lovington, New Mexico*

Oil Base Mud Plant *Monahans, Texas*

Water Base Mud Plant *Monahans, Texas*

(800) 592-4627 or (432) 697-8661. Both 24 hours.

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State GQ Com #2
Section 7, T-25-S, R-28-E
Eddy County, New Mexico

Lost Circulation Procedures

Seepage Losses – Mud consumed at the rate of 2.0-2.5 barrels per barrel of hole drilled (18.5± bbls of mud per 100' of 8-3/4" hole drilled) can be expected. The 1.0-1.5 bbls lost per barrel of hole drilled is due to mud retained on cuttings and filtration losses down hole. Volumes in excess of 20 bbls per 100' of hole should be considered seepage losses and the following remedial action taken:

1. Discontinue drilling and circulate cuttings out of the hole at a reduced rate for 5 minutes. Pull one stand and stop pumps to see if the hole is standing full. Keep pipe moving while checking fluid level.

2. If the hole is standing full while static, the seepage losses may be from excessive cuttings, out of gauge hole or circulating pressure losses (ECD). Break circulation slowly and return to drilling, carefully monitoring mud consumption rates and static hole conditions on connections.

3. If the hole is taking fluid while static, prepare a 50-60 bbl pill of 45-50 viscosity mud with 10-20 ppb of Fiber-Plug and 10-20 ppb of Fiber-Seal, and spot near bottom. Pull five stands and check static level of fluid in the hole. Keep hole full at all times and monitor the mud loss rate.

4. If little or no improvement is noted after pumping the 50-60 barrel LCM pill, prepare a balanced, high-filtrate (50cc/30min@100psi) water based pill (40 bbls). This pill can be formulated with Dynazan or New Gel (flocculated with CaCl2 or Lime)and Calcium Carbonate. Pull pipe above the suspected loss zone and spot the pill outside the drill pipe at 1 barrel per minute. Pull out of the pill, close the hydril and if a float collar is in the string, pump down the annulus until sufficient backpressure is established. Hold the maximum allowable backpressure (300-900 psi) for 2-4 hours, open the hydril and establish full circulation before going to bottom.

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State GQ Com #2
Section 7, T-25-S, R-28-E
Eddy County, New Mexico

Severe Losses:

1. Should complete returns be lost, stop the pumps and pull the pipe into the casing while pumping through the fill-up line to keep the hole full.

2. Allow the hole to remain static while filling with mud on the annulus side, monitoring the rate of mud loss.

3. Build 50-60 bbl pill of 45-50-viscosity mud with 10-20 ppb of Fiber-Plug and 10-20 ppb of Fiber-Seal, and spot near bottom. Pull five stands and check static level of fluid in the hole. Keep hole full at all times and monitor the mud loss rate. Should the hole stand full, allow 4-6 hours of healing time before staging back to bottom slowly and resuming drilling.

4. Should only partial returns be established, repeat the LCM pill once more. If complete loss of circulation persist, or if only partial returns can be established after the 2nd LCM pill, prepare a balanced, high-filtrate (50cc/30min@100psi) water based pill (40 bbls). Pull pipe above the suspected loss zone and spot the pill outside the drill pipe at 1 barrel per minute. Pull out of the pill, close the hydril and if a float collar is in the string, pump down the annulus until sufficient backpressure is established. Hold the maximum allowable backpressure (300-900 psi) for 2-4 hours, open the hydril and establish full circulation before going to bottom.

5. Should the LCM pills fail to establish returns, be prepared to squeeze cement into loss zone.

Loss of circulation is a possibility on any well. Although each well is different, there are some basic procedures and drilling practices that can aid in reducing the severity and in some, cases prevent lost circulation. Below is a list of several parameters, which may prove helpful.

1. Maintain viscosities as low as possible and still clean the hole.

2. Maintain mud weights as low as possible without jeopardizing safety.

3. Use slower tripping speeds to prevent swabbing and surging.

4. Break circulation in stages while tripping in the hole.

5. Rotate pipe while breaking circulation.

Solids Control

The most important contributing factor to good mud properties is a low native solids content. Conventional means of solids control (dilution, desanders, and desilters), used for water based muds are not economical because these methods can cause loss of liquid portion of the mud and increase chemical consumption. The solids control equipment for this well should include:

- High Speed shale shaker with fine mesh screens.
- Mud Cleaners

Shale Shaker

Use a high-speed shale shaker with fine mesh screens. It is imperative to remove cuttings as quickly as possible before they have a chance to mechanically break up in the circulating system.

Mud Cleaner

Use a mud cleaner using the smallest screen possible (200 mesh). Monitor the discharge to avoid stripping excess amounts of product from the mud.

Hydraulics

While drilling the deep mature shales in the Permian Basin, it is important to maintain an API filtrate to prevent hydration of the clays contained in those shales. Equally important is to maintain a Laminar Hydraulic Profile in the annulus while drilling those shales. These shale exhibit a high degree of erosion when the annular profile is in turbulent flow.

The annular velocity in the well bore is a measure to control hole cleaning and to determine the annular hydraulic profile. Critical velocity is the point at which flow transitions from laminar to turbulent flow. Mud weight, Plastic Viscosity, Yield Point, Pump Rate, Hole Diameter and tool diameter all are factors in determining critical velocity.

If adjusting the pump rate will affect the bit nozzle optimization, then the rheology can be adjusted to bring the annular profile into laminar flow.

$$\tau C = \frac{1.08\ PV + 1.08\sqrt{PV^2 + 9.26(dh-dp)^2\ YP\ M}}{M\ (dh-dp)}$$

PV = Plastic Viscosity
YP = Yield Point
M = Mud Weight (ppg)
Dh = Diameter of hole (inches)
Dp = Diameter of pipe (inches)

τC = Critical Velocity in feet per second.

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Section 7, T-25-S, R-28-E
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Filtration Control & Filter Cake Quality:

Sealing permeable zones in the well bore has long been accepted as a major function of a drilling fluid. The cost of the filtration control represents a major portion of the mud cost. Traditionally, most of this cost has resulted from controlling the filtration rate as opposed to controlling the filter cake quality. This is understandable since a definitive number is more a comfortable target than a subjective evaluation of a filter cake.

The primary objectives of filtration are:
- Minimize damage to the production zones.
- Optimize formation evaluation.
- Avoid differential pressure sticking of the pipe.
- Avoid under gauged holes due to thick filter cakes.

These objectives are achieved by focusing on important design factors:
- Compatibility of filtrate with formation solids.
- Thin, impermeable, and deformable filter cakes.
- Lubricious and shearable filter cakes.

Filtration Control Mechanisms:
There are four basic mechanisms for controlling filtration control and reducing the filter cake permeability. Understanding these mechanisms along with how filtration control products function is important.

1. **Bridging**- Bridging reduces filtration rates and permeability by plugging or blocking the pore spaces at the face of the filter medium. It generally requires solids about one-third the diameter of the pore space to form a bridge. New Gel, Calcium Carbonate, Lost Circulation Materials, Starch, and Soltex (LST-MD) are primary bridging materials.

2. **Bonding**- Bonding is the connecting or binding of solids together. New Pac, Dynazan, WL-100 and other high molecular weight polymers function as bonding materials. Secondarily, these materials function as bridging materials as well as increasing the viscosity of the filtrate.

3. **Deflocculation**- Deflocculants reduce the electro-chemical attraction between solids. This allows solids to be filtered individually, as opposed to flocs, and also reduces the void spaces in the cake created by flocs of solids. Lignite, Chrome Ligno-Sulphonates, Desco, and other low molecular weight polymers perform as deflocculants.

4. **Viscosity**- Fluid loss decreases proportional to the increase in viscosity of the filtrate. Temperature alone will change the filtrate viscosity. Therefore, filtration control is more difficult at high temperatures. Any soluble material added to the fluid will viscosify the filtrate.

Hydration, Flocculation, and Deflocculation

The degree of hydration and flocculation of the filtered solids influence filter cake permeability. The effectiveness in permeability reduction may be demonstrated by ranking of clay solids according to their surface characteristics:

1. Dehydration/Aggregated/Flocculated (high permeability)
2. Hydrated/Flocculated (medium permeability)
3. Hydrated/Deflocculated (low permeability)

Since fluid loss and filter cake quality are important design factors, it is important to understand the predominate electro-chemical state of the solids. Initially, cake permeability is reduced as pre-hydrated bentonite is added to the system. When flocculated, these hydrated solids promote deformability or permeability reduction with increased pressure. This results from the compaction of hydrated flocs. With deflocculation, permeability is further decreased, as the void spaces created by the flocs diminish.

During drilling operations, hydrated solids are eventually dehydrated as the solids content increases and/or the system is converted to an inhibitive fluid. At this point, a decision must be made on the basis of economic and operational objectives. More pre-hydrated bentonite and/or other products may be added. These other products include New Pac, Calcium Carbonate, CMC, starch, or one of the new generation polymers.

Fluid loss control is a very complex process. The major factors that affect the process include time, pressure, temperature, filtrate viscosity, solids hydration, flocculation and filter cake erodability. Effective evaluation of the process requires that all factors be given strong consideration. Testing the fluids relative to the various factors is necessary to understand how a fluid may perform under down-hole conditions.