State of New Mexico
Energy, Minerals and Natural Resources Department

Susana Martinez
Governor

David Martin
Cabinet Secretary-Designate

Brett F. Woods, Ph.D.
Deputy Cabinet Secretary

Jami Bailey, Division Director
Oil Conservation Division

New Mexico Oil Conservation Division approval and conditions listed below are made in accordance with OCD Rule 19.15.7.11 and are in addition to the actions approved by BLM on the following 3160-3 APD form.

Operator Signature Date: 5-30-14
Well information;
Operator Logos, Well Name and Number Katie #2H
API# 30-045-35554, Section 6, Township 23 N/S, Range 8 E/W

Conditions of Approval:
(See the below checked and handwritten conditions)

- ✓ Notify Aztec OCD 24hrs prior to casing & cement.
- ✓ Hold C-104 for directional survey & "As Drilled" Plat
- o Hold C-104 for NSL, NSP, DHC
- o Spacing rule violation. Operator must follow up with change of status notification on other well to be shut in or abandoned
- o Regarding the use of a pit, closed loop system or below grade tank, the operator must comply with the following as applicable:
  - A pit requires a complete C-144 be submitted and approved prior to the construction or use of the pit, pursuant to 19.15.17.8.A
  - A closed loop system requires notification prior to use, pursuant to 19.15.17.9.A
  - A below grade tank requires a registration be filed prior to the construction or use of the below grade tank, pursuant to 19.15.17.8.C
- o Once the well is spud, to prevent ground water contamination through whole or partial conduits from the surface, the operator shall drill without interruption through the fresh water zone or zones and shall immediately set in cement the water protection string
- ✓ Oil base muds are not to be used until fresh water zones are cased and cemented providing isolation from the oil or diesel. This includes synthetic oils. Oil based mud, drilling fluids and solids must be contained in a steel closed loop system.

Charles Perrin — 7-3-14

NMOCD Approved by Signature — Date

Form 3160-3
(March 2012)

RECEIVED
MAY 30 2014
Farmington Field Office
Bureau of Land Management

FORM APPROVED
OMB No. 1004-0137
Expires October 31, 2014

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

APPLICATION FOR PERMIT TO DRILL OR REENTER

5. Lease Serial No.
NM 109399

6. If Indian, Allotee or Tribe Name

1a. Type of work: ☑ DRILL ☐ REENTER

7. If Unit or CA Agreement, Name and No.

1b. Type of Well: ☑ Oil Well ☐ Gas Well ☐ Other ☑ Single Zone ☐ Multiple Zone

8. Lease Name and Well No.
KATIE 2H

2. Name of Operator Logos Operating, LLC

9. API Well No.
30-045-35554

3a. Address 4001 North Butler Ave, Building 7101
Farmington, NM 87401

3b. Phone No. *(include area code)*
505-330-9333

10. Field and Pool, or Exploratory
Nageezi Gallup

4. Location of Well *(Report location clearly and in accordance with any State requirements.*)*
At surface 1737' FNL & 276' FEL (SE/NE)
At proposed prod. zone 1687' FNL & 300' FWL (SW/NW)

11. Sec., T. R. M. or Blk. and Survey or Area
SHL: Sec 6, T23N R08W, UL H
BHL: Sec 6, T23N R08W, UL E

14. Distance in miles and direction from nearest town or post office*
1.5 miles east of Nageezi

12. County or Parish
San Juan

13. State
NM

15. Distance from proposed* location to nearest property or lease line, ft. (Also to nearest drig. unit line, if any)
276' from eastern edge of Sec 6

16. No. of acres in lease
977 acres

17. Spacing Unit dedicated to this well
Lot 5, SE/NW, S2/NE 160.87 acres

18. Distance from proposed location* to nearest well, drilling, completed, applied for, on this lease, ft.
50' from applied for Katie 1H

19. Proposed Depth
9711' MD, 5277' VD

20. BLM/BIA Bond No. on file
BLM NMB000917

OIL CONS. DIV DIST. 3
JUN 27 2014

21. Elevations (Show whether DF, KDB, RT, GL, etc.)
6926' GL

22. Approximate date work will start*
07/15/2014

23. Estimated duration
45 days

24. Attachments

The following, completed in accordance with the requirements of Onshore Oil and Gas Order No.1, must 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 must 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 BLM.

25. Signature Tamra Sessions — Name *(Printed/Typed)* Tamra Sessions — Date 5/30/14

Title
Operations Technician

Approved by *(Signature)* /s/ Matthew Kade — Name *(Printed/Typed)* — Date 6/26/14

Title AFM — Office FFO

Application approval 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.
Conditions of approval, if any, are 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.

CONFIDENTIAL

(Continued on page 2)

*(Instructions on page 2)

BLM'S APPROVAL OR ACCEPTANCE OF THIS ACTION DOES NOT RELIEVE THE LESSEE AND OPERATOR FROM OBTAINING ANY OTHER AUTHORIZATION REQUIRED FOR OPERATIONS ON FEDERAL AND INDIAN LANDS

NMOCD

DRILLING OPERATIONS AUTHORIZED ARE SUBJECT TO COMPLIANCE WITH ATTACHED "GENERAL REQUIREMENTS"

This action is subject to technical and procedural review pursuant to 43 CFR 3165.3 and appeal pursuant to 43 CFR 3165.4

DISTRICT I
1625 N. French Dr., Hobbs, N.M. 88240
Phone: (575) 393-6161 Fax: (575) 393-0720

DISTRICT II
611 S. First St., Artesia, N.M. 88210
Phone: (575) 748-1283 Fax: (575) 748-9720

DISTRICT III
1000 Rio Brazos Rd., Aztec, N.M. 87410
Phone: (505) 334-6178 Fax: (505) 334-6170

DISTRICT IV
1220 S. St. Francis Dr., Santa Fe, NM 87505
Phone: (505) 476-3460 Fax: (505) 476-3462

State of New Mexico
Energy, Minerals & Natural Resources Department

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

RECEIVED
MAY 30 2014

Form C-102
Revised August 1, 2011
Submit one copy to appropriate District Office

☐ AMENDED REPORT

WELL LOCATION AND ACREAGE DEDICATION PLAT

[1] API Number	[2] Pool Code	[3] Pool Name
30-045-35554	47540	NAGEEZI GALLUP

[4] Property Code	[5] Property Name	[6] Well Number
313429	KATIE	002H

[7] OGRID No.	[8] Operator Name	[9] Elevation
289408	LOGOS OPERATING, LLC	6926'

[10] Surface Location

UL or lot no.	Section	Township	Range	Lot Idn	Feet from the	North/South line	Feet from the	East/West line	County
H	6	23-N	8-W		1737	NORTH	276	EAST	SAN JUAN

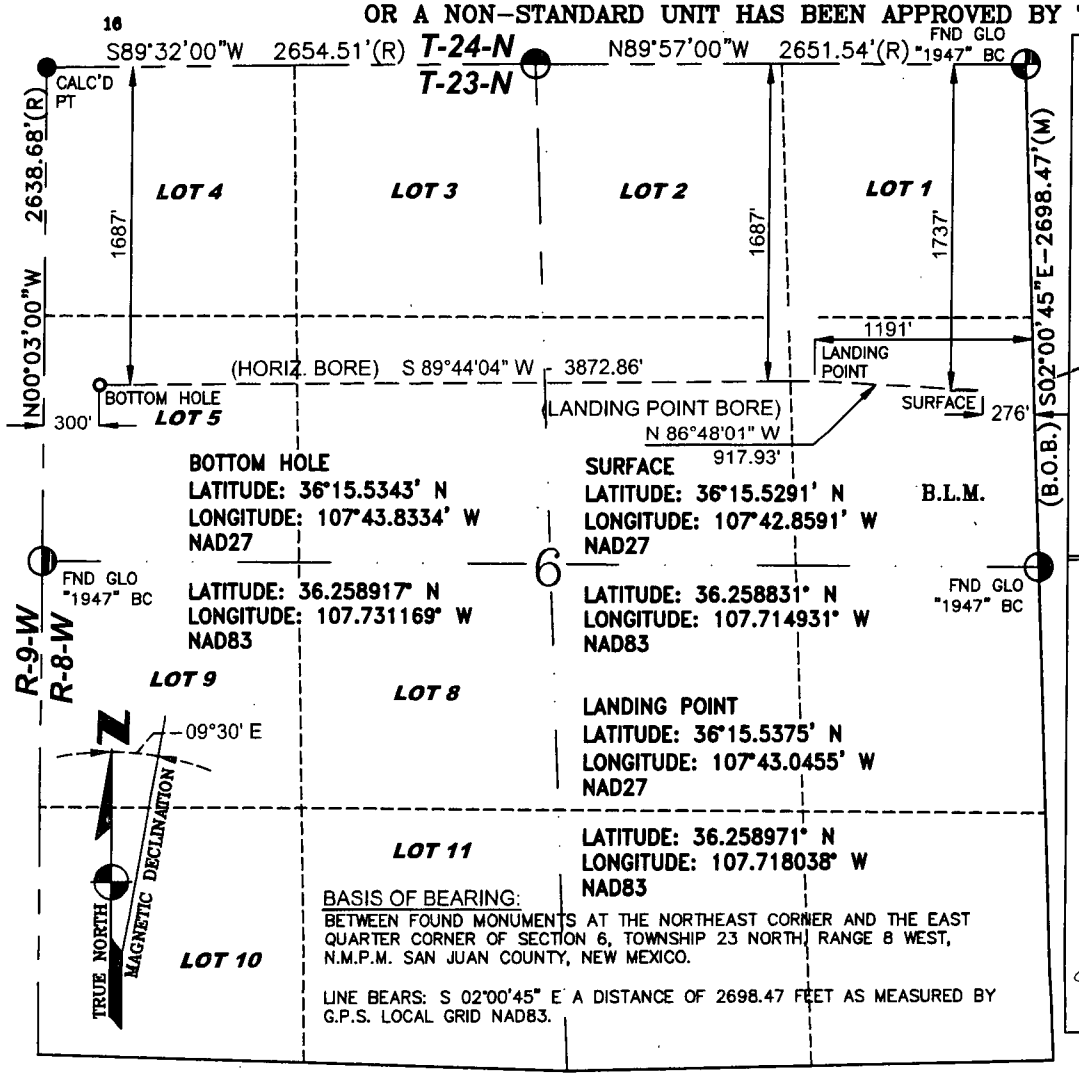
[11] Bottom Hole Location If Different From Surface

UL or lot no.	Section	Township	Range	Lot Idn	Feet from the	North/South line	Feet from the	East/West line	County
E	6	23N	8W	5	1687	NORTH	300	WEST	SAN JUAN

[12] Dedicated Acres	[13] Joint or Infill	[14] Consolidation Code	[15] Order No.
Lot 5, SE/NW, S2/NE, 160.87 acres			

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

[16]



BASIS OF BEARING:
BETWEEN FOUND MONUMENTS AT THE NORTHEAST CORNER AND THE EAST QUARTER CORNER OF SECTION 6, TOWNSHIP 23 NORTH, RANGE 8 WEST, N.M.P.M. SAN JUAN COUNTY, NEW MEXICO.

LINE BEARS: S 02°00'45" E A DISTANCE OF 2698.47 FEET AS MEASURED BY G.P.S. LOCAL GRID NAD83.

[17] 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 or has a right to drill this well at this location pursuant to a contract with an owner of such a mineral or a working interest, or to a voluntary pooling agreement or a compulsory pooling order heretofore entered by the division.

Tamra Sessions 5/30/14
Signature Date

Tamra Sessions
Printed Name

tsessions@logosresourcesllc.com
E-mail Address

[18] 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 supervision, and that the same is true and correct to the best of my belief.

MARCH 12, 2013
Date of Survey

Signature and Seal of Professional Surveyor

GLEN W. RUSSELL
NEW MEXICO
15703
LICENSED PROFESSIONAL SURVEYOR

GLEN W. RUSSELL
Certificate Number 15703

Attachment To Application For Permit To Drill.
Drilling program

LOGOS OPERATING, LLC
4001 N. Butler, Bldg. 7101
Farmington, NM 87401
U.S.A

KATIE #02H
Horizontal Gallup Oil and Gas Well
Surface Location: 1737' FNL – 276' FEL
Section 6, T23N, R8W
Ungraded GL Elev = 6929'
Estimate KB Elev =6944'
Lat. = 36.258831 deg N
Long. = 107.714931 deg W
NAD83
San Juan County, New Mexico

Proposed Bottom Hole Location: 1687' FNL – 300' FWL
Section 6, T23N, R8W
San Juan County, New Mexico

Drilling program written in compliance with onshore Oil and Gas Order No. 1
(III.D.3, effective May 2007) and Onshore Order No. 2 Dated November 18, 1988

- **ESTIMATED TOPS FOR IMPORTANT GEOLOGICAL FORMATIONS**

Formation Tops	Surface (TVD)
Ojo Alamo	1358
Kirtland	1404
Pictured Cliff's	1627
Fruitland	1725
Chacra	2000
Cliffs House	3106
Menefee	3157
Point Lookout	4067
Mancos	4257
Gallup	5101
Landing Point	5320
Total Depth	5277

Drilling Plan

Drill 12 ¼" hole to 500' then set 9 5/8" casing. Drill 8 3/4" hole with fresh water mud from 500' MD to kick off point 4480' MD. and build 8 degrees per 100' .

Trip out of hole and pick up 8 ¾" kick off assembly at 4480' MD. Build angle at 8 deg/100' to to 45.48 degrees, 275.99 degrees azimuth and hold to approximately 5100' MD. Then build angle at 5 deg/100' to 85 degrees inclination and 269.71 degrees azimuth in the Gallup formation at 5219' MD / 5101' TVD where 7" intermediate casing will be set at 5839' MD / 5315' TVD.
7" casing will be set in a legal position 1687' FNL & 1191' FEL in Section 6.
The 7" casing will be drilled out with a 6 1/8" drilling assembly building angle at 5 deg/100' to 90.66 degrees inclination and 269.71 degree azimuth to 5952' MD / 5320' TVD. Hold 90.66 degrees, 269.71 degrees azimuth and drill to a total depth at 9711' MD / 5277' TVD. Adjustments may be made to the directional program based on geology. Total depth will be 9711' MD / 5277' TVD- 90.66 degrees, 269.71 degrees Azimuth.
The Bottom hole location will be in a legal location at 9711' MD at 1687' FNL & 300' FWL of section 6.
A total of 3872' of horizontal hole will be drilled.

- **ANTICIPATED DEPTHS OF PROSPECTIVE OIL GAS AND OTHER HYDROCARBONS**

  Primary objective is the Gallup formation encountered first at 5101' TVD at 7" casing point

  See formation listings in #1 above for additional zones of interest.

- **MINIMUM SPECIFICATIONS FOR PRESSURE CONTROL EQUIPMENT**

  A. Wellhead Equipment 2,000 PSI System (See Exhibit A)

  - 9 5/8" slip-on / welded x 11" 2,000 psi casing head.
  - One 11" 2,000 psi WP double-ram preventer with one (1) set of blind rams on top & one (1) set of pipe rams on bottom complete with hand wheels and extension arms.
  - The choke and kill lines will be connected to outlets between the bottom and top rams, utilizing either the ram body outlet or a drilling spool with side outlets for 2" kill line and minimum 3" choke line
  - One 11" x 2,000 psi WP Hydril GK (or equivalent) annular preventer.
  - Accumulator - Four Station Koomey (or equivalent) 120 gallon closing unit with remote, backup. The accumulator shall have sufficient capacity to open the hydraulically-controlled gate valve and close all rams plus the annular preventer, with a 50% safety factor and retain a minimum of 200 psi above the precharge on the closing manifold without the use of the closing unit pumps. The reservoir capacity shall be double the usable accumulator capacity, and the fluid level shall be maintained at the manufacturer's recommendations.
  - The BOP system shall have two (2) independent power sources (electric and air) available for powering the closing unit pumps. Sufficient nitrogen bottles are suitable as a backup power source only, and shall be recharged when the pressure falls below manufacturer's specification.
  - A valve shall be installed in the closing line as close as possible to the annular preventer to act as a locking device. This valve shall be maintained in the open position and shall be closed only when the power source for the accumulator system is inoperative.

All BOP equipment will be hydraulically operated with controls accessible both on the rig floor.

The wellhead BOP equipment will be nippled-up on the 9-5/8" x 11" 2,000 psi WP casing head prior to drilling out from under surface casing. All ram preventers and related equipment will be tested to 2,000 psi for 10 minutes. Annular preventers will be tested to 50% of rated working pressure for 10 minutes. Surface casing will be tested to 70% of internal yield pressure. All preventers and surface casing will be tested before drilling out of surface casing. BOP equipment will be tested every 14 days, after any repairs are made to the BOP equipment, and after the BOP equipment is subjected to pressure. Annular preventers will be functionally operated at least once per week. Pipe rams will be activated daily and blind rams shall be activated each trip or at least weekly. The New Mexico Oil & Gas Conservation Commission and the BLM will be notified 24 hours in advance of testing of BOPE.

- **PROPOSED BIT AND CASING PROGRAM**

  - Bit Program
    12 1/4" Surface Hole = Surface to 500'
    8 3/4" = 500' to 5952' = 7" Casing point
    6-1/8" Lateral = 5952' MD to 9711' MD = Gallup Pay Zone Horizontal

- Casing Program – all casing stings are new casing

Casing & Hole Size	Weight	Grade	Coupling	Setting Depth (MD)	Comments
9-5/8" (12 1/4")	36 ppf	K-55	LT&C	0' - 500'	New casing. Cement to surface.
7" (8 ¾")	23 ppf	J-55	LT&C	0' - 5839' MD	New Casing. Cement to surface with foam cement.
4 ½" (6 1/8")	11.6 ppf	P-110	LT&C	5000' - 9711' MD	New Casing - Horizontal Hole Cemented full length with foam cement - TOL at 40°.

Casing strings below the conductor casing will be tested to .22 psi per foot of casing string length or 1500 psi, whichever is greater, but not to exceed 70% of the minimum internal yield.

Minimum casing design factors used:
Collapse - 1.125
Burst - 1.0
Jt. Strength - 1.60

Surface casing shall have a minimum of 1 centralizer per joint on the bottom three (3) joints, starting with the shoe joint for a total of (4) minimum centralizers. Centralizers will be placed 10' above the shoe on the shoe joint, on the 1st, 2nd and 3rd casing collars.

The intermediate casing will be centralized using 1 centralizer the first 6 jts and spaced appropriately through the curve section of the well-bore and then spaced +/- 1 centralizer / 4 jts through the remainder of the cement column, using approximately 40 centralizers.

- **PROPOSED CEMENTING PROGRAM**

The proposed cementing program has been designed to protect and/or isolate all usable water zones, potentially productive zones, lost circulation zones, abnormally pressured zones, and any prospectively valuable deposits of minerals. Any isolating medium other than cement shall receive approval prior to use. The casing setting depth shall be calculated to position the casing seat opposite a competent formation which will contain the maximum pressure to which it will be exposed during normal drilling operations. All indications of useable water shall be reported.

- The proposed cementing program is as follows:

Top plugs shall be used to reduce contamination of cement by displacement fluid. A bottom plug or other acceptable technique, such as a pre-flush fluid, inner string cement method, etc. shall be utilized to help isolate the cement from contamination by the mud fluid being displaced ahead of the cement slurry.

Surface Casing Single Stage Job – (0-500'):
Excess – 100% over gauge hole – 12-1/4" hole and 9-5/8" casing (0.3132ft3/ft)
Top of Cement - Surface
Primary Cement
HALCEM (TM) SYSTEM
0.125 lbm/sk Poly-E-Flake (Lost Circulation Additive)
0.4 % Halad(R)-344 (Low Fluid Loss Control)

Fluid Weight	15.80 lbm/gal
Slurry Yield:	1.15 ft^3/sk
Total Mixing Fluid:	4.94 Gal/sk
Top of Fluid:	0 ft
Calculated Fill:	500 ft
Volume:	55.8 bbl 313.2
Calculated Sacks:	273 sks

Intermediate Casing – Two Stage Stage Job (0-5839' MD):
Excess – 50% over gauge hole – 8-3/4" hole and 7" casing (0.1503 ft3/ft)
Top of Cement – Surface.
Foamed Lead Cement
ELASTISEAL (TM) SYSTEM
0.2 % Versaset (Thixotropic Additive)
0.15 % HALAD-766 (Low Fluid Loss Control)
1.5 % CHEM - FOAMER 760, TOTETANK (Foamer)

Fluid Weight	13 lbm/gal
Slurry Yield:	1.43 ft^3/sk
Total Mixing Fluid:	6.74 Gal/sk
Top of Fluid:	0 ft
Calculated Fill:	5760 ft
Volume:	231 bbl
Calculated Sacks:	908 sks

Tail Cement
HALCEM (TM) SYSTEM
0.2 % Versaset (Thixotropic Additive)
0.15 % HALAD-766 (Low Fluid Loss Control)

Fluid Weight	13.50 lbm/gal
Slurry Yield:	1.29 ft^3/sk
Total Mixing Fluid:	5.70 Gal/sk
Top of Fluid:	5760 ft
Calculated Fill:	500 ft
Volume:	20
Calculated Sacks:	90 sks

Primary Cement – Cap Cement
HALCEM (TM) SYSTEM
2 % Calcium Chloride (Accelerator)

Fluid Weight	15.80 lbm/gal
Slurry Yield:	1.17 ft^3/sk
Total Mixing Fluid:	5.02 Gal/sk
Calculated Fill:	500 ft
Volume:	20.77 bbl
Calculated Sacks:	100 sks

Detailed Pumping Schedule

Fluid #	Fluid Type	Fluid Name	Surface Density lbm/gal	Estimated Avg Rate bbl/min	Downhole Volume
1	Spacer	Fresh Water Spacer	8.3		10 bbl
2	Spacer	CHEMICAL WASH	8.4		40 bbl
3	Spacer	Fresh Water Spacer	8.3		10 bbl
4	Cement	Foamed Lead Cement	13.0		908 sks

5	Cement	Tail Cement	13.5		90 sks
6	Spacer	Displacement	8.3		
7	Cement	Cap Cement	15.8		100 sks

Foam Output Parameter Summary:

Fluid #	Fluid Name	Unfoamed Liquid Volume	Beginning Density lbm/gal	Ending Density lbm/gal	Beginning Rate scf/bbl	Ending Rate scf/bbl
Stage 1						
4	Foamed Lead Cement	200bbl	9.5	9.5	4.2	372.9

Foam Design Specifications:

Foam Calculation Method: Constant Density
Backpressure: 14 psig
Bottom Hole Circulating Temp: 105 degF
Mud Outlet Temperature: 85 degF

Calculated Gas = 23129.9 scf
Additional Gas = 50000 scf
Total Gas = 73129.9 scf

Cement volumes are minimums and may be adjusted based on caliper log results.

Production Casing – Single Stage Job (5000' – 9711' MD):
Excess – 50% over gauge hole – 6-1/8" hole and 4-1/2" casing (0.0942 ft3/ft)
Top of Cement – Top of Liner.

Lead Cement - Cap Cement
ELASTISEAL (TM) SYSTEM
0.2 % Versaset (Thixotropic Additive)
0.15 % HALAD-766 (Low Fluid Loss Control)
0.2 % Halad(R)-344 (Low Fluid Loss Control)

Fluid Weight: 13 lbm/gal
Slurry Yield: 1.43 ft^3/sk
Total Mixing Fluid: 6.75 Gal/sk
Top of Fluid: 5300 ft
Calculated Fill: 300 ft
Volume: 7.15 bbl
Calculated Sacks: 30 sks

Foamed Lead Cement
ELASTISEAL (TM) SYSTEM
0.2 % Versaset (Thixotropic Additive)
0.15 % HALAD-766 (Low Fluid Loss Control)
2.5 % CHEM - FOAMER 760, TOTETANK (Foamer)
0.2 % Halad(R)-344 (Low Fluid Loss Control)

Fluid Weight: 13 lbm/gal
Slurry Yield: 1.43 ft^3/sk
Total Mixing Fluid: 6.75 Gal/sk
Top of Fluid: 5600 ft
Calculated Fill: 3914 ft
Volume: 99 bbl
Calculated Sacks: 387 sks

Tail Cement
ELASTISEAL (TM) SYSTEM
0.2 % Versaset (Thixotropic Additive)
0.15 % HALAD-766 (Low Fluid Loss Control)
0.05 % SA-1015 (Suspension Agent)

Fluid Weight: 13.50 lbm/gal
Slurry Yield: 1.28 ft^3/sk
Total Mixing Fluid: 5.64 Gal/sk
Top of Fluid: 9514 ft
Calculated Fill: 1069 ft
Volume: 20.85 bbl
Calculated Sacks: 100 sks

Detailed Pumping Schedule

Fluid #	Fluid Type	Fluid Name	Surface Density lbm/gal	Estimated Avg Rate bbl/min	Downhole Volume
1	Spacer	Fresh Water Spacer	8.3		10 bbl
2	Spacer	CHEMICAL WASH	8.4		40 bbl
3	Spacer	Fresh Water Spacer	8.3		10 bbl
4	Cement	Cap Cement	13.0		30 sks
5	Cement	Foamed Lead Cement	13.0		387 sks
6	Cement	Tail Cement	13.5		100 sks
7	Spacer	MMCR Spacer	8.3		20 bbl
8	Spacer	Fresh Water Displacement	8.3		

Foam Output Parameter Summary:

Fluid #	Fluid Name	Unfoamed Liquid Volume	Beginning Density lbm/gal	Ending Density lbm/gal	Beginning Rate scf/bbl	Ending Rate scf/bbl
Stage 1						
5	Foamed Lead Cement	50.98bbl	10.0	10.0	303.8	509.4

Foam Design Specifications:

Foam Calculation Method: Constant Density
Backpressure: 14 psig
Bottom Hole Circulating Temp: 158 degF
Mud Outlet Temperature: 100 degF

Calculated Gas = 20792.1 scf
Additional Gas = 50000 scf
Total Gas = 70792.1 scf

Production liner clarification: Utilizing foam cement for zonal isolation in the production liner.

Actual volumes will be calculated and determined by conditions onsite. All cement slurries will meet or exceed minimum BLM and New Mexico Oil Conservation Division requirements. Slurries used will be the slurries listed above or equivalent slurries depending on service provider selected. Cement yields may change depending on slurries selected.

All waiting on cement times shall be a minimum of 8 hours or adequate to achieve a minimum of 500 psi compressive strength at the casing shoe prior to drilling out.

- **PROPOSED DRILLING FLUIDS PROGRAM**
  - Vertical Portion

Hole Size (in)	TVD (ft)	Mud Type	Density (lb/gal)	Viscosity (sec/qt)	Fluid Loss (cc)
12 1/4"	0-500'	Fresh Water	8.4-8.6	60-70	NC
8 3/4"	500'-4480'	Fresh Water LSND	8.5-8.8	40-50	8-10

- Kick off to Horizontal Lateral:

Hole Size (in)	TVD/MD (ft)	Mud Type	Density (lb/gal)	Viscosity (sec/qt)	Fluid Loss (CC)	
8 3/4"	4480' MD (KOP)-5952' MD	Fresh Water LSND	8.5-8.8	40-50	8-10	
6 1/8"	5952' MD - 9711' MD	Synthetic Oil Based Mud	7.0-9.0	15-25	<1	

- There will be sufficient mud on location to control a blowout should one occur. Mud flow and volume will be monitored both visually and with electronic pit volume totalizers. Mud tests shall be performed every 24 hours after mudding up to determine, as applicable: density, viscosity, gel strength, filtration, and pH.

- A closed-loop system will be used to recover drilling fluid and dry cuttings in both phases of the well and on all hole intervals, including fresh water and oil-based operations. Above-ground tanks will be utilized to hold cuttings and fluids for rig operations. A frac tank will be on location to store fresh water. Waste will be disposed of properly at an EPA-approved hazardous waste facility. Fresh water cuttings will be disposed of at Basin Disposal, Inc. and/or Industrial Ecosystems, Inc. The location will be lined in accordance with the Surface Use Plan of Operations.

- **TESTING, CORING and LOGGING**

  - Drill Stem Testing - None anticipated
  - Coring - None anticipated.
  - Mud Logging - Mud loggers will be on location from intermediate casing point to TD.
  - Logging - See Below
  - Gamma Ray from surface casing point to TD

  Cased Hole:
  CBL/CCL/GRNDL will be run as needed for perforating control

- **ABNORMAL PRESSURES & HYDROGEN SULFIDE**

  The anticipated bottom hole pressure is +/- 2489 psi based on a 9.0 ppg at 5320' TVD of the landing point of the horizontal. No abnormal pressure or temperatures are anticipated.

  No hydrogen sulfide gas is anticipated, however, if H2S is encountered, the guidelines in Onshore Order No. 6 will be followed.

- **ANTICIPATED START DATE AND DURATION OF OPERATIONS**

Drilling is estimated to commence on July 15, 2014. It is anticipated that completion operations will begin within 30 days after the well has been drilled depending on fracture treatment schedules with various pumping service companies.

It is anticipated that the drilling of this well will take approximately 45 days.

CLOSED-LOOP SYSTEM DESIGN PLAN

The closed-loop system will consist of a series of temporary above-ground storage tanks and/or haul-off bins suitable for holding the cuttings and fluids from drilling operations. The closed loop system will not entail temporary pits, below-grade storage tanks, below-grade sumps, or drying pads.

Design considerations include:

- The closed-loop system will be signed in accordance with 19.15.17.11 NMAC.
- The closed-loop system storage tanks will be of adequate volume to ensure confinement of all fluids and provide sufficient freeboard to prevent uncontrolled releases.
- Topsoil will be salvaged and stored for use in reclamation activities.
- The closed-loop system storage tanks will be placed in bermed secondary containment sized to contain a minimum of 110 percent of the volume of the largest storage tank.

CLOSED-LOOP SYSTEM OPERATING & MAINTENANCE PLAN

The closed-loop system will be operated and maintained to contain liquids and solids; minimize the amount of drilling fluids and cuttings that require disposal; maximize the amount of drilling fluid recycled and reused in the drilling process; isolate drilling wastes from the environment; prevent contamination of fresh water; and protect public health and the environment.

Operation and maintenance considerations include:

- Fluid levels will be maintained to provide sufficient freeboard to prevent over-topping.
- Visual inspections will be conducted on a daily basis to identify any potential leaks and to ensure that the closed-loop system storage tanks have sufficient freeboard to prevent over-topping.
- Only drilling fluids or cuttings intrinsic to, used by, or generated from, drilling operations will be stored in the closed-loop system storage tanks. Hazardous waste, miscellaneous solid waste, and/or debris will not be stored in the storage tanks.
- The OCD District Office will be notified within 48 hours of discovery of a leak in the closed-loop drilling system. If a leak is discovered, all liquid will be removed within 48 hours and the damage repaired.

CLOSED-LOOP SYSTEM CLOSURE PLAN

The closed-loop system will be closed in accordance with 19.15.17.13 NMAC. Closure considerations include:

- Drilling fluids will be recycled and transferred to other permitted closed-loop systems or returned to the vendor for reuse, as practical.
- Residual fluids will be pulled from the storage tanks, mixed with saw dust or similar absorbent material, and disposed of at Industrial Ecosystem, Inc. waste disposal facilities.
- Remaining cuttings or sludges will be vacuumed from the storage tanks and disposed of at the Envirotech, Inc and/or Industrial Ecosystem, Inc. waste disposal facilities.
- Storage tanks will be removed from the well location during the rig move.
- The well pad will be reclaimed and seeded in accordance with subsections G, Hand I of 19.15.17.13 NMAC.

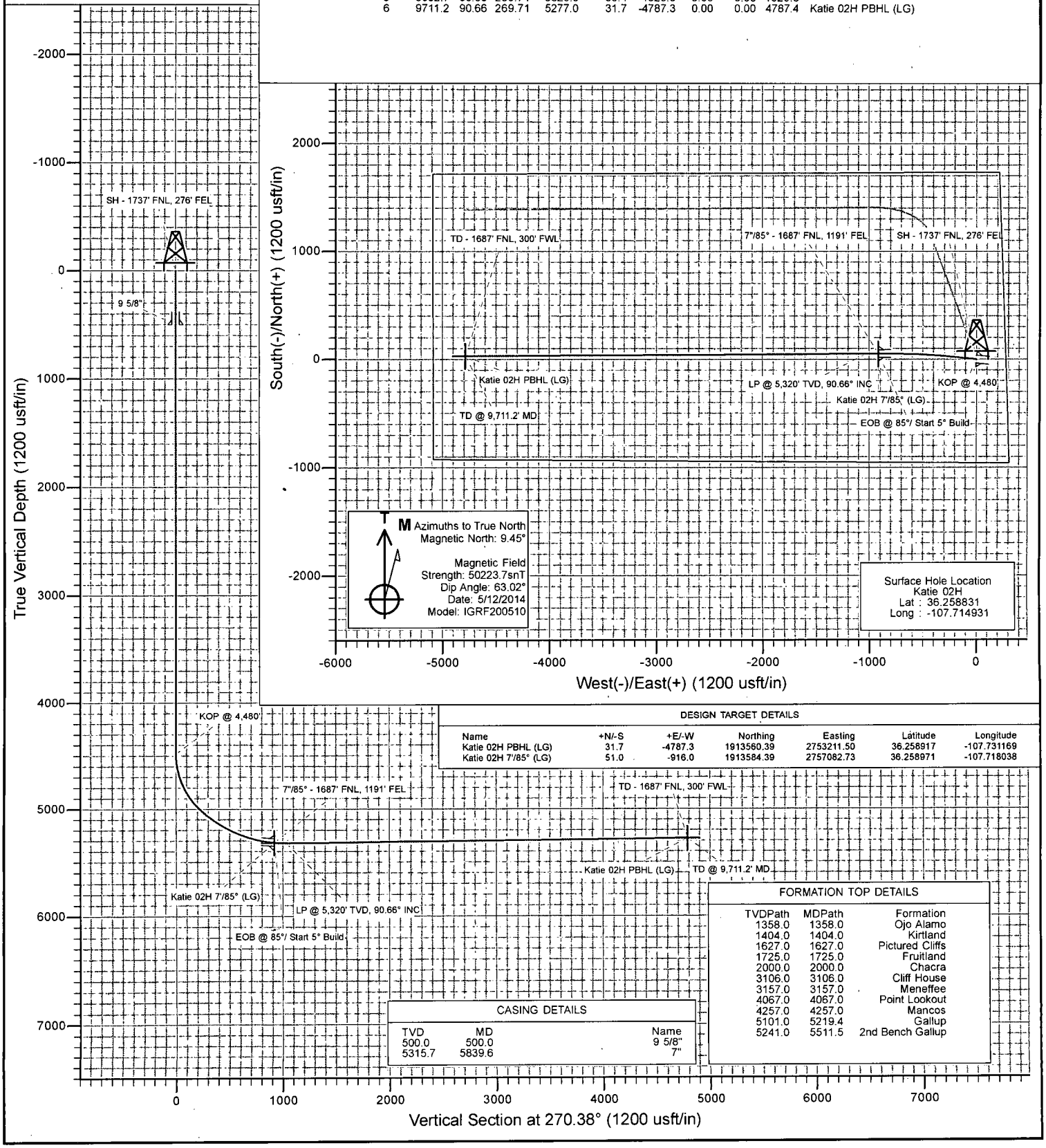
Project: San Juan County, NM
Site: S6--T23N-R8W (Katie Pad)
Well: Katie 02H
Wellbore: HZ
Design: Plan #1 Lower Gallup

CATHEDRAL

Plan #1 Lower Gallup
Katie 02H
145XXX, SC
KB=15' @ 6944.0usft
Ground Elevation @ 6929.0
North American Datum 1983
Well Katie 02H, True North

SECTION DETAILS

Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	VSect	Target
1	0.0	0.00	0.00	0.0	0.0	0.0	0.00	0.00	0.0	
2	4480.0	0.00	0.00	4480.0	0.0	0.0	0.00	0.00	0.0	
3	5048.5	45.48	275.99	4990.6	22.4	-212.9	8.00	275.99	213.0	
4	5839.6	85.00	269.71	5315.7	51.0	-916.0	5.04	-9.79	916.3	Katie 02H 7'/85° (LG)
5	5952.7	90.66	269.71	5320.0	50.4	-1029.0	5.00	0.05	1029.3	
6	9711.2	90.66	269.71	5277.0	31.7	-4787.3	0.00	0.00	4787.4	Katie 02H PBHL (LG)



DESIGN TARGET DETAILS

Name	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
Katie 02H PBHL (LG)	31.7	-4787.3	1913560.39	2753211.50	36.258917	-107.731169
Katie 02H 7'/85° (LG)	51.0	-916.0	1913584.39	2757082.73	36.258971	-107.718038

CASING DETAILS

TVD	MD	Name
500.0	500.0	9 5/8"
5315.7	5839.6	7"

FORMATION TOP DETAILS

TVDPath	MDPath	Formation
1358.0	1358.0	Ojo Alamo
1404.0	1404.0	Kirtland
1627.0	1627.0	Pictured Cliffs
1725.0	1725.0	Fruitland
2000.0	2000.0	Chacra
3106.0	3106.0	Cliff House
3157.0	3157.0	Meneffee
4067.0	4067.0	Point Lookout
4257.0	4257.0	Mancos
5101.0	5219.4	Gallup
5241.0	5511.5	2nd Bench Gallup

Cathedral Energy Services

Planning Report

Database:	USA EDM 5000 Multi Users DB	**Local Co-ordinate Reference:**	Well Katie 02H
Company:	LOGOS Operating LLC	**TVD Reference:**	KB=15' @ 6944.0usft
Project:	San Juan County, NM	**MD Reference:**	KB=15' @ 6944.0usft
Site:	S6--T23N-R8W (Katie Pad)	**North Reference:**	True
Well:	Katie 02H	**Survey Calculation Method:**	Minimum Curvature
Wellbore:	HZ		
Design:	Plan #1 Lower Gallup		

Project San Juan County, NM

Map System:	US State Plane 1983	**System Datum:**	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	New Mexico Western Zone		

Site S6--T23N-R8W (Katie Pad)

Site Position:		**Northing:**	1,913,584.75 usft	**Latitude:**	36.258969
From:	Lat/Long	**Easting:**	2,757,981.93 usft	**Longitude:**	-107.714988
Position Uncertainty:	0.0 usft	**Slot Radius:**	13-3/16"	**Grid Convergence:**	0.07 °

Well Katie 02H

Well Position	**+N/-S**	0.0 usft	**Northing:**	1,913,534.53 usft	**Latitude:**	36.258831
	+E/-W	0.0 usft	**Easting:**	2,757,998.79 usft	**Longitude:**	-107.714931
Position Uncertainty		0.0 usft	**Wellhead Elevation:**	0.0 usft	**Ground Level:**	6,929.0 usft

Wellbore HZ

Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF200510	5/12/2014	9.45	63.02	50,224

Design Plan #1 Lower Gallup

Audit Notes:

Version:		**Phase:**	PROTOTYPE	**Tie On Depth:**	0.0
Vertical Section:	**Depth From (TVD) (usft)**	**+N/-S (usft)**	**+E/-W (usft)**	**Direction (°)**	
	0.0	0.0	0.0	270.38	

Plan Sections

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	TFO (°)	Target
0.0	0.00	0.00	0.0	0.0	0.0	0.00	0.00	0.00	0.00	
4,480.0	0.00	0.00	4,480.0	0.0	0.0	0.00	0.00	0.00	0.00	
5,048.5	45.48	275.99	4,990.6	22.4	-212.9	8.00	8.00	0.00	275.99	
5,839.6	85.00	269.71	5,315.7	51.0	-916.0	5.04	5.00	-0.79	-9.79	Katie 02H 7'/85° (LG)
5,952.7	90.66	269.71	5,320.0	50.4	-1,029.0	5.00	5.00	0.00	0.05	
9,711.2	90.66	269.71	5,277.0	31.7	-4,787.3	0.00	0.00	0.00	0.00	Katie 02H PBHL (LG)

Database:	USA EDM 5000 Multi Users DB	**Local Co-ordinate Reference:**	Well Katie 02H
Company:	LOGOS Operating LLC	**TVD Reference:**	KB=15' @ 6944.0usft
Project:	San Juan County, NM	**MD Reference:**	KB=15' @ 6944.0usft
Site:	S6--T23N-R8W (Katie Pad)	**North Reference:**	True
Well:	Katie 02H	**Survey Calculation Method:**	Minimum Curvature
Wellbore:	HZ		
Design:	Plan #1 Lower Gallup		

Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft	Build Rate (°/100u	Comments / Formations
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00	
0.5	0.00	0.00	0.5	0.0	0.0	0.0	0.00	0.00	SH - 1737' FNL, 276' FEL
100.0	0.00	0.00	100.0	0.0	0.0	0.0	0.00	0.00	
200.0	0.00	0.00	200.0	0.0	0.0	0.0	0.00	0.00	
300.0	0.00	0.00	300.0	0.0	0.0	0.0	0.00	0.00	
400.0	0.00	0.00	400.0	0.0	0.0	0.0	0.00	0.00	
500.0	0.00	0.00	500.0	0.0	0.0	0.0	0.00	0.00	9 5/8"
600.0	0.00	0.00	600.0	0.0	0.0	0.0	0.00	0.00	
700.0	0.00	0.00	700.0	0.0	0.0	0.0	0.00	0.00	
800.0	0.00	0.00	800.0	0.0	0.0	0.0	0.00	0.00	
900.0	0.00	0.00	900.0	0.0	0.0	0.0	0.00	0.00	
1,000.0	0.00	0.00	1,000.0	0.0	0.0	0.0	0.00	0.00	
1,100.0	0.00	0.00	1,100.0	0.0	0.0	0.0	0.00	0.00	
1,200.0	0.00	0.00	1,200.0	0.0	0.0	0.0	0.00	0.00	
1,300.0	0.00	0.00	1,300.0	0.0	0.0	0.0	0.00	0.00	
1,358.0	0.00	0.00	1,358.0	0.0	0.0	0.0	0.00	0.00	Ojo Alamo
1,400.0	0.00	0.00	1,400.0	0.0	0.0	0.0	0.00	0.00	
1,404.0	0.00	0.00	1,404.0	0.0	0.0	0.0	0.00	0.00	Kirtland
1,500.0	0.00	0.00	1,500.0	0.0	0.0	0.0	0.00	0.00	
1,600.0	0.00	0.00	1,600.0	0.0	0.0	0.0	0.00	0.00	
1,627.0	0.00	0.00	1,627.0	0.0	0.0	0.0	0.00	0.00	Pictured Cliffs
1,700.0	0.00	0.00	1,700.0	0.0	0.0	0.0	0.00	0.00	
1,725.0	0.00	0.00	1,725.0	0.0	0.0	0.0	0.00	0.00	Fruitland
1,800.0	0.00	0.00	1,800.0	0.0	0.0	0.0	0.00	0.00	
1,900.0	0.00	0.00	1,900.0	0.0	0.0	0.0	0.00	0.00	
2,000.0	0.00	0.00	2,000.0	0.0	0.0	0.0	0.00	0.00	Chacra
2,100.0	0.00	0.00	2,100.0	0.0	0.0	0.0	0.00	0.00	
2,200.0	0.00	0.00	2,200.0	0.0	0.0	0.0	0.00	0.00	
2,300.0	0.00	0.00	2,300.0	0.0	0.0	0.0	0.00	0.00	
2,400.0	0.00	0.00	2,400.0	0.0	0.0	0.0	0.00	0.00	
2,500.0	0.00	0.00	2,500.0	0.0	0.0	0.0	0.00	0.00	
2,600.0	0.00	0.00	2,600.0	0.0	0.0	0.0	0.00	0.00	
2,700.0	0.00	0.00	2,700.0	0.0	0.0	0.0	0.00	0.00	
2,800.0	0.00	0.00	2,800.0	0.0	0.0	0.0	0.00	0.00	
2,900.0	0.00	0.00	2,900.0	0.0	0.0	0.0	0.00	0.00	
3,000.0	0.00	0.00	3,000.0	0.0	0.0	0.0	0.00	0.00	
3,100.0	0.00	0.00	3,100.0	0.0	0.0	0.0	0.00	0.00	
3,106.0	0.00	0.00	3,106.0	0.0	0.0	0.0	0.00	0.00	Cliff House
3,157.0	0.00	0.00	3,157.0	0.0	0.0	0.0	0.00	0.00	Meneffee
3,200.0	0.00	0.00	3,200.0	0.0	0.0	0.0	0.00	0.00	
3,300.0	0.00	0.00	3,300.0	0.0	0.0	0.0	0.00	0.00	
3,400.0	0.00	0.00	3,400.0	0.0	0.0	0.0	0.00	0.00	
3,500.0	0.00	0.00	3,500.0	0.0	0.0	0.0	0.00	0.00	
3,600.0	0.00	0.00	3,600.0	0.0	0.0	0.0	0.00	0.00	
3,700.0	0.00	0.00	3,700.0	0.0	0.0	0.0	0.00	0.00	
3,800.0	0.00	0.00	3,800.0	0.0	0.0	0.0	0.00	0.00	
3,900.0	0.00	0.00	3,900.0	0.0	0.0	0.0	0.00	0.00	
4,000.0	0.00	0.00	4,000.0	0.0	0.0	0.0	0.00	0.00	
4,067.0	0.00	0.00	4,067.0	0.0	0.0	0.0	0.00	0.00	Point Lookout
4,100.0	0.00	0.00	4,100.0	0.0	0.0	0.0	0.00	0.00	
4,200.0	0.00	0.00	4,200.0	0.0	0.0	0.0	0.00	0.00	
4,257.0	0.00	0.00	4,257.0	0.0	0.0	0.0	0.00	0.00	Mancos

Database:	USA EDM 5000 Multi Users DB	**Local Co-ordinate Reference:**	Well Katie 02H
Company:	LOGOS Operating LLC	**TVD Reference:**	KB=15' @ 6944.0usft
Project:	San Juan County, NM	**MD Reference:**	KB=15' @ 6944.0usft
Site:	S6--T23N-R8W (Katie Pad)	**North Reference:**	True
Well:	Katie 02H	**Survey Calculation Method:**	Minimum Curvature
Wellbore:	HZ		
Design:	Plan #1 Lower Gallup		

Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft	Build Rate (°/100u	Comments / Formations
4,300.0	0.00	0.00	4,300.0	0.0	0.0	0.0	0.00	0.00	
4,400.0	0.00	0.00	4,400.0	0.0	0.0	0.0	0.00	0.00	
4,480.0	0.00	0.00	4,480.0	0.0	0.0	0.0	0.00	0.00	KOP @ 4,480'
4,500.0	1.60	275.99	4,500.0	0.0	-0.3	0.3	8.00	8.00	
4,550.0	5.60	275.99	4,549.9	0.4	-3.4	3.4	8.00	8.00	
4,600.0	9.60	275.99	4,599.4	1.0	-10.0	10.0	8.00	8.00	
4,650.0	13.60	275.99	4,648.4	2.1	-20.0	20.0	8.00	8.00	
4,700.0	17.60	275.99	4,696.6	3.5	-33.3	33.4	8.00	8.00	
4,750.0	21.60	275.99	4,743.6	5.3	-50.0	50.1	8.00	8.00	
4,800.0	25.60	275.99	4,789.5	7.3	-69.9	70.0	8.00	8.00	
4,850.0	29.60	275.99	4,833.8	9.8	-93.0	93.0	8.00	8.00	
4,900.0	33.60	275.99	4,876.3	12.5	-119.0	119.1	8.00	8.00	
4,950.0	37.60	275.99	4,917.0	15.5	-147.9	148.0	8.00	8.00	
5,000.0	41.60	275.99	4,955.5	18.9	-179.6	179.8	8.00	8.00	
5,048.5	45.48	275.99	4,990.6	22.4	-212.9	213.0	8.00	8.00	
5,100.0	48.04	275.40	5,025.9	26.1	-250.2	250.4	5.04	4.97	
5,200.0	53.02	274.37	5,089.5	32.6	-327.1	327.3	5.04	4.98	
5,219.4	53.99	274.19	5,101.0	33.8	-342.6	342.8	5.04	4.99	Gallup
5,300.0	58.01	273.47	5,146.1	38.2	-409.3	409.5	5.04	4.99	
5,400.0	63.01	272.66	5,195.3	42.9	-496.2	496.5	5.04	5.00	
5,500.0	68.01	271.92	5,236.7	46.5	-587.1	587.4	5.04	5.00	
5,511.5	68.58	271.84	5,241.0	46.9	-597.8	598.1	5.04	5.00	2nd Bench Gallup
5,600.0	73.01	271.24	5,270.1	49.1	-681.3	681.6	5.04	5.00	
5,700.0	78.01	270.58	5,295.1	50.6	-778.1	778.4	5.04	5.00	
5,800.0	83.02	269.95	5,311.6	51.1	-876.7	877.0	5.04	5.01	
5,839.6	85.00	269.71	5,315.7	51.0	-916.0	916.4	5.04	5.00	EOB @ 85°/ Start 5° Build - 7"/85° - 1687' FNL,
5,900.0	88.02	269.71	5,319.4	50.7	-976.3	976.6	5.00	5.00	
5,952.7	90.66	269.71	5,320.0	50.4	-1,029.0	1,029.3	5.00	5.00	LP @ 5,320' TVD, 90.66° INC
6,000.0	90.66	269.71	5,319.4	50.2	-1,076.3	1,076.6	0.00	0.00	
6,100.0	90.66	269.71	5,318.3	49.7	-1,176.3	1,176.6	0.00	0.00	
6,200.0	90.66	269.71	5,317.2	49.2	-1,276.3	1,276.6	0.00	0.00	
6,300.0	90.66	269.71	5,316.0	48.7	-1,376.3	1,376.6	0.00	0.00	
6,400.0	90.66	269.71	5,314.9	48.2	-1,476.3	1,476.6	0.00	0.00	
6,500.0	90.66	269.71	5,313.7	47.7	-1,576.3	1,576.6	0.00	0.00	
6,600.0	90.66	269.71	5,312.6	47.2	-1,676.3	1,676.5	0.00	0.00	
6,700.0	90.66	269.71	5,311.4	46.7	-1,776.3	1,776.5	0.00	0.00	
6,800.0	90.66	269.71	5,310.3	46.2	-1,876.2	1,876.5	0.00	0.00	
6,900.0	90.66	269.71	5,309.2	45.7	-1,976.2	1,976.5	0.00	0.00	
7,000.0	90.66	269.71	5,308.0	45.2	-2,076.2	2,076.5	0.00	0.00	
7,100.0	90.66	269.71	5,306.9	44.7	-2,176.2	2,176.5	0.00	0.00	
7,200.0	90.66	269.71	5,305.7	44.2	-2,276.2	2,276.5	0.00	0.00	
7,300.0	90.66	269.71	5,304.6	43.7	-2,376.2	2,376.4	0.00	0.00	
7,400.0	90.66	269.71	5,303.4	43.2	-2,476.2	2,476.4	0.00	0.00	
7,500.0	90.66	269.71	5,302.3	42.7	-2,576.2	2,576.4	0.00	0.00	
7,600.0	90.66	269.71	5,301.1	42.2	-2,676.2	2,676.4	0.00	0.00	
7,700.0	90.66	269.71	5,300.0	41.7	-2,776.2	2,776.4	0.00	0.00	
7,800.0	90.66	269.71	5,298.9	41.2	-2,876.2	2,876.4	0.00	0.00	
7,900.0	90.66	269.71	5,297.7	40.7	-2,976.2	2,976.4	0.00	0.00	
8,000.0	90.66	269.71	5,296.6	40.2	-3,076.2	3,076.4	0.00	0.00	
8,100.0	90.66	269.71	5,295.4	39.7	-3,176.1	3,176.3	0.00	0.00	
8,200.0	90.66	269.71	5,294.3	39.2	-3,276.1	3,276.3	0.00	0.00	
8,300.0	90.66	269.71	5,293.1	38.7	-3,376.1	3,376.3	0.00	0.00	

Cathedral Energy Services

Planning Report

Database:	USA EDM 5000 Multi Users DB	**Local Co-ordinate Reference:**	Well Katie 02H
Company:	LOGOS Operating LLC	**TVD Reference:**	KB=15' @ 6944.0usft
Project:	San Juan County, NM	**MD Reference:**	KB=15' @ 6944.0usft
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Well:	Katie 02H	**Survey Calculation Method:**	Minimum Curvature
Wellbore:	HZ		
Design:	Plan #1 Lower Gallup		

Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft	Build Rate (°/100u	Comments / Formations
8,400.0	90.66	269.71	5,292.0	38.2	-3,476.1	3,476.3	0.00	0.00	
8,500.0	90.66	269.71	5,290.9	37.7	-3,576.1	3,576.3	0.00	0.00	
8,600.0	90.66	269.71	5,289.7	37.2	-3,676.1	3,676.3	0.00	0.00	
8,700.0	90.66	269.71	5,288.6	36.7	-3,776.1	3,776.3	0.00	0.00	
8,800.0	90.66	269.71	5,287.4	36.2	-3,876.1	3,876.2	0.00	0.00	
8,900.0	90.66	269.71	5,286.3	35.7	-3,976.1	3,976.2	0.00	0.00	
9,000.0	90.66	269.71	5,285.1	35.2	-4,076.1	4,076.2	0.00	0.00	
9,100.0	90.66	269.71	5,284.0	34.7	-4,176.1	4,176.2	0.00	0.00	
9,200.0	90.66	269.71	5,282.8	34.3	-4,276.1	4,276.2	0.00	0.00	
9,300.0	90.66	269.71	5,281.7	33.8	-4,376.1	4,376.2	0.00	0.00	
9,400.0	90.66	269.71	5,280.6	33.3	-4,476.0	4,476.2	0.00	0.00	
9,500.0	90.66	269.71	5,279.4	32.8	-4,576.0	4,576.2	0.00	0.00	
9,600.0	90.66	269.71	5,278.3	32.3	-4,676.0	4,676.1	0.00	0.00	
9,700.0	90.66	269.71	5,277.1	31.8	-4,776.0	4,776.1	0.00	0.00	
9,711.2	90.66	269.71	5,277.0	31.7	-4,787.2	4,787.3	0.00	0.00	TD @ 9,711.2' MD - TD - 1687' FNL, 300' FWL

Targets

Target Name - hit/miss target - Shape	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
Katie 02H PBHL (LG) - plan hits target center - Point	0.00	0.00	5,277.0	31.7	-4,787.3	1,913,560.39	2,753,211.50	36.258917	-107.731169
Katie 01H 7'/85° - plan misses target center by 1359.5usft at 5860.5usft MD (5317.3 TVD, 50.9 N, -936.9 E) - Point	0.00	0.00	5,226.7	1,407.3	-949.3	1,914,940.70	2,757,047.80	36.262697	-107.718151
Katie 02H PBHL - plan misses target center by 6.0usft at 9711.2usft MD (5277.0 TVD, 31.7 N, -4787.2 E) - Point	0.00	0.00	5,271.0	31.7	-4,787.3	1,913,560.39	2,753,211.50	36.258917	-107.731169
Katie 01H PBHL - plan misses target center by 1354.2usft at 9706.1usft MD (5277.1 TVD, 31.7 N, -4782.1 E) - Point	0.00	0.00	5,271.0	1,385.9	-4,788.8	1,914,914.56	2,753,208.31	36.262637	-107.731175
Katie 02H 7'/85° - plan misses target center by 88.6usft at 5830.3usft MD (5314.9 TVD, 51.0 N, -906.8 E) - Point	0.00	0.00	5,226.7	51.0	-916.0	1,913,584.39	2,757,082.73	36.258971	-107.718038
Katie 02H 7'/85° (LG) - plan hits target center - Point	0.00	0.00	5,315.7	51.0	-916.0	1,913,584.39	2,757,082.73	36.258971	-107.718038

Casing Points

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
500.0	500.0	9 5/8"	0	0
5,839.6	5,315.7	7"	0	0

Database:	USA EDM 5000 Multi Users DB	**Local Co-ordinate Reference:**	Well Katie 02H
Company:	LOGOS Operating LLC	**TVD Reference:**	KB=15' @ 6944.0usft
Project:	San Juan County, NM	**MD Reference:**	KB=15' @ 6944.0usft
Site:	S6--T23N-R8W (Katie Pad)	**North Reference:**	True
Well:	Katie 02H	**Survey Calculation Method:**	Minimum Curvature
Wellbore:	HZ		
Design:	Plan #1 Lower Gallup		

Formations

Measured Depth (usft)	Vertical Depth (usft)	Name	Lithology	Dip (°)	Dip Direction (°)
1,358.0	1,358.0	Ojo Alamo			
1,404.0	1,404.0	Kirtland			
1,627.0	1,627.0	Pictured Cliffs			
1,725.0	1,725.0	Fruitland			
2,000.0	2,000.0	Chacra			
3,106.0	3,106.0	Cliff House			
3,157.0	3,157.0	Meneffee			
4,067.0	4,067.0	Point Lookout			
4,257.0	4,257.0	Mancos			
5,219.4	5,101.0	Gallup			
5,511.5	5,241.0	2nd Bench Gallup			

Plan Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates +N/-S (usft)	Local Coordinates +E/-W (usft)	Comment
0.5	0.5	0.0	0.0	SH - 1737' FNL, 276' FEL
4,480.0	4,480.0	0.0	0.0	KOP @ 4,480'
5,839.6	5,315.7	51.0	-916.0	EOB @ 85°/ Start 5° Build
5,839.6	5,315.7	51.0	-916.0	7"/85° - 1687' FNL, 1191' FEL
5,952.7	5,320.0	50.4	-1,029.0	LP @ 5,320' TVD, 90.66° INC
9,711.2	5,277.0	31.7	-4,787.2	TD @ 9,711.2' MD
9,711.2	5,277.0	31.7	-4,787.2	TD - 1687' FNL, 300' FWL

LOGOS Operating LLC

San Juan County, NM
S6--T23N-R8W (Katie Pad)
Katie 02H
HZ
Plan #1 Lower Gallup

Anticollision Report

15 May, 2014

Cathedral Energy Services

Anticollision Report

Company:	LOGOS Operating LLC	**Local Co-ordinate Reference:**	Well Katie 02H
Project:	San Juan County, NM	**TVD Reference:**	KB=15' @ 6944.0usft
Reference Site:	S6--T23N-R8W (Katie Pad)	**MD Reference:**	KB=15' @ 6944.0usft
Site Error:	0.0usft	**North Reference:**	True
Reference Well:	Katie 02H	**Survey Calculation Method:**	Minimum Curvature
Well Error:	0.0usft	**Output errors are at**	2.00 sigma
Reference Wellbore	HZ	**Database:**	USA EDM 5000 Multi Users DB
Reference Design:	Plan #1 Lower Gallup	**Offset TVD Reference:**	Offset Datum

Reference Plan #1 Lower Gallup

Filter type:	NO GLOBAL FILTER: Using user defined selection & filtering criteria		
Interpolation Method:	MD Interval 100.0usft	**Error Model:**	ISCWSA
Depth Range:	Unlimited	**Scan Method:**	Closest Approach 3D
Results Limited by:	Maximum center-center distance of 500.0usft	**Error Surface:**	Elliptical Conic
Warning Levels Evaluated at:	2.00 **Sigma**		

Survey Tool Program **Date** 5/15/2014

From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description
0.0	9,711.2	Plan #1 Lower Gallup (HZ)	Geolink MWD	Geolink MWD

Summary

Site Name Offset Well - Wellbore - Design	Reference Measured Depth (usft)	Offset Measured Depth (usft)	Distance Between Centres (usft)	Distance Between Ellipses (usft)	Separation Factor	Warning
S6--T23N-R8W (Katie Pad)						
Katie 01H - HZ - Plan #1	2,400.0	2,400.0	53.0	44.6	6.363	CC, ES
Katie 01H - HZ - Plan #1	2,500.0	2,498.5	54.1	45.5	6.243	SF

CC - Min centre to center distance or covergent point, SF - min separation factor, ES - min ellipse separation

Cathedral Energy Services

Anticollision Report

Company:	LOGOS Operating LLC	**Local Co-ordinate Reference:**	Well Katie 02H
Project:	San Juan County, NM	**TVD Reference:**	KB=15' @ 6944.0usft
Reference Site:	S6-T23N-R8W (Katie Pad)	**MD Reference:**	KB=15' @ 6944.0usft
Site Error:	0.0usft	**North Reference:**	True
Reference Well:	Katie 02H	**Survey Calculation Method:**	Minimum Curvature
Well Error:	0.0usft	**Output errors are at**	2.00 sigma
Reference Wellbore	HZ	**Database:**	USA EDM 5000 Multi Users DB
Reference Design:	Plan #1 Lower Gallup	**Offset TVD Reference:**	Offset Datum

Offset Design S6-T23N-R8W (Katie Pad) - Katie 01H - HZ - Plan #1 — **Offset Site Error:** 0.0 usft

Survey Program: 0-Geolink MWD — **Offset Well Error:** 0.0 usft

Reference Measured Depth (usft)	Reference Vertical Depth (usft)	Offset Measured Depth (usft)	Offset Vertical Depth (usft)	Semi Major Axis Reference (usft)	Semi Major Axis Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	Offset Wellbore Centre +E/-W (usft)	Distance Between Centres (usft)	Distance Between Ellipses (usft)	Total Uncertainty Axis	Separation Factor	Warning
0.0	0.0	0.0	0.0	0.0	0.0	-18.50	50.2	-16.8	53.0				
100.0	100.0	100.0	100.0	0.1	0.1	-18.50	50.2	-16.8	53.0	52.7	0.30	178.532	
200.0	200.0	200.0	200.0	0.3	0.3	-18.50	50.2	-16.8	53.0	52.3	0.65	82.028	
300.0	300.0	300.0	300.0	0.5	0.5	-18.50	50.2	-16.8	53.0	52.0	0.99	53.246	
400.0	400.0	400.0	400.0	0.7	0.7	-18.50	50.2	-16.8	53.0	51.6	1.34	39.416	
500.0	500.0	500.0	500.0	0.8	0.8	-18.50	50.2	-16.8	53.0	51.3	1.69	31.289	
600.0	600.0	600.0	600.0	1.0	1.0	-18.50	50.2	-16.8	53.0	50.9	2.04	25.941	
700.0	700.0	700.0	700.0	1.2	1.2	-18.50	50.2	-16.8	53.0	50.6	2.39	22.154	
800.0	800.0	800.0	800.0	1.4	1.4	-18.50	50.2	-16.8	53.0	50.2	2.74	19.331	
900.0	900.0	900.0	900.0	1.5	1.5	-18.50	50.2	-16.8	53.0	49.9	3.09	17.147	
1,000.0	1,000.0	1,000.0	1,000.0	1.7	1.7	-18.50	50.2	-16.8	53.0	49.5	3.44	15.406	
1,100.0	1,100.0	1,100.0	1,100.0	1.9	1.9	-18.50	50.2	-16.8	53.0	49.2	3.79	13.986	
1,200.0	1,200.0	1,200.0	1,200.0	2.1	2.1	-18.50	50.2	-16.8	53.0	48.8	4.14	12.806	
1,300.0	1,300.0	1,300.0	1,300.0	2.2	2.2	-18.50	50.2	-16.8	53.0	48.5	4.49	11.810	
1,400.0	1,400.0	1,400.0	1,400.0	2.4	2.4	-18.50	50.2	-16.8	53.0	48.1	4.83	10.957	
1,500.0	1,500.0	1,500.0	1,500.0	2.6	2.6	-18.50	50.2	-16.8	53.0	47.8	5.18	10.219	
1,600.0	1,600.0	1,600.0	1,600.0	2.8	2.8	-18.50	50.2	-16.8	53.0	47.4	5.53	9.574	
1,700.0	1,700.0	1,700.0	1,700.0	2.9	2.9	-18.50	50.2	-16.8	53.0	47.1	5.88	9.006	
1,800.0	1,800.0	1,800.0	1,800.0	3.1	3.1	-18.50	50.2	-16.8	53.0	46.7	6.23	8.502	
1,900.0	1,900.0	1,900.0	1,900.0	3.3	3.3	-18.50	50.2	-16.8	53.0	46.4	6.58	8.051	
2,000.0	2,000.0	2,000.0	2,000.0	3.5	3.5	-18.50	50.2	-16.8	53.0	46.0	6.93	7.645	
2,100.0	2,100.0	2,100.0	2,100.0	3.6	3.6	-18.50	50.2	-16.8	53.0	45.7	7.28	7.278	
2,200.0	2,200.0	2,200.0	2,200.0	3.8	3.8	-18.50	50.2	-16.8	53.0	45.3	7.63	6.945	
2,300.0	2,300.0	2,300.0	2,300.0	4.0	4.0	-18.50	50.2	-16.8	53.0	45.0	7.98	6.641	
2,400.0	2,400.0	2,400.0	2,400.0	4.2	4.2	-18.50	50.2	-16.8	53.0	44.6	8.33	6.363	CC, ES
2,500.0	2,500.0	2,498.5	2,498.5	4.3	4.3	-18.54	51.3	-17.2	54.1	45.5	8.67	6.243	SF
2,600.0	2,600.0	2,596.5	2,596.3	4.5	4.5	-18.69	55.5	-18.8	58.7	49.7	9.02	6.505	
2,700.0	2,700.0	2,694.0	2,693.6	4.7	4.7	-18.90	62.7	-21.5	66.6	57.2	9.37	7.107	
2,800.0	2,800.0	2,790.9	2,789.9	4.9	4.9	-19.12	73.0	-25.3	77.9	68.2	9.74	8.005	
2,900.0	2,900.0	2,887.0	2,884.9	5.0	5.1	-19.33	86.2	-30.2	92.6	82.5	10.11	9.155	
3,000.0	3,000.0	2,982.0	2,978.4	5.2	5.3	-19.51	102.2	-36.2	110.5	100.0	10.51	10.515	
3,100.0	3,100.0	3,075.8	3,070.0	5.4	5.6	-19.66	120.8	-43.2	131.7	120.8	10.94	12.043	
3,200.0	3,200.0	3,168.1	3,159.6	5.6	5.8	-19.79	141.8	-51.0	156.1	144.7	11.39	13.698	
3,300.0	3,300.0	3,258.9	3,246.9	5.7	6.2	-19.89	165.2	-59.7	183.5	171.6	11.88	15.442	
3,400.0	3,400.0	3,348.0	3,331.7	5.9	6.5	-19.97	190.6	-69.2	213.9	201.5	12.41	17.243	
3,500.0	3,500.0	3,435.3	3,414.0	6.1	6.9	-20.03	217.8	-79.4	247.3	234.3	12.97	19.070	
3,600.0	3,600.0	3,520.6	3,493.5	6.3	7.3	-20.08	246.7	-90.2	283.5	269.9	13.56	20.902	
3,700.0	3,700.0	3,600.0	3,566.7	6.4	7.7	-20.13	275.6	-101.0	322.4	308.2	14.16	22.761	
3,800.0	3,800.0	3,685.1	3,644.2	6.6	8.3	-20.16	308.7	-113.4	363.9	349.1	14.85	24.502	
3,900.0	3,900.0	3,764.3	3,715.2	6.8	8.8	-20.20	341.4	-125.6	408.0	392.4	15.55	26.244	
4,000.0	4,000.0	3,841.2	3,783.3	7.0	9.3	-20.22	374.9	-138.1	454.5	438.2	16.26	27.949	

Cathedral Energy Services

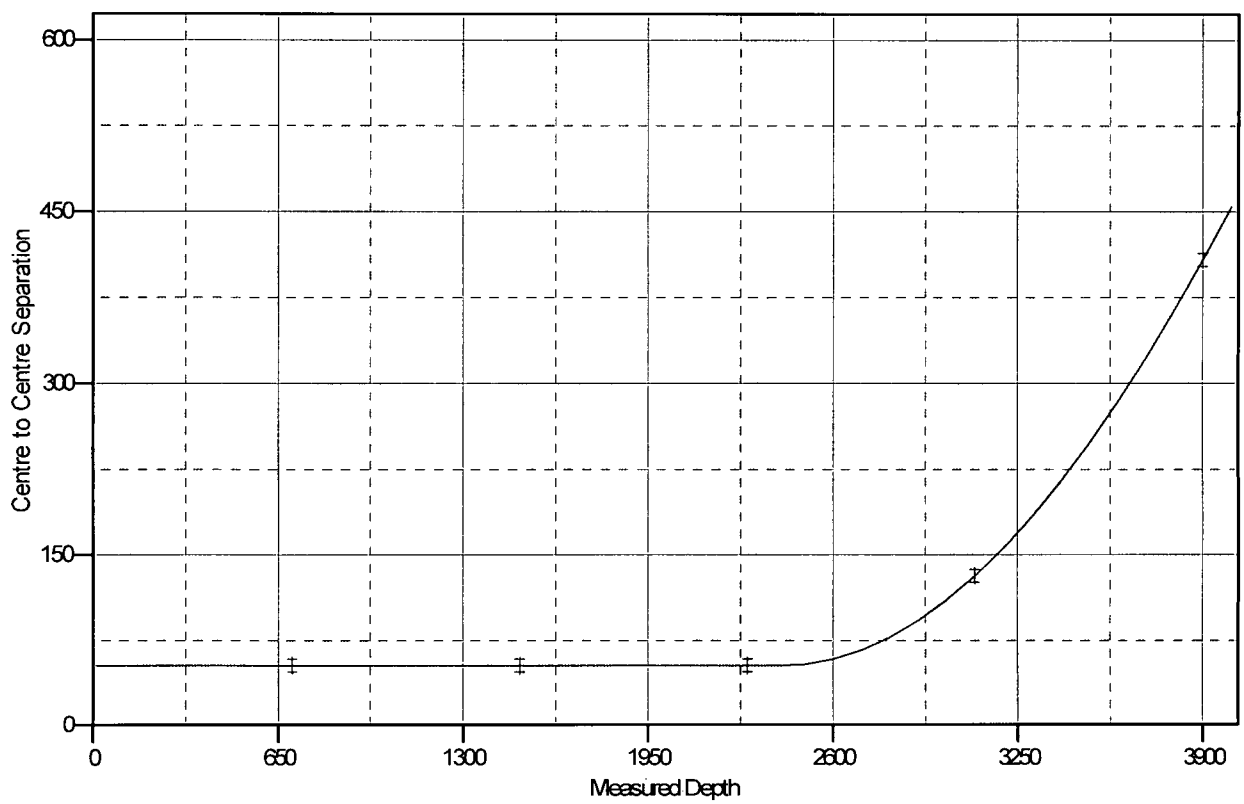
Anticollision Report

Company:	LOGOS Operating LLC	**Local Co-ordinate Reference:**	Well Katie 02H
Project:	San Juan County, NM	**TVD Reference:**	KB=15' @ 6944.0usft
Reference Site:	S6--T23N-R8W (Katie Pad)	**MD Reference:**	KB=15' @ 6944.0usft
Site Error:	0.0usft	**North Reference:**	True
Reference Well:	Katie 02H	**Survey Calculation Method:**	Minimum Curvature
Well Error:	0.0usft	**Output errors are at**	2.00 sigma
Reference Wellbore	HZ	**Database:**	USA EDM 5000 Multi Users DB
Reference Design:	Plan #1 Lower Gallup	**Offset TVD Reference:**	Offset Datum

Reference Depths are relative to KB=15' @ 6944.0usft
Offset Depths are relative to Offset Datum
Central Meridian is -107.833333 °

Coordinates are relative to: Katie 02H
Coordinate System is US State Plane 1983, New Mexico Western Zone
Grid Convergence at Surface is: 0.07°

Ladder Plot



LEGEND

Katie 01H, HZ, Plan #1 V0

CC - Min centre to center distance or covergent point, SF - min separation factor, ES - min ellipse separation

Sheet C

Directions from the Intersection of Highway 550 and Highway 64 in Bloomfield, NM
to
LOGOS OPERATING, LLC
KATIE #002H
1737' FNL 276' FEL,
Section 6, T23N, R8W, N.M.P.M., San Juan County, New Mexico
Latitude: 36° 15' 31.791" N
Longitude: 107° 42' 53.751" W
Nad 1983

From the Intersection of Highway 550 & Highway 64
Go South on Hwy 550 for 36.3 miles,
turn left (easterly) for 1.2 miles
To the beginning of new access
on the right (south) side of the field road and
continues (southerly) for 2026.75'
to the new location.

Well Control Equipment Schematic for 2M Service

Attachment to Drilling Technical Program

Exhibit #1
Typical BOP setup

Location: San Juan Basin, New Mexcio

Date: August 24, 2004
By: John Thompson (Walsh E&P)