

State of New Mexico
Energy, Minerals and Natural Resources Department

Michelle Lujan Grisham
Governor

Sarah Cottrell Propst
Cabinet Secretary

Todd E. Leahy, JD, PhD
Deputy Secretary

Adrienne Sandoval, 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: 2/6/2020

Operator: LOGOS **Well Name and Number:** Apollo 2407 29E 4H

API#: [Click or tap here to enter text.](#), **Section:** 29, **Township:** 24N, **Range:** 7 W

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

☒ Notify appropriate OCD district office 24hrs prior to casing & cement.

☒ If cement doesn't circulate on any casing string or stage tool a CBL will be required. Contact the regulatory agencies prior to proceeding.

☒ Hold C-104 for directional survey & "As Drilled" Plat

☐ Hold C-104 for: ☐ NSL, ☐ NSP, ☐ DHC, ☐ 5.9 Compliance

☐ Spacing rule violation. Operator must follow up with change of status notification on other well to be shut in or abandoned

☒ 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

☒ 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 freshwater zone or zones and shall immediately set in cement the water protection string

☒ Regarding Hydraulic Fracturing, review EPA Underground Injection Control Guidance 84

☒ 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.

☒ Well-bore communication is regulated under 19.15.29 NMAC. This requires well-bore Communication to be reported in accordance with 19.15.29.8.



NMOCD Approved by Signature

10/29/2020

Date

Form 3160-3
(June 2015)FORM APPROVED
OMB No. 1004-0137
Expires: January 31, 2018

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
APPLICATION FOR PERMIT TO DRILL OR REENTER

1a. Type of work: <input checked="" type="checkbox"/> DRILL <input type="checkbox"/> REENTER 1b. Type of Well: <input checked="" type="checkbox"/> Oil Well <input type="checkbox"/> Gas Well <input type="checkbox"/> Other 1c. Type of Completion: <input type="checkbox"/> Hydraulic Fracturing <input checked="" type="checkbox"/> Single Zone <input type="checkbox"/> Multiple Zone		5. Lease Serial No. NMSF0078924 6. If Indian, Allottee or Tribe Name 7. If Unit or CA Agreement, Name and No. 8. Lease Name and Well No. APOLLO 2407 29E 4H 9. API Well No. 30-039-31402
2. Name of Operator LOGOS OPERATING LLC 3a. Address 2010 Afton Place, FARMINGTON, NM 87401 3b. Phone No. (include area code) (505) 324-4145		10. Field and Pool, or Exploratory ESCRITO/ESCRITO-GALLUP ASSOCIAT 11. Sec., T. R. M. or Blk. and Survey or Area SEC 29/T24N/R7W/NMP
4. Location of Well (Report location clearly and in accordance with any State requirements. *) At surface SWNW / 2188 FNL / 93 FWL / LAT 36.286109 / LONG -107.606383 At proposed prod. zone NWNW / 504 FNL / 146 FWL / LAT 36.290929 / LONG -107.624074		12. County or Parish RIO ARRIBA 13. State NM
14. Distance in miles and direction from nearest town or post office* 47 miles 15. Distance from proposed* location to nearest property or lease line, ft. (Also to nearest drig. unit line, if any) 93 feet		16. No of acres in lease 1520 17. Spacing Unit dedicated to this well 281.62
18. Distance from proposed location* to nearest well, drilling, completed, applied for, on this lease, ft. 20 feet		19. Proposed Depth 6045 feet / 14011 feet 20. BLM/BIA Bond No. in file FED: NMB001387
21. Elevations (Show whether DF, KDB, RT, GL, etc.) 7300 feet		22. Approximate date work will start* 03/07/2020 23. Estimated duration 30 days
24. Attachments		

The following, completed in accordance with the requirements of Onshore Oil and Gas Order No. 1, and the Hydraulic Fracturing rule per 43 CFR 3162.3-3 (as applicable)

- | | |
|---|---|
| 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 requested by the BLM. |
|---|---|

25. Signature (Electronic Submission)	Name (Printed/Typed) MARIE FLOREZ / Ph: (505) 324-4145	Date 02/06/2020
Title Regulatory Specialist		
Approved by (Signature) (Electronic Submission)	Name (Printed/Typed) Dave Mankiewicz / Ph: (505) 564-7761	Date 09/16/2020
Title AFM-Minerals		
Office Farmington Field Office		

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.

APPROVED WITH CONDITIONS

Approval Date: 09/16/2020

Submit one copy to
Appropriate District Office

District II
811 S. First Street, Artesia, NM 88210
Phone: (575) 748-1283 Fax: (575) 748-9720

District III
1000 Rio Brazos Road, Aztec, NM 87410
Phone: (505) 334-6178 Fax: (505) 334-6170

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

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

☐ AMENDED REPORT

WELL LOCATION AND ACREAGE DEDICATION PLAT

*API Number 30-039-31402	*Pool Code 22619	*Pool Name ESCRITO GALLUP (ASSOCIATED)
*Property Code 328118	*Property Name APOLLO 2407 29E	*Well Number 4H
*OGRID No. 289408	*Operator Name LOGOS OPERATING, LLC	*Elevation 7300'

¹⁰ Surface Location

UL or lot no.	Section	Township	Range	Lot 10n	Feet from the	North/South line	Feet from the	East/West line	County
E	29	24N	7W		2188	NORTH	93	WEST	RIO ARRIBA

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
D	30	24N	7W	1	504	NORTH	146	WEST	RIO ARRIBA

¹² Dedicated Acres 281.62 SW/4 NW/4 - Section 29 W/2 NW/4 (LOTS 1 & 2) E/2 NW/4, S/2 NE/4 - Section 30	¹³ Joint or Infill	¹⁴ Consolidation Code	¹⁵ Order No.
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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

END-OF-LATERAL (A)	FIRST PERF (B)	ANGLE POINT (C)	ANGLE POINT (D)	ANGLE POINT (E)
504' FNL 145' FWL	568' FNL 221' FWL	1539' FNL 1358' FWL	2080' FNL 2492' FWL	2270' FNL 1774' FEL
SEC 30, T24N, R7W	SEC 30, T24N, R7W	SEC 30, T24N, R7W	SEC 30, T24N, R7W	SEC 30, T24N, R7W
LAT: 36.290917° N	LAT: 36.290738° N	LAT: 36.288030° N	LAT: 36.286501° N	LAT: 36.285944° N
LONG: 107.623465° W	LONG: 107.623207° W	LONG: 107.619291° W	LONG: 107.615409° W	LONG: 107.612107° W
DATUM: NAD1927	DATUM: NAD1927	DATUM: NAD1927	DATUM: NAD1927	DATUM: NAD1927
LAT: 36.290929° N	LAT: 36.290750° N	LAT: 36.288042° N	LAT: 36.286513° N	LAT: 36.285956° N
LONG: 107.624074° W	LONG: 107.623816° W	LONG: 107.619900° W	LONG: 107.616018° W	LONG: 107.612716° W
DATUM: NAD1983	DATUM: NAD1983	DATUM: NAD1983	DATUM: NAD1983	DATUM: NAD1983
ANGLE POINT (F)	LAST PERF (G)	POINT-OF-ENTRY (H)	SURFACE LOCATION (I)	
2270' FNL 1' FWL	2265' FNL 1201' FWL	2265' FNL 1351' FWL	2188' FNL 93' FWL	
SEC 29, T24N, R7W	SEC 29, T24N, R7W	SEC 29, T24N, R7W	SEC 29, T24N, R7W	
LAT: 36.285877° N	LAT: 36.285811° N	LAT: 36.285803° N	LAT: 36.286096° N	
LONG: 107.606087° W	LONG: 107.602016° W	LONG: 107.601508° W	LONG: 107.605774° W	
DATUM: NAD1927	DATUM: NAD1927	DATUM: NAD1927	DATUM: NAD1927	
LAT: 36.285889° N	LAT: 36.285823° N	LAT: 36.285815° N	LAT: 36.286109° N	
LONG: 107.606696° W	LONG: 107.602624° W	LONG: 107.602116° W	LONG: 107.606383° W	
DATUM: NAD1983	DATUM: NAD1983	DATUM: NAD1983	DATUM: NAD1983	
	(RECORD)	NO 05 W 2601.39°		

47 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 the owner of said mineral or working interest, or to a voluntary pooling agreement or a compulsory pooling order heretofore entered by the division.

Tan Session 2/4/20
Signature Date

Tamra Sessions
Printed Name
tsessions@logosresourcesllc.com

E-mail Address

18 SURVEYOR CERTIFICATION

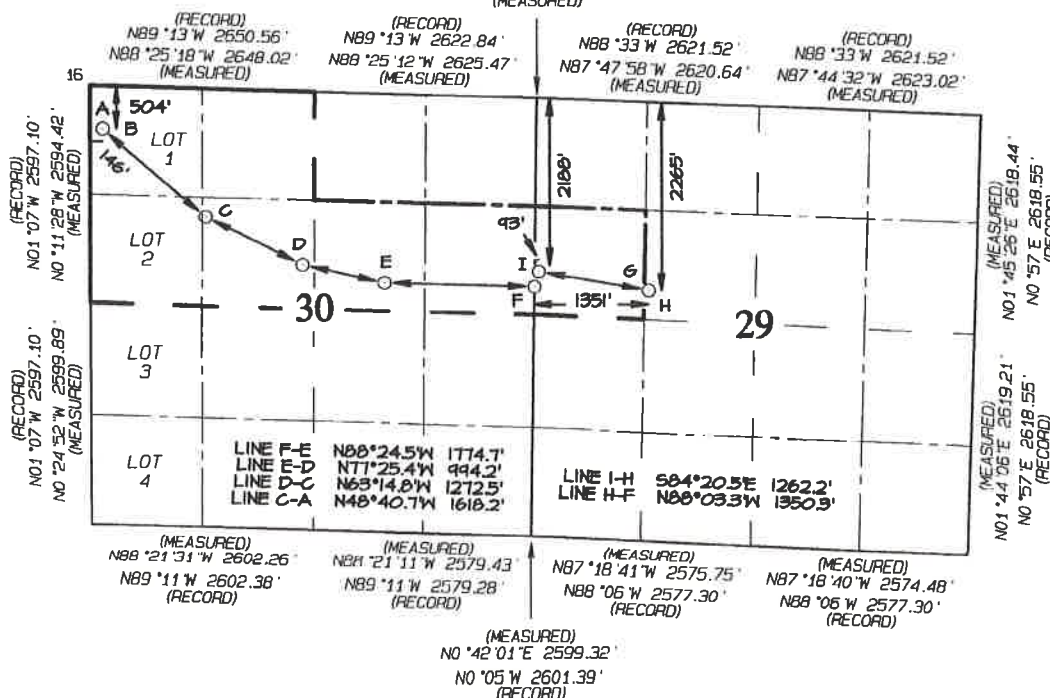
I hereby certify that the well location shown on this plat was plotted from field notes of actual surveys made by me or under my supervision, and that the same is true and correct to the best of my belief.

Date Revised: FEBRUARY 3, 2020
Survey Date: OCTOBER 31, 2018

Signature and Seal of Professional Surveyor



JASON C. EDWARDS
Certificate Number 15269





LOGOS Operating, LLC Operations Plan

Note: This procedure will be adjusted onsite based upon actual conditions

Date:	February 3, 2020	Pool:	Escrito Gallup
Well Name:	Apollo 2407 29E 4H	Elevation:	7,300'
Surface Location:	Sec 29, T24N, R7W 2188 FNL, 93 FWL (36.286109° N, 107.606383° W – NAD83)	Measured Depth:	14,011'
Bottom Hole Location:	Sec 30, T24N, R7W 504 FNL, 146 FWL (36.290929° N, 107.624074° W – NAD83)	County:	Rio Arriba

Lease Serial #NMNM 117567

I. GEOLOGY

A. **Formation Tops (KB):** Estimated top of important geological markers:

NOTE: All Formation Tops/Kickoff points/Landing Depths are based on Ground Level elevation as a reference point and will be adjusted to actual KB when the actual rig is selected.

SURFACE FORMATION - NACIMIENTO

NAME	MD	TVD	NAME	MD	TVD
OJO ALAMO	1760	1755	MENEFEE	4373	4046
KIRTLAND	1914	1904	*POINT LOOKOUT	5234	4780
*FRUITLAND	2137	2115	*MANCOS	5517	5023
*PICTURED CLIFFS	2501	2446	GALLUP	6354	5808
CHACRA	3516	3315	KICKOFF POINT	5465	4799
*CLIFF HOUSE	4299	3983	LANDING POINT	6990	6067
			TD	14011	6045

* indicates depth at which anticipated water, oil, gas or other mineral bearing formations are expected to be encountered.

B. **MUD LOGGING PROGRAM:** Mudlogger on location from KOP to TD.

C. **LOGGING PROGRAM:** LWD GR from surface casing to TD.

D. **NATURAL GAUGES:** Gauge any noticeable increases in gas flow. Record all gauges in Tour book and on morning reports.

II. DRILLING

A. **MUD PROGRAM:** LSND mud (WBM) will be used to drill the 12-1/4" Surface hole, the 8 3/4" Directional Vertical hole, and the curve portion of the wellbore. A LSND (WBM) or (OBM) will be used to drill the lateral portion of well. Treat for lost circulation as necessary. Obtain 100% returns prior to cementing. Notify Engineering of any mud losses.

Above ground steel pits will be used for fluid and cuttings while drilling. In the unlikely event that a tank develops a leak, upon immediate visual discovery, the fluid would be transferred to another tank



and contaminated soil would be removed and disposed. Any leaks, spills or other undesirable events will be reported in accordance with BLM NTL 3A. Rig crews will monitor the tanks at all times.

- B. BOP TESTING:** While drill pipe is in use, the pipe rams and the blindrams will be function tested once each trip. The BOPE will be tested to **250 psi (Low) for 5 minutes** and **1500 psi (High) for 10 minutes**. Pressure test surface casing to **600 psi for 30 minutes** and intermediate casing to **1500 psi for 30 minutes**. Utilize a BOPE Testing Unit with a recording chart and appropriate test plug for testing. The drum brakes will be inspected and tested each tour. **All tests and inspections will be recorded and logged with time and results.**

III. MATERIALS

A. CASING EQUIPMENT:

CASING TYPE	OHSIZE (IN)	DEPTH (MD)	CSG SIZE	WEIGHT	GRADE	CON N
SURFACE	12.25"	320'	9.625"	36 LBS	J-55 or equiv	STC
INTERMEDIATE	8.75"	6,099'	7"	23 LBS	J-55 or equiv	LTC
PRODUCTION	6.125"	5,999' – 14,011'	4.5"	11.6 LBS	P-110 or equiv	LTC
TIE BACK	6.125"	Surf. – 5,999'	4.5"	11.6 LBS	P-110 or equiv	LTC

NOTE: All casing depths are approximate and will be based on drilling conditions +/- 50'. Weights, grades and connections will be based on availability and may vary but will be equivalent or greater.

B. FLOAT EQUIPMENT:

- 1. SURFACE CASING:** 9-5/8" notched regular pattern guide shoe. Run (1) standard centralizer on each of the bottom (4) joints of Surface Casing.
- 2. INTERMEDIATE CASING:** 7" cement nose guide shoe with a self-fill insert float. Place float collar one joint above the shoe. Install (1) centralizer on each of the bottom (3) joints and one standard centralizer every (3) joints to 2,500 ft. Run (1) centralizer at 2,500 ft., 2,300ft., 2,000ft., 1,500 ft., and 1,000 ft. Optional use of DV Tool will be considered if losses while drilling are encountered. See note below.
- 3. PRODUCTION LINER:** Run 4-1/2" Liner with cement nose guide Float Shoe+ 1 jt. of 4- 1/2" casing+ Landing Collar+ 4-1/2" pup joint+ 1 RSI (Sliding Sleeve) positioned inside the legal setback. Centralizer program will be determined by wellbore condition. Set seals on Liner Hanger. Liner to be pressure tested during completion operations.

NOTE: Use of DV tool would be considered by operator as back up in case we experience heavy losses and are concerned with cement not reaching surface. If major losses are not encountered we will not run DV tool. Optional use of cancellation plugs for DV tools may be used if losses while cementing are not encountered.

C. CEMENTING:

(Note: Volumes may be adjusted onsite due to actual conditions)

- 1. SURFACE:** 5 bbl Fresh Water Spacer, 100 sx (161 cu.ft.) of 14.5 ppg Type 1-11



(Neat G) + 20% Fly Ash cement w/ 7.41 gal/sack mix water ratio @ 1.61 cu ft/sx yield. Calculated @volume+ 50% excess. WOC 12 hours. Test csg to 600 psi. Total Volume: (160cu-ft/100 sx/ Bbls). TOC at Surface.

2. INTERMEDIATE: Stage 1: Spacer #1: 20 bbl (112 cuft) Chemwash. Lead Cement: 244 bbls, 702 sks (1368 cu.ft.), 12.3 ppg@ 1.95 cuft/sk yield. Tail Cement: 71 bbls, 307 sks, (399 cuft), 13.5 ppg@ 1.3 cu'ft/sk yield. Displacement: Displace w/ drilling mud or water. Total Cement: 315 bbls, 1009 sks, (1767 cuft)
3. PRODUCTION LINER: Spacer #1: 10 bbl (56.cu-ft) Water Spacer. Spacer #2: 40 bbl 9.5 ppg (224.6 cu-ft) Tuned Spacer Ill. Spacer #3: 10 bbl Water Spacer. Lead Cement: Extencem TM System. Yield 1.36 cuft/sk 13.3 ppg (663 sx / 902 cuft /161 bbls). Tail Spacer: 40 BBL of MMCR. Displacement: Displace w/ drilling mud or water.

IV. COMPLETION

A. CBL

CBLs and/or Temperature Surveys Will Be Performed as needed or required.

B. PRESSURE TEST

With frac stack installed on wellhead, pressure test 4-1/2" casing to 4000 psi max, hold at 1500 psi for 30 minutes. Increase pressure to Open RSI sleeves.

C. STIMULATION

Stimulate with sand, water and N2. Isolate stages with flow through frac plugs. Drill out frac plugs and flowback lateral.

D. PRODUCTION TUBING

Run 2-7/8", 6.5#, J-55, EUE tubing

Intermediate Casing Design - Evacuated/Max Mud Wt (collapse & burst), 100k overpull (tension)

Apollo 2407 29E 4H

Intermediate Interval 1	Top Interval 0	Btm Interval 6099	Size 7	Weight 23	Grade J55	Conn LTC	Collapse 3,270 1.125	Burst 4,360 1.000	Tension 313,000 1.200	Notes 0'-6099'
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Collapse

Interval 1	0	6099	Depth TVD 5587	MW in 0	MW out 9	Pres in 0	Pres out 2615	SF - 1.125 1.25
23	J55							

Burst

Interval 1	0	6099	Depth TVD 5587	MW in 9	MW out 0	Pres in 2615 2615	Pres out 0	SF - 1.0 1.67	Frac Pres 0
23	J55								

Tension

Interval 1	0	6099	Depth TVD 5587	Mud Wt 9	Air Wt 128,501	Bouy Wt 110,844	BW +100k 210,844	SF - 1.2 1.48
23	J55			BF 0.8626				

$$BF = 1 - (MW) / 65.5$$

Liner Casing Design - Evacuation/Max Mud Wt (collaspe), Max Frac Pres (burst) & 100k overpull (tension)

Apollo 2407 29E 4H

Liner	Size	Weight	Grade	Conn	Collapse	Burst	Tension	Notes
Interval 1	4.5	11.6	P-110	LTC	7,560 1.125	10,690 1.000	278,000 1.200	TD 14011', TVD 6067'
Collapse	Casing Depth (TVD) 6067	MW in 0.00	MW out 9.00	Pres in 0	Pres out 2839	SF 2.66		
Burst	6067	9.00	0.00	2839 9339	0	1.14	6500	6500 psi frac pressure + no backup Burst pressure = Hyd + frac pressure
Tension	6067	Mud Wt 8.80 BF 0.8656	Alr Wt 70,377	Bouy Wt 60,922	BW +100k 160,922	1.73		100k over pull BF= 1- (MW)/65.5

Surface Casing Design - Evacuated/Max SICP (collaspe & burst), 100k overpull (tension)

Apollo 2407 29E 4H							
	Size	Weight	Grade	Conn	Collapse	Burst	Tension
Surface	9.625	36	J55	STC	2,020	3,520	394,000
					1.125	1.000	1.200

341 psi (Maximum Estimated SIP)

36 ppf K55 STC

Collapse	Casing Depth	MW in	MW out	Pres in	Pres out	SF	
	320	0	9	0	146	13.79	
Burst	320	9	0	146	0	24.04	
Tension	320	Mud Wt	Air Wt	Bouy Wt	BW +100k	SF	100k over pull
		9	11,520	9,937	109,937	3.58	
		BF					BF= 1- (MW)/65.5
		0.8626					



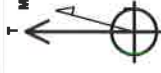
Company: Logos Operating LLC
Project: Rio Arriba, NM NAD83
Site: Apollo 2407-29E
Well: Apollo 2407-29E 4H
Wellbore: OH
Design: Plan #3

PROJECT DETAILS: Rio Arriba, NM NAD83

Geodetic System: US State Plane 1983
Datum: North American Datum 1983
Ellipsoid: GRS 1980
Zone: New Mexico Western Zone
System Datum: Mean Sea Level
Local North: True

Scientific Drilling

Azimuths to True North
Magnetic North: 8.62°
Magnetic Field
Strength: 49371.5nT
Dip Angle: 62.83°
Date: 4/30/2020
Model: HDGM_FILE



WELL DETAILS: Apollo 2407-29E 4H

+N/-S +E/-W Northing Easting Longitude
0.00 0.00 1923521.45 2789977.45 -107.6063830 A

Plan: Plan #3 (Apollo 2407-29E 4H/OH)
Created By: Janie Collins Date: 10:58, January 30 2020

DESIGN TARGET DETAILS

Name	MD	Inc	Adj	TVD	+N/-S	+E/-W	Longitude
Apollo 4H POE	1100.00	0.00	0.00	1100.00	0.00	0.00	-107.6021160
Apollo 4H AP_F	2672.68	31.45	92.981	2594.87	-21.89	420.37	-107.6127160
Apollo 4H AP_E	5465.74	31.45	92.981	4977.53	-87.69	1875.84	-107.6160180
Apollo 4H AP_D	8940.76	31.45	92.981	8627.00	-107.00	1220.56	-107.6199000
Apollo 4H AP_C	8940.76	31.45	92.981	8627.00	-107.00	1220.56	-107.6199000
Apollo 4H AP_B	8358.46	31.45	92.981	8033.82	-79.79	-110.02	-107.6238751
Apollo 4H AP_A	10115.18	31.45	92.981	9058.42	-55.63	-1866.44	-107.6238160
Apollo 4H BHL	11011.16	31.45	92.981	10598.42	-117.21	-2343.66	-107.6238160
Apollo 4H LPerf	11871.48	31.45	92.981	11112.52	-147.21	-2839.58	-107.6238160
Apollo 4H AP_D	12389.72	31.45	92.981	11871.48	-147.21	-2839.58	-107.6238160
Apollo 4H AP_C	13012.46	31.45	92.981	12389.72	-147.21	-2839.58	-107.6238160
Apollo 4H AP_B	14011.16	31.45	92.981	13012.46	-147.21	-2839.58	-107.6238160

SECTION DETAILS

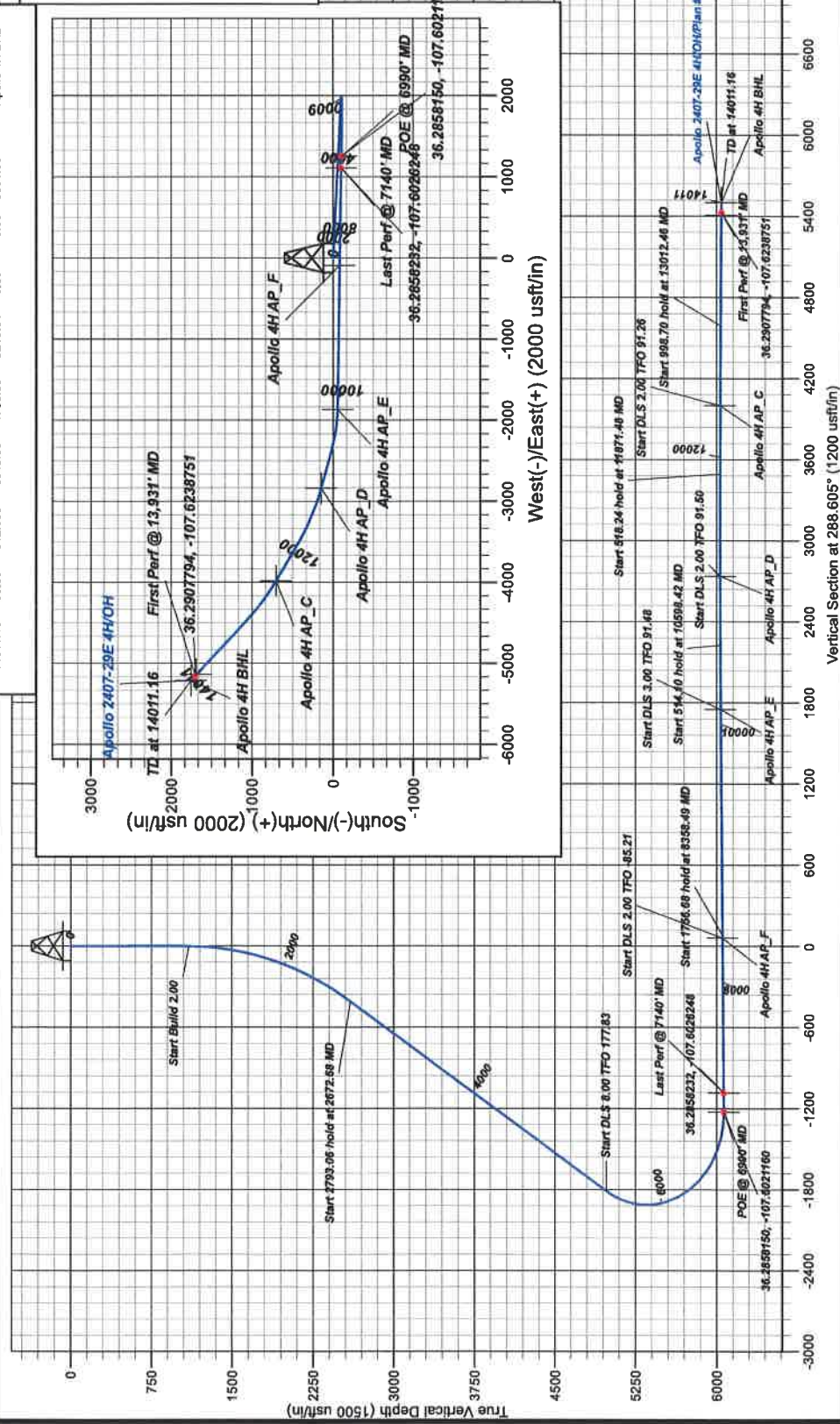
Target	MD	Inc	Adj	TVD	+N/-S	+E/-W	Dleg	TFace	VSecl
Apollo 4H POE	1100.00	0.00	0.00	1100.00	0.00	0.00	0.00	0.00	0.00
Apollo 4H AP_F	2672.68	31.45	92.981	2594.87	-21.89	420.37	0.00	0.00	0.00
Apollo 4H AP_E	5465.74	31.45	92.981	4977.53	-87.69	1875.84	0.00	0.00	0.00
Apollo 4H AP_D	8940.76	31.45	92.981	8627.00	-107.00	1220.56	0.00	0.00	0.00
Apollo 4H AP_C	8940.76	31.45	92.981	8627.00	-107.00	1220.56	0.00	0.00	0.00
Apollo 4H AP_B	8358.46	31.45	92.981	8033.82	-79.79	-110.02	0.00	0.00	0.00
Apollo 4H AP_A	10115.18	31.45	92.981	9058.42	-55.63	-1866.44	0.00	0.00	0.00
Apollo 4H BHL	11011.16	31.45	92.981	10598.42	-117.21	-2343.66	0.00	0.00	0.00
Apollo 4H LPerf	11871.48	31.45	92.981	11112.52	-147.21	-2839.58	0.00	0.00	0.00
Apollo 4H AP_D	12389.72	31.45	92.981	11871.48	-147.21	-2839.58	0.00	0.00	0.00
Apollo 4H AP_C	13012.46	31.45	92.981	12389.72	-147.21	-2839.58	0.00	0.00	0.00
Apollo 4H AP_B	14011.16	31.45	92.981	13012.46	-147.21	-2839.58	0.00	0.00	0.00

CASING DETAILS

No casing data is available

FORMATION DETAILS

MDPath	Formation
1755.00	Ojo Alamo
1904.00	Kirtland
2115.00	Fruitland
2446.00	Pictured Cliffs
3315.00	Chacra
3983.00	Cliff House
4046.00	Menefee
4780.00	Point Lookout
5023.00	Mancos
5517.93	Gallup
5806.00	





Logos Operating LLC

Rio Arriba, NM NAD83

Apollo 2407-29E

Apollo 2407-29E 4H - Slot A

OH

Plan: Plan #3

Standard Planning Report

30 January, 2020





Scientific Drilling, Intl
Planning Report



Database:	Grand Junction	Local Co-ordinate Reference:	Well Apollo 2407-29E 4H - Slot A
Company:	Logos Operating LLC	TVD Reference:	GL 7300' @ 7300.00usft
Project:	Rio Arriba, NM NAD83	MD Reference:	GL 7300' @ 7300.00usft
Site:	Apollo 2407-29E	North Reference:	True
Well:	Apollo 2407-29E 4H	Survey Calculation Method:	Minimum Curvature
Wellbore:	OH		
Design:	Plan #3		

Project	Rio Arriba, NM NAD83		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	New Mexico Western Zone		

Site	Apollo 2407-29E				
Site Position:		Northing:	1,923,521.45 usft	Latitude:	36.2861090
From:	Lat/Long	Easting:	2,789,977.45 usft	Longitude:	-107.6063830
Position Uncertainty:	0.00 usft	Slot Radius:	13.20 in	Grid Convergence:	0.13 °

Well	Apollo 2407-29E 4H - Slot A				
Well Position	+N/-S	0.00 usft	Northing:	1,923,521.45 usft	Latitude: 36.2861090
	+E/-W	0.00 usft	Easting:	2,789,977.45 usft	Longitude: -107.6063830
Position Uncertainty		0.00 usft	Wellhead Elevation:	0.00 usft	Ground Level: 7,300.00 usft

Wellbore	OH				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	BGGM2016	12/31/2017	9.03	63.01	49,676.45684151

Design	Plan #3			
Audit Notes:				
Version:	Phase:	PLAN	Tie On Depth:	0.00
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)
	0.00	0.00	0.00	288.605

Plan Sections										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Dogleg Rate (°/100usft)	Bulld Rate (°/100usft)	Turn Rate (°/100usft)	TFO (°)	Target
0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
1,100.00	0.00	0.000	1,100.00	0.00	0.00	0.00	0.00	0.00	0.00	
2,672.68	31.45	92.981	2,594.87	-21.89	420.37	2.00	2.00	0.00	92.98	
5,465.74	31.45	92.981	4,977.53	-97.69	1,875.84	0.00	0.00	0.00	0.00	
6,990.58	90.55	271.142	6,067.00	-107.00	1,257.56	8.00	3.88	11.68	177.83	Apollo 4H POE
8,340.72	90.55	271.142	6,054.00	-80.09	-92.25	0.00	0.00	0.00	0.00	Apollo 4H AP_F
8,358.49	90.58	270.788	6,053.82	-79.79	-110.02	2.00	0.17	-1.99	-85.21	
10,115.18	90.58	270.788	6,036.00	-55.63	-1,866.44	0.00	0.00	0.00	0.00	Apollo 4H AP_E
10,598.42	90.19	285.280	6,032.72	11.72	-2,343.66	3.00	-0.08	3.00	91.48	
11,112.52	90.19	285.280	6,031.00	147.21	-2,839.58	0.00	0.00	0.00	0.00	Apollo 4H AP_D
11,871.48	89.79	300.454	6,031.11	441.27	-3,536.85	2.00	-0.05	2.00	91.50	
12,389.72	89.79	300.454	6,033.00	703.94	-3,983.59	0.00	0.00	0.00	0.00	Apollo 4H AP_C
13,012.46	89.53	312.906	6,036.73	1,075.20	-4,482.02	2.00	-0.04	2.00	91.26	
14,011.16	89.53	312.906	6,045.00	1,755.09	-5,213.51	0.00	0.00	0.00	0.00	Apollo 4H BHL



Scientific Drilling, Intl
Planning Report



Database:	Grand Junction	Local Co-ordinate Reference:	Well Apollo 2407-29E 4H - Slot A
Company:	Logos Operating LLC	TVD Reference:	GL 7300' @ 7300.00usft
Project:	Rio Arriba, NM NAD83	MD Reference:	GL 7300' @ 7300.00usft
Site:	Apollo 2407-29E	North Reference:	True
Well:	Apollo 2407-29E 4H	Survey Calculation Method:	Minimum Curvature
Wellbore:	OH		
Design:	Plan #3		

Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100.00	0.00	0.000	100.00	0.00	0.00	0.00	0.00	0.00	0.00
200.00	0.00	0.000	200.00	0.00	0.00	0.00	0.00	0.00	0.00
300.00	0.00	0.000	300.00	0.00	0.00	0.00	0.00	0.00	0.00
400.00	0.00	0.000	400.00	0.00	0.00	0.00	0.00	0.00	0.00
500.00	0.00	0.000	500.00	0.00	0.00	0.00	0.00	0.00	0.00
600.00	0.00	0.000	600.00	0.00	0.00	0.00	0.00	0.00	0.00
700.00	0.00	0.000	700.00	0.00	0.00	0.00	0.00	0.00	0.00
800.00	0.00	0.000	800.00	0.00	0.00	0.00	0.00	0.00	0.00
900.00	0.00	0.000	900.00	0.00	0.00	0.00	0.00	0.00	0.00
1,000.00	0.00	0.000	1,000.00	0.00	0.00	0.00	0.00	0.00	0.00
1,100.00	0.00	0.000	1,100.00	0.00	0.00	0.00	0.00	0.00	0.00
1,200.00	2.00	92.981	1,199.98	-0.09	1.74	-1.68	2.00	2.00	0.00
1,300.00	4.00	92.981	1,299.84	-0.36	6.97	-6.72	2.00	2.00	0.00
1,400.00	6.00	92.981	1,399.45	-0.82	15.67	-15.11	2.00	2.00	0.00
1,500.00	8.00	92.981	1,498.70	-1.45	27.84	-26.85	2.00	2.00	0.00
1,600.00	10.00	92.981	1,597.47	-2.26	43.46	-41.91	2.00	2.00	0.00
1,700.00	12.00	92.981	1,695.62	-3.26	62.52	-60.29	2.00	2.00	0.00
1,800.00	14.00	92.981	1,793.06	-4.43	84.98	-81.95	2.00	2.00	0.00
1,900.00	16.00	92.981	1,889.64	-5.77	110.83	-106.88	2.00	2.00	0.00
2,000.00	18.00	92.981	1,985.27	-7.29	140.02	-135.03	2.00	2.00	0.00
2,100.00	20.00	92.981	2,079.82	-8.98	172.53	-166.38	2.00	2.00	0.00
2,200.00	22.00	92.981	2,173.17	-10.85	208.32	-200.89	2.00	2.00	0.00
2,300.00	24.00	92.981	2,265.21	-12.88	247.34	-238.52	2.00	2.00	0.00
2,400.00	26.00	92.981	2,355.84	-15.08	289.54	-279.22	2.00	2.00	0.00
2,500.00	28.00	92.981	2,444.94	-17.44	334.88	-322.94	2.00	2.00	0.00
2,600.00	30.00	92.981	2,532.39	-19.96	383.29	-369.63	2.00	2.00	0.00
2,672.68	31.45	92.981	2,594.87	-21.89	420.37	-405.39	2.00	2.00	0.00
2,700.00	31.45	92.981	2,618.18	-22.63	434.61	-419.12	0.00	0.00	0.00
2,800.00	31.45	92.981	2,703.48	-25.35	486.72	-469.37	0.00	0.00	0.00
2,900.00	31.45	92.981	2,788.79	-28.06	538.83	-519.62	0.00	0.00	0.00
3,000.00	31.45	92.981	2,874.09	-30.77	590.94	-569.88	0.00	0.00	0.00
3,100.00	31.45	92.981	2,959.40	-33.49	643.05	-620.13	0.00	0.00	0.00
3,200.00	31.45	92.981	3,044.71	-36.20	695.16	-670.38	0.00	0.00	0.00
3,300.00	31.45	92.981	3,130.01	-38.92	747.27	-720.63	0.00	0.00	0.00
3,400.00	31.45	92.981	3,215.32	-41.63	799.38	-770.89	0.00	0.00	0.00
3,500.00	31.45	92.981	3,300.63	-44.34	851.49	-821.14	0.00	0.00	0.00
3,600.00	31.45	92.981	3,385.93	-47.06	903.60	-871.39	0.00	0.00	0.00
3,700.00	31.45	92.981	3,471.24	-49.77	955.71	-921.64	0.00	0.00	0.00
3,800.00	31.45	92.981	3,556.54	-52.48	1,007.82	-971.90	0.00	0.00	0.00
3,900.00	31.45	92.981	3,641.85	-55.20	1,059.93	-1,022.15	0.00	0.00	0.00
4,000.00	31.45	92.981	3,727.16	-57.91	1,112.04	-1,072.40	0.00	0.00	0.00
4,100.00	31.45	92.981	3,812.46	-60.62	1,164.15	-1,122.66	0.00	0.00	0.00
4,200.00	31.45	92.981	3,897.77	-63.34	1,216.26	-1,172.91	0.00	0.00	0.00
4,300.00	31.45	92.981	3,983.08	-66.05	1,268.37	-1,223.16	0.00	0.00	0.00
4,400.00	31.45	92.981	4,068.38	-68.77	1,320.48	-1,273.41	0.00	0.00	0.00
4,500.00	31.45	92.981	4,153.69	-71.48	1,372.59	-1,323.67	0.00	0.00	0.00
4,600.00	31.45	92.981	4,238.99	-74.19	1,424.70	-1,373.92	0.00	0.00	0.00
4,700.00	31.45	92.981	4,324.30	-76.91	1,476.81	-1,424.17	0.00	0.00	0.00
4,800.00	31.45	92.981	4,409.61	-79.62	1,528.92	-1,474.42	0.00	0.00	0.00
4,900.00	31.45	92.981	4,494.91	-82.33	1,581.03	-1,524.68	0.00	0.00	0.00
5,000.00	31.45	92.981	4,580.22	-85.05	1,633.15	-1,574.93	0.00	0.00	0.00
5,100.00	31.45	92.981	4,665.53	-87.76	1,685.26	-1,625.18	0.00	0.00	0.00
5,200.00	31.45	92.981	4,750.83	-90.48	1,737.37	-1,675.43	0.00	0.00	0.00



Scientific Drilling, Intl
Planning Report



Database:	Grand Junction	Local Co-ordinate Reference:	Well Apollo 2407-29E 4H - Slot A
Company:	Logos Operating LLC	TVD Reference:	GL 7300' @ 7300.00usft
Project:	Rio Arriba, NM NAD83	MD Reference:	GL 7300' @ 7300.00usft
Site:	Apollo 2407-29E	North Reference:	True
Well:	Apollo 2407-29E 4H	Survey Calculation Method:	Minimum Curvature
Wellbore:	OH		
Design:	Plan #3		

Planned Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
5,300.00	31.45	92.981	4,836.14	-93.19	1,789.48	-1,725.69	0.00	0.00	0.00
5,400.00	31.45	92.981	4,921.44	-95.90	1,841.59	-1,775.94	0.00	0.00	0.00
5,465.74	31.45	92.981	4,977.53	-97.69	1,875.84	-1,808.98	0.00	0.00	0.00
5,500.00	28.71	93.197	5,007.17	-98.61	1,892.99	-1,825.52	8.00	-7.99	0.63
5,600.00	20.72	94.123	5,097.93	-101.23	1,934.69	-1,865.88	8.00	-7.99	0.93
5,700.00	12.74	96.140	5,193.62	-103.68	1,963.35	-1,893.82	8.00	-7.98	2.02
5,800.00	4.83	104.649	5,292.37	-105.93	1,978.41	-1,908.82	8.00	-7.92	8.51
5,900.00	3.49	252.259	5,392.26	-107.93	1,979.59	-1,910.56	8.00	-1.34	147.61
6,000.00	11.36	265.491	5,491.35	-109.63	1,966.85	-1,899.03	8.00	7.87	13.23
6,100.00	19.34	267.905	5,587.71	-111.01	1,940.44	-1,874.45	8.00	7.98	2.41
6,200.00	27.33	268.941	5,679.46	-112.04	1,900.88	-1,837.28	8.00	7.99	1.04
6,300.00	35.32	269.534	5,764.81	-112.70	1,848.94	-1,788.27	8.00	7.99	0.59
6,400.00	43.32	269.931	5,842.11	-112.98	1,785.63	-1,728.35	8.00	8.00	0.40
6,500.00	51.31	270.225	5,909.85	-112.87	1,712.18	-1,658.71	8.00	8.00	0.29
6,600.00	59.31	270.460	5,966.71	-112.37	1,630.02	-1,580.68	8.00	8.00	0.23
6,700.00	67.31	270.658	6,011.59	-111.49	1,540.75	-1,495.80	8.00	8.00	0.20
6,800.00	75.31	270.835	6,043.61	-110.26	1,446.11	-1,405.71	8.00	8.00	0.18
6,900.00	83.31	270.998	6,062.15	-108.69	1,347.94	-1,312.17	8.00	8.00	0.16
6,990.58	90.55	271.142	6,067.00	-107.00	1,257.56	-1,225.98	8.00	8.00	0.16
7,000.00	90.55	271.142	6,066.91	-106.81	1,248.14	-1,216.99	0.00	0.00	0.00
7,100.00	90.55	271.142	6,065.95	-104.82	1,148.17	-1,121.60	0.00	0.00	0.00
7,200.00	90.55	271.142	6,064.98	-102.82	1,048.19	-1,026.22	0.00	0.00	0.00
7,300.00	90.55	271.142	6,064.02	-100.83	948.22	-930.83	0.00	0.00	0.00
7,400.00	90.55	271.142	6,063.06	-98.84	848.24	-835.45	0.00	0.00	0.00
7,500.00	90.55	271.142	6,062.10	-96.84	748.27	-740.06	0.00	0.00	0.00
7,600.00	90.55	271.142	6,061.13	-94.85	648.29	-644.67	0.00	0.00	0.00
7,700.00	90.55	271.142	6,060.17	-92.86	548.32	-549.29	0.00	0.00	0.00
7,800.00	90.55	271.142	6,059.21	-90.86	448.34	-453.90	0.00	0.00	0.00
7,900.00	90.55	271.142	6,058.24	-88.87	348.36	-358.51	0.00	0.00	0.00
8,000.00	90.55	271.142	6,057.28	-86.88	248.39	-263.13	0.00	0.00	0.00
8,100.00	90.55	271.142	6,056.32	-84.89	148.41	-167.74	0.00	0.00	0.00
8,200.00	90.55	271.142	6,055.36	-82.89	48.44	-72.35	0.00	0.00	0.00
8,300.00	90.55	271.142	6,054.39	-80.90	-51.54	23.03	0.00	0.00	0.00
8,340.72	90.55	271.142	6,054.00	-80.09	-92.25	61.87	0.00	0.00	0.00
8,358.49	90.58	270.788	6,053.82	-79.79	-110.02	78.81	2.00	0.17	-1.99
8,400.00	90.58	270.788	6,053.40	-79.22	-151.52	118.33	0.00	0.00	0.00
8,500.00	90.58	270.788	6,052.39	-77.84	-251.50	213.52	0.00	0.00	0.00
8,600.00	90.58	270.788	6,051.37	-76.47	-351.49	308.72	0.00	0.00	0.00
8,700.00	90.58	270.788	6,050.36	-75.09	-451.47	403.92	0.00	0.00	0.00
8,800.00	90.58	270.788	6,049.34	-73.72	-551.46	499.12	0.00	0.00	0.00
8,900.00	90.58	270.788	6,048.33	-72.34	-651.45	594.32	0.00	0.00	0.00
9,000.00	90.58	270.788	6,047.32	-70.97	-751.43	689.52	0.00	0.00	0.00
9,100.00	90.58	270.788	6,046.30	-69.59	-851.42	784.72	0.00	0.00	0.00
9,200.00	90.58	270.788	6,045.29	-68.22	-951.40	879.92	0.00	0.00	0.00
9,300.00	90.58	270.788	6,044.27	-66.84	-1,051.39	975.11	0.00	0.00	0.00
9,400.00	90.58	270.788	6,043.26	-65.47	-1,151.37	1,070.31	0.00	0.00	0.00
9,500.00	90.58	270.788	6,042.24	-64.09	-1,251.36	1,165.51	0.00	0.00	0.00
9,600.00	90.58	270.788	6,041.23	-62.72	-1,351.34	1,260.71	0.00	0.00	0.00
9,700.00	90.58	270.788	6,040.21	-61.34	-1,451.33	1,355.91	0.00	0.00	0.00
9,800.00	90.58	270.788	6,039.20	-59.97	-1,551.31	1,451.11	0.00	0.00	0.00
9,900.00	90.58	270.788	6,038.18	-58.59	-1,651.30	1,546.31	0.00	0.00	0.00
10,000.00	90.58	270.788	6,037.17	-57.22	-1,751.28	1,641.50	0.00	0.00	0.00
10,100.00	90.58	270.788	6,036.15	-55.84	-1,851.27	1,736.70	0.00	0.00	0.00
10,115.18	90.58	270.788	6,036.00	-55.63	-1,866.44	1,751.15	0.00	0.00	0.00



Scientific Drilling, Intl
Planning Report



Database:	Grand Junction	Local Co-ordinate Reference:	Well Apollo 2407-29E 4H - Slot A
Company:	Logos Operating LLC	TVD Reference:	GL 7300' @ 7300.00usft
Project:	Rio Arriba, NM NAD83	MD Reference:	GL 7300' @ 7300.00usft
Site:	Apollo 2407-29E	North Reference:	True
Well:	Apollo 2407-29E 4H	Survey Calculation Method:	Minimum Curvature
Wellbore:	OH		
Design:	Plan #3		

Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
10,200.00	90.51	273.332	6,035.19	-52.59	-1,951.20	1,832.45	3.00	-0.08	3.00
10,300.00	90.44	276.331	6,034.36	-44.17	-2,050.83	1,929.56	3.00	-0.08	3.00
10,400.00	90.35	279.330	6,033.67	-30.54	-2,149.89	2,027.78	3.00	-0.08	3.00
10,500.00	90.27	282.329	6,033.12	-11.76	-2,248.09	2,126.85	3.00	-0.08	3.00
10,598.42	90.19	285.280	6,032.72	11.72	-2,343.66	2,224.92	3.00	-0.08	3.00
10,600.00	90.19	285.280	6,032.72	12.14	-2,345.18	2,226.49	0.00	0.00	0.00
10,700.00	90.19	285.280	6,032.38	38.49	-2,441.65	2,326.32	0.00	0.00	0.00
10,800.00	90.19	285.280	6,032.05	64.85	-2,538.11	2,426.15	0.00	0.00	0.00
10,900.00	90.19	285.280	6,031.71	91.20	-2,634.58	2,525.99	0.00	0.00	0.00
11,000.00	90.19	285.280	6,031.38	117.56	-2,731.04	2,625.82	0.00	0.00	0.00
11,100.00	90.19	285.280	6,031.04	143.91	-2,827.50	2,725.65	0.00	0.00	0.00
11,112.52	90.19	285.280	6,031.00	147.21	-2,839.58	2,738.15	0.00	0.00	0.00
11,200.00	90.15	287.029	6,030.74	171.55	-2,923.60	2,825.54	2.00	-0.05	2.00
11,300.00	90.09	289.029	6,030.53	202.50	-3,018.69	2,925.53	2.00	-0.05	2.00
11,400.00	90.04	291.028	6,030.42	236.74	-3,112.64	3,025.50	2.00	-0.05	2.00
11,500.00	89.99	293.027	6,030.39	274.25	-3,205.33	3,125.31	2.00	-0.05	2.00
11,600.00	89.93	295.026	6,030.46	314.96	-3,296.66	3,224.86	2.00	-0.05	2.00
11,700.00	89.88	297.026	6,030.62	358.84	-3,386.52	3,324.02	2.00	-0.05	2.00
11,800.00	89.83	299.025	6,030.88	405.82	-3,474.79	3,422.66	2.00	-0.05	2.00
11,871.48	89.79	300.454	6,031.11	441.27	-3,536.85	3,492.79	2.00	-0.05	2.00
11,900.00	89.79	300.454	6,031.22	455.73	-3,561.43	3,520.71	0.00	0.00	0.00
12,000.00	89.79	300.454	6,031.58	506.42	-3,647.64	3,618.58	0.00	0.00	0.00
12,100.00	89.79	300.454	6,031.94	557.10	-3,733.84	3,716.45	0.00	0.00	0.00
12,200.00	89.79	300.454	6,032.31	607.78	-3,820.04	3,814.32	0.00	0.00	0.00
12,300.00	89.79	300.454	6,032.67	658.47	-3,906.25	3,912.18	0.00	0.00	0.00
12,389.72	89.79	300.454	6,033.00	703.94	-3,983.59	3,999.99	0.00	0.00	0.00
12,400.00	89.79	300.660	6,033.04	709.17	-3,992.44	4,010.05	2.00	-0.04	2.00
12,500.00	89.74	302.659	6,033.45	761.65	-4,077.55	4,107.46	2.00	-0.04	2.00
12,600.00	89.70	304.659	6,033.93	817.07	-4,160.78	4,204.02	2.00	-0.04	2.00
12,700.00	89.66	306.658	6,034.50	875.37	-4,242.03	4,299.62	2.00	-0.04	2.00
12,800.00	89.61	308.658	6,035.13	936.46	-4,321.19	4,394.13	2.00	-0.04	2.00
12,900.00	89.57	310.657	6,035.84	1,000.27	-4,398.17	4,487.45	2.00	-0.04	2.00
13,000.00	89.53	312.657	6,036.63	1,066.73	-4,472.88	4,579.46	2.00	-0.04	2.00
13,012.46	89.53	312.906	6,036.73	1,075.20	-4,482.02	4,590.82	2.00	-0.04	2.00
13,100.00	89.53	312.906	6,037.45	1,134.79	-4,546.14	4,670.61	0.00	0.00	0.00
13,200.00	89.53	312.906	6,038.28	1,202.87	-4,619.39	4,761.74	0.00	0.00	0.00
13,300.00	89.53	312.906	6,039.11	1,270.95	-4,692.63	4,852.88	0.00	0.00	0.00
13,400.00	89.53	312.906	6,039.94	1,339.02	-4,765.87	4,944.02	0.00	0.00	0.00
13,500.00	89.53	312.906	6,040.77	1,407.10	-4,839.12	5,035.15	0.00	0.00	0.00
13,600.00	89.53	312.906	6,041.59	1,475.18	-4,912.36	5,126.29	0.00	0.00	0.00
13,700.00	89.53	312.906	6,042.42	1,543.26	-4,985.61	5,217.43	0.00	0.00	0.00
13,800.00	89.53	312.906	6,043.25	1,611.34	-5,058.85	5,308.56	0.00	0.00	0.00
13,900.00	89.53	312.906	6,044.08	1,679.41	-5,132.10	5,399.70	0.00	0.00	0.00
14,000.00	89.53	312.906	6,044.91	1,747.49	-5,205.34	5,490.84	0.00	0.00	0.00
14,011.16	89.53	312.906	6,045.00	1,755.09	-5,213.51	5,501.00	0.00	0.00	0.00



Scientific Drilling, Intl Planning Report



Database:	Grand Junction	Local Co-ordinate Reference:	Well Apollo 2407-29E 4H - Slot A
Company:	Logos Operating LLC	TVD Reference:	GL 7300' @ 7300.00usft
Project:	Rio Arriba, NM NAD83	MD Reference:	GL 7300' @ 7300.00usft
Site:	Apollo 2407-29E	North Reference:	True
Well:	Apollo 2407-29E 4H	Survey Calculation Method:	Minimum Curvature
Wellbore:	OH		
Design:	Plan #3		

Design 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
Apollo 4H AP_D - plan hits target center - Point	0.00	0.000	6,031.00	147.21	-2,839.58	1,923,662.01	2,787,137.53	36.2865130	-107.6160180
Apollo 4H AP_C - plan hits target center - Point	0.00	0.000	6,033.00	703.94	-3,983.59	1,924,216.06	2,785,992.23	36.2880420	-107.6199000
Apollo 4H AP_E - plan hits target center - Point	0.00	0.000	6,036.00	-55.63	-1,866.44	1,923,461.44	2,788,111.14	36.2859560	-107.6127160
Apollo 4H FPerf - plan misses target center by 4.02usft at 13911.10usft MD (6044.17 TVD, 1686.97 N, -5140.22 E) - Point	0.00	0.000	6,044.00	1,689.91	-5,137.49	1,925,199.32	2,784,836.01	36.2907500	-107.6238160
Apollo 4H BHL - plan hits target center - Point	0.00	0.000	6,045.00	1,755.09	-5,213.51	1,925,264.31	2,784,759.84	36.2909290	-107.6240740
Apollo 4H AP_F - plan hits target center - Point	0.00	0.000	6,054.00	-80.09	-92.25	1,923,441.15	2,789,885.39	36.2858890	-107.6066960
Apollo 4H LPerf - plan misses target center by 0.56usft at 7140.34usft MD (6065.56 TVD, -104.01 N, 1107.84 E) - Point	0.00	0.000	6,065.00	-104.09	1,107.84	1,923,419.96	2,791,085.54	36.2858230	-107.6026240
Apollo 4H POE - plan hits target center - Point	0.00	0.000	6,067.00	-107.00	1,257.56	1,923,417.41	2,791,235.26	36.2858150	-107.6021160

Formations

Measured Depth (usft)	Vertical Depth (usft)	Name	Lithology	Dip (°)	Dip Direction (°)
1,760.85	1,755.00	Ojo Alamo		0.00	0.000
1,914.95	1,904.00	Kirtland		0.00	0.000
2,137.53	2,115.00	Fruitland		0.00	0.000
2,501.20	2,446.00	Pictured Cliffs		0.00	0.000
3,516.85	3,315.00	Chacra		0.00	0.000
4,299.91	3,983.00	Cliff House		0.00	0.000
4,373.76	4,046.00	Menefee		0.00	0.000
5,234.19	4,780.00	Point Lookout		0.00	0.000
5,517.93	5,023.00	Mancos		0.00	0.000
6,354.45	5,808.00	Gallup		0.00	0.000



Scientific Drilling, Intl
Planning Report



Database: Grand Junction
Company: Logos Operating LLC
Project: Rio Arriba, NM NAD83
Site: Apollo 2407-29E
Well: Apollo 2407-29E 4H
Wellbore: OH
Design: Plan #3

Local Co-ordinate Reference: Well Apollo 2407-29E 4H - Slot A
TV D Reference: GL 7300' @ 7300.00usft
MD Reference: GL 7300' @ 7300.00usft
North Reference: True
Survey Calculation Method: Minimum Curvature

Plan Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
1,100.00	1,100.00	0.00	0.00	Start Build 2.00
2,672.68	2,594.87	-21.89	420.37	Start 2793.06 hold at 2672.68 MD
5,465.74	4,977.53	-97.69	1,875.84	Start DLS 8.00 TFO 177.83
6,990.58	6,067.00	-107.00	1,257.56	POE @ 6990' MD
6,990.58	6,067.00	-107.00	1,257.56	36.2858150, -107.6021160
7,140.58	6,065.56	-104.01	1,107.60	Last Perf @ 7140' MD
7,140.58	6,065.56	-104.01	1,107.60	36.2858232, -107.6026248
8,340.72	6,054.00	-80.09	-92.25	Start DLS 2.00 TFO -85.21
8,358.49	6,053.82	-79.79	-110.01	Start 1756.68 hold at 8358.49 MD
10,115.18	6,036.00	-55.63	-1,866.45	Start DLS 3.00 TFO 91.48
10,598.42	6,032.72	11.72	-2,343.66	Start 514.10 hold at 10598.42 MD
11,112.52	6,031.00	147.21	-2,839.58	Start DLS 2.00 TFO 91.50
11,871.48	6,031.11	441.28	-3,536.85	Start 518.24 hold at 11871.48 MD
12,389.72	6,033.00	703.94	-3,983.59	Start DLS 2.00 TFO 91.26
13,012.46	6,036.73	1,075.20	-4,482.02	Start 998.70 hold at 13012.46 MD
13,931.16	6,044.34	1,700.63	-5,154.92	First Perf @ 13,931' MD
13,931.16	6,044.34	1,700.63	-5,154.92	36.2907794, -107.6238751
14,011.16	6,045.00	1,755.09	-5,213.51	TD at 14011.16



Logos Operating LLC

Rio Arriba, NM NAD83

Apollo 2407-29E

Apollo 2407-29E 4H

OH

Plan #3

Anticollision Report

30 January, 2020



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Scientific Drilling, Intl Anticollision Report



Company:	Logos Operating LLC	Local Co-ordinate Reference:	Well Apollo 2407-29E 4H - Slot A
Project:	Rio Arriba, NM NAD83	TVD Reference:	GL 7300' @ 7300.00usft
Reference Site:	Apollo 2407-29E	MD Reference:	GL 7300' @ 7300.00usft
Site Error:	0.00 usft	North Reference:	True
Reference Well:	Apollo 2407-29E 4H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 usft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction
Reference Design:	Plan #3	Offset TVD Reference:	Offset Datum

Reference	Plan #3		
Filter type:	NO GLOBAL FILTER: Using user defined selection & filtering criteria		
Interpolation Method:	Stations	Error Model:	ISCWSA
Depth Range:	Unlimited	Scan Method:	Closest Approach 3D
Results Limited by:	Maximum ellipse separation of 1,000.00 usft	Error Surface:	Pedal Curve
Warning Levels Evaluated at:	2.00 Sigma	Casing Method:	Not applied

Survey Tool Program		Date	1/30/2020		
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
0.00	14,011.16	Plan #3 (OH)	MWD+HDGM	OWSG MWD + HDGM	

Summary						
Site Name	Reference	Offset	Distance		Separation	Warning
	Measured Depth (usft)	Measured Depth (usft)	Between Centres (usft)	Between Ellipses (usft)		
Offset Well - Wellbore - Design						
Apollo 2407-29E						
Apollo 2407-29E 1H - OH - Plan #3	1,100.00	1,100.00	19.96	12.08	2.531	CC, ES
Apollo 2407-29E 1H - OH - Plan #3	1,200.00	1,199.98	21.34	12.75	2.483	SF
Apollo 2407-29E 2H - OH - Plan #3	1,100.00	1,100.00	39.93	32.04	5.063	CC, ES
Apollo 2407-29E 2H - OH - Plan #3	1,200.00	1,199.98	41.29	32.70	4.804	SF
Apollo 2407-29E 3H - OH - Plan #3	1,100.00	1,100.00	59.89	52.01	7.594	CC, ES
Apollo 2407-29E 3H - OH - Plan #3	8,900.00	5,961.61	520.32	406.90	4.588	SF

Offset Design	Apollo 2407-29E - Apollo 2407-29E 1H - OH - Plan #3										Offset Site Error:	0.00 usft
Survey Program:	O-MWD+HDGM										Offset Well Error:	0.00 usft
Reference	Offset	Semi Major Axis		Distance		Minimum Separation		Separation Factor	Warning			
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N-S (usft)	+E-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	
0.00	0.00	0.00	0.00	0.00	0.00	-47.57	13.47	-14.74	19.96	19.96	0.00	N/A
100.00	100.00	100.00	100.00	0.36	0.36	-47.57	13.47	-14.74	19.96	19.25	0.72	27.845
200.00	200.00	200.00	200.00	0.72	0.72	-47.57	13.47	-14.74	19.96	18.53	1.43	13.923
300.00	300.00	300.00	300.00	1.08	1.08	-47.57	13.47	-14.74	19.96	17.81	2.15	9.282
400.00	400.00	400.00	400.00	1.43	1.43	-47.57	13.47	-14.74	19.96	17.10	2.87	6.961
500.00	500.00	500.00	500.00	1.79	1.79	-47.57	13.47	-14.74	19.96	16.38	3.58	5.569
600.00	600.00	600.00	600.00	2.15	2.15	-47.57	13.47	-14.74	19.96	15.66	4.30	4.641
700.00	700.00	700.00	700.00	2.51	2.51	-47.57	13.47	-14.74	19.96	14.94	5.02	3.978
800.00	800.00	800.00	800.00	2.87	2.87	-47.57	13.47	-14.74	19.96	14.23	5.74	3.481
900.00	900.00	900.00	900.00	3.23	3.23	-47.57	13.47	-14.74	19.96	13.51	6.45	3.094
1,000.00	1,000.00	1,000.00	1,000.00	3.58	3.58	-47.57	13.47	-14.74	19.96	12.79	7.17	2.785
1,100.00	1,100.00	1,100.00	1,100.00	3.94	3.94	-47.57	13.47	-14.74	19.96	12.08	7.89	2.531 CC, ES
1,200.00	1,199.98	1,199.98	1,199.98	4.29	4.30	-143.51	13.47	-14.74	21.34	12.75	8.59	2.483 SF
1,300.00	1,299.84	1,299.84	1,299.84	4.64	4.66	-150.41	13.47	-14.74	25.74	16.44	9.30	2.769
1,400.00	1,399.45	1,399.45	1,399.45	4.99	5.02	-157.71	13.47	-14.74	33.60	23.60	10.00	3.360
1,500.00	1,498.70	1,499.77	1,499.75	5.34	5.37	-161.96	14.23	-13.17	43.92	33.22	10.70	4.106
1,600.00	1,597.47	1,600.32	1,600.16	5.71	5.72	-162.90	10.53	-8.44	55.26	43.87	11.30	4.851
1,700.00	1,695.62	1,701.07	1,700.52	6.09	6.08	-162.34	20.37	-0.52	67.49	55.41	12.09	5.585
1,800.00	1,793.06	1,801.79	1,800.48	6.49	6.44	-160.81	25.74	10.56	80.65	67.86	12.79	6.307
1,900.00	1,889.64	1,900.57	1,898.33	6.92	6.80	-159.75	31.64	22.70	96.13	82.62	13.51	7.117
2,000.00	1,985.27	1,998.80	1,995.63	7.37	7.16	-159.57	37.50	34.78	114.85	100.61	14.23	8.069

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



Scientific Drilling, Intl Anticollision Report



Company:	Logos Operating LLC	Local Co-ordinate Reference:	Well Apollo 2407-29E 4H - Slot A
Project:	Rio Arriba, NM NAD83	TVD Reference:	GL 7300' @ 7300.00usft
Reference Site:	Apollo 2407-29E	MD Reference:	GL 7300' @ 7300.00usft
Site Error:	0.00 usft	North Reference:	True
Reference Well:	Apollo 2407-29E 4H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 usft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction
Reference Design:	Plan #3	Offset TVD Reference:	Offset Datum

Offset Design Apollo 2407-29E - Apollo 2407-29E 1H - OH - Plan #3													Offset Site Error:	0.00 usft
Survey Program: 0-MWD+HDGM													Offset Well Error:	0.00 usft
Reference		Offset		Semi Major Axis		Highside Toolface (°)	Distance		Minimum Separation (usft)	Separation Factor	Warning			
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)		Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)						
2,100.00	2,079.82	2,096.35	2,092.27	7.87	7.53	-159.89	43.32	46.78	136.77	121.81	14.96	9.140		
2,200.00	2,173.17	2,193.12	2,188.13	8.41	7.89	-160.50	49.10	58.68	161.90	146.20	15.70	10.314		
2,300.00	2,265.21	2,288.98	2,283.09	9.00	8.25	-161.23	54.82	70.46	190.23	173.80	16.43	11.575		
2,400.00	2,355.84	2,383.81	2,377.03	9.65	8.61	-162.00	60.48	82.13	221.76	204.59	17.17	12.913		
2,500.00	2,444.94	2,477.50	2,469.85	10.36	8.97	-162.75	66.07	93.65	256.49	238.57	17.92	14.317		
2,600.00	2,532.39	2,569.94	2,561.42	11.15	9.33	-163.47	71.59	105.01	294.38	275.73	18.66	15.779		
2,672.68	2,594.87	2,636.28	2,627.13	11.77	9.58	-163.96	75.55	113.17	323.90	304.70	19.20	16.872		
2,700.00	2,618.18	2,661.07	2,651.69	12.01	9.68	-164.20	77.03	116.22	335.30	315.90	19.40	17.283		
2,800.00	2,703.48	2,751.82	2,741.59	12.92	10.03	-164.95	82.44	127.38	377.09	356.95	20.14	18.722		
2,900.00	2,788.79	2,842.57	2,831.49	13.86	10.38	-165.55	87.86	138.54	418.92	398.03	20.89	20.054		
3,000.00	2,874.09	2,933.32	2,921.39	14.82	10.73	-166.04	93.27	149.70	460.79	439.14	21.65	21.287		
3,100.00	2,959.40	3,024.08	3,011.29	15.80	11.09	-166.45	98.69	160.85	502.67	480.26	22.41	22.433		
3,200.00	3,044.71	3,114.83	3,101.19	16.79	11.44	-166.80	104.11	172.01	544.57	521.40	23.17	23.499		
3,300.00	3,130.01	3,205.58	3,191.09	17.80	11.80	-167.10	109.52	183.17	586.49	562.54	23.95	24.491		
3,400.00	3,215.32	3,296.33	3,280.99	18.82	12.16	-167.35	114.94	194.33	628.42	603.70	24.72	25.418		
3,500.00	3,300.63	3,387.08	3,370.89	19.84	12.51	-167.58	120.35	205.49	670.36	644.85	25.50	26.284		
3,600.00	3,385.93	3,477.83	3,460.79	20.88	12.87	-167.78	125.77	216.65	712.30	686.02	26.29	27.096		
3,700.00	3,471.24	3,568.58	3,550.69	21.92	13.23	-167.96	131.19	227.81	754.26	727.18	27.08	27.857		
3,800.00	3,556.54	3,659.34	3,640.59	22.96	13.59	-168.11	136.60	238.97	796.21	768.35	27.87	28.573		
3,900.00	3,641.85	3,750.09	3,730.49	24.02	13.95	-168.26	142.02	250.13	838.17	809.52	28.66	29.246		
4,000.00	3,727.16	3,840.84	3,820.39	25.07	14.31	-168.39	147.43	261.29	880.14	850.69	29.46	29.880		
4,100.00	3,812.46	3,931.59	3,910.29	26.13	14.67	-168.50	152.85	272.44	922.11	891.86	30.25	30.479		
4,200.00	3,897.77	4,022.34	4,000.19	27.19	15.03	-168.61	158.27	283.60	964.08	933.03	31.05	31.045		
6,990.58	6,067.00	5,750.00	5,697.24	51.79	21.81	49.89	338.74	452.51	991.72	945.31	46.42	21.366		
7,000.00	6,066.91	5,750.00	5,697.24	51.96	21.81	49.89	338.74	452.51	983.98	937.42	46.56	21.135		
7,100.00	6,065.95	5,750.00	5,697.24	53.78	21.81	49.89	338.74	452.51	903.68	855.41	48.27	18.721		
7,200.00	6,064.98	5,768.33	5,713.08	55.70	21.87	51.72	347.67	450.22	827.26	775.89	51.36	16.106		
7,300.00	6,064.02	5,774.86	5,718.67	57.72	21.89	52.38	350.94	449.35	756.46	701.81	54.64	13.843		
7,400.00	6,063.06	5,781.85	5,724.62	59.81	21.91	53.09	354.48	448.39	692.76	634.10	58.66	11.810		
7,500.00	6,062.10	5,800.00	5,739.90	61.98	21.97	54.93	363.91	445.75	638.45	574.41	64.04	9.970		
7,600.00	6,061.13	5,800.00	5,739.90	64.22	21.97	54.93	363.91	445.75	595.54	526.92	68.62	8.678		
7,700.00	6,060.17	5,800.00	5,739.90	66.52	21.97	54.93	363.91	445.75	567.21	494.21	72.99	7.771		
7,800.00	6,059.21	5,815.39	5,752.67	68.87	22.02	56.50	372.16	443.34	555.32	477.58	77.74	7.143		
7,817.46	6,059.04	5,817.10	5,754.08	69.29	22.02	56.67	373.09	443.06	555.05	476.68	78.37	7.082		
7,900.00	6,058.24	5,825.51	5,760.97	71.27	22.05	57.53	377.71	441.68	561.05	480.33	80.72	6.950		
8,000.00	6,057.28	5,836.48	5,769.87	73.72	22.08	58.64	383.84	439.80	583.79	501.61	82.18	7.104		
8,100.00	6,056.32	5,850.00	5,780.71	76.20	22.12	60.00	391.55	437.38	621.65	539.23	82.41	7.543		
8,200.00	6,055.36	5,861.47	5,789.79	78.72	22.15	61.15	398.22	435.23	672.02	590.50	81.52	8.244		
8,300.00	6,054.39	5,875.77	5,800.94	81.27	22.19	62.57	406.71	432.45	732.28	652.04	80.24	9.126		
8,340.72	6,054.00	5,881.98	5,805.74	82.32	22.21	63.18	410.46	431.20	759.12	679.46	79.66	9.529		
8,358.49	6,053.82	5,884.74	5,807.86	82.78	22.22	63.28	412.14	430.63	771.23	691.82	79.41	9.713		
8,400.00	6,053.40	5,891.32	5,812.88	83.85	22.24	63.92	416.16	429.27	800.35	721.55	78.81	10.156		
8,500.00	6,052.39	5,908.30	5,825.67	86.46	22.29	65.56	426.72	425.64	874.36	796.94	77.42	11.294		
8,600.00	6,051.37	5,927.10	5,839.53	89.09	22.34	67.33	438.70	421.41	952.70	876.52	76.19	12.505		



Scientific Drilling, Intl Anticollision Report



Company:	Logos Operating LLC	Local Co-ordinate Reference:	Well Apollo 2407-29E 4H - Slot A
Project:	Rio Arriba, NM NAD83	TVD Reference:	GL 7300' @ 7300.00usft
Reference Site:	Apollo 2407-29E	MD Reference:	GL 7300' @ 7300.00usft
Site Error:	0.00 usft	North Reference:	True
Reference Well:	Apollo 2407-29E 4H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 usft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction
Reference Design:	Plan #3	Offset TVD Reference:	Offset Datum

Offset Design Apollo 2407-29E - Apollo 2407-29E 2H - OH - Plan #3												Offset Site Error:	0.00 usft
Survey Program: O-MWD+HDGM												Offset Well Error:	0.00 usft
Reference		Offset		Semi Major Axis		Highside Toolface (°)	Distance		Minimum Separation (usft)	Separation Factor	Warning		
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)		Between Centres (usft)	Between Ellipses (usft)					
0.00	0.00	0.00	0.00	0.00	0.00	-47.57	26.94	-29.47	39.93				
100.00	100.00	100.00	100.00	0.36	0.36	-47.57	26.94	-29.47	39.93	39.21	0.72	55.692	
200.00	200.00	200.00	200.00	0.72	0.72	-47.57	26.94	-29.47	39.93	38.49	1.43	27.846	
300.00	300.00	300.00	300.00	1.08	1.08	-47.57	26.94	-29.47	39.93	37.78	2.15	18.564	
400.00	400.00	400.00	400.00	1.43	1.43	-47.57	26.94	-29.47	39.93	37.06	2.87	13.923	
500.00	500.00	500.00	500.00	1.79	1.79	-47.57	26.94	-29.47	39.93	36.34	3.58	11.138	
600.00	600.00	600.00	600.00	2.15	2.15	-47.57	26.94	-29.47	39.93	35.63	4.30	9.282	
700.00	700.00	700.00	700.00	2.51	2.51	-47.57	26.94	-29.47	39.93	34.91	5.02	7.956	
800.00	800.00	800.00	800.00	2.87	2.87	-47.57	26.94	-29.47	39.93	34.19	5.74	6.962	
900.00	900.00	900.00	900.00	3.23	3.23	-47.57	26.94	-29.47	39.93	33.48	6.45	6.188	
1,000.00	1,000.00	1,000.00	1,000.00	3.58	3.58	-47.57	26.94	-29.47	39.93	32.76	7.17	5.569	
1,100.00	1,100.00	1,100.00	1,100.00	3.94	3.94	-47.57	26.94	-29.47	39.93	32.04	7.89	5.063 CC, ES	
1,200.00	1,199.98	1,199.98	1,199.98	4.29	4.30	-142.07	26.94	-29.47	41.29	32.70	8.59	4.804 SF	
1,300.00	1,299.84	1,299.84	1,299.84	4.64	4.66	-146.08	26.94	-29.47	45.53	36.24	9.30	4.498	
1,400.00	1,399.45	1,398.66	1,398.66	4.99	5.01	-151.01	27.30	-29.68	53.36	43.37	9.99	5.339	
1,500.00	1,498.70	1,495.86	1,495.80	5.34	5.36	-154.51	30.15	-31.33	67.14	56.46	10.68	6.285	
1,600.00	1,597.47	1,591.67	1,591.38	5.71	5.70	-156.40	35.76	-34.57	87.02	75.66	11.36	7.660	
1,700.00	1,695.62	1,685.59	1,684.82	6.09	6.04	-157.22	43.94	-39.29	112.74	100.71	12.02	9.376	
1,800.00	1,793.06	1,777.18	1,775.60	6.49	6.37	-157.41	54.46	-45.38	144.10	131.43	12.67	11.371	
1,900.00	1,889.64	1,866.05	1,863.26	6.92	6.70	-157.26	67.07	-52.66	180.92	167.61	13.30	13.599	
2,000.00	1,985.27	1,955.05	1,950.66	7.37	7.03	-157.02	81.63	-61.07	222.59	208.62	13.96	15.944	
2,100.00	2,079.82	2,044.46	2,038.42	7.87	7.38	-156.99	96.44	-69.63	267.34	252.70	14.64	18.258	
2,200.00	2,173.17	2,132.35	2,124.69	8.41	7.72	-157.11	110.99	-78.04	314.96	299.63	15.33	20.550	
2,300.00	2,265.21	2,218.63	2,209.37	9.00	8.06	-157.29	125.28	-86.30	365.40	349.39	16.01	22.823	
2,400.00	2,355.84	2,303.18	2,292.36	9.65	8.40	-157.50	139.28	-94.39	418.64	401.95	16.69	25.077	
2,500.00	2,444.94	2,385.90	2,373.56	10.36	8.73	-157.71	152.98	-102.30	474.62	457.25	17.38	27.312	
2,600.00	2,532.39	2,466.69	2,452.86	11.15	9.06	-157.91	166.36	-110.04	533.30	515.25	18.06	29.531	
2,672.68	2,594.87	2,524.15	2,509.25	11.77	9.30	-158.04	175.88	-115.53	577.62	559.06	18.55	31.131	
2,700.00	2,618.18	2,545.54	2,530.24	12.01	9.38	-158.24	179.42	-117.58	594.54	575.80	18.74	31.725	
2,800.00	2,703.48	2,623.83	2,607.09	12.92	9.71	-158.88	192.39	-125.07	656.50	637.08	19.42	33.813	
2,900.00	2,788.79	2,702.13	2,683.94	13.86	10.03	-159.41	205.36	-132.57	718.51	698.41	20.10	35.749	
3,000.00	2,874.09	2,780.42	2,760.79	14.82	10.36	-159.86	218.32	-140.06	780.54	759.76	20.79	37.547	
3,100.00	2,959.40	2,858.72	2,837.64	15.80	10.68	-160.24	231.29	-147.55	842.61	821.12	21.48	39.219	
3,200.00	3,044.71	2,937.01	2,914.49	16.79	11.01	-160.57	244.26	-155.04	904.69	882.50	22.19	40.776	
3,300.00	3,130.01	3,015.31	2,991.34	17.80	11.34	-160.86	257.22	-162.54	966.79	943.90	22.89	42.229	
8,300.00	6,054.39	5,727.07	5,647.52	81.27	23.27	63.14	722.63	-433.30	978.24	891.49	86.75	11.277	
8,340.72	6,054.00	5,730.99	5,651.08	82.32	23.29	63.38	724.02	-434.19	962.21	873.36	88.86	10.829	
8,358.49	6,053.82	5,732.73	5,652.65	82.78	23.31	63.56	724.64	-434.59	955.71	865.93	89.78	10.645	
8,400.00	6,053.40	5,750.00	5,668.18	83.85	23.41	64.64	730.99	-438.66	941.95	849.52	92.43	10.190	
8,500.00	6,052.39	5,750.00	5,668.18	86.46	23.41	64.64	730.99	-438.66	914.79	817.71	97.08	9.423	
8,600.00	6,051.37	5,750.00	5,668.18	89.09	23.41	64.64	730.99	-438.66	898.01	796.77	101.24	8.871	
8,700.00	6,050.36	5,770.11	5,686.04	91.74	23.54	65.89	738.77	-443.66	891.71	786.11	105.60	8.444	
8,707.30	6,050.29	5,771.01	5,686.84	91.94	23.55	65.94	739.13	-443.89	891.69	785.82	105.87	8.423	
8,800.00	6,049.34	5,782.83	5,697.20	94.41	23.62	66.68	743.90	-446.97	896.34	787.55	108.79	8.239	
8,900.00	6,048.33	5,800.00	5,712.08	97.11	23.74	67.74	751.08	-451.62	911.60	800.36	111.24	8.195	
9,000.00	6,047.32	5,800.00	5,712.08	99.82	23.74	67.74	751.08	-451.62	937.03	825.12	111.91	8.373	
9,100.00	6,046.30	5,827.13	5,735.18	102.54	23.93	69.40	763.02	-459.38	971.46	858.36	113.10	8.589	

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



Scientific Drilling, Intl Anticollision Report



Company:	Logos Operating LLC	Local Co-ordinate Reference:	Well Apollo 2407-29E 4H - Slot A
Project:	Rio Arriba, NM NAD83	TVD Reference:	GL 7300' @ 7300.00usft
Reference Site:	Apollo 2407-29E	MD Reference:	GL 7300' @ 7300.00usft
Site Error:	0.00 usft	North Reference:	True
Reference Well:	Apollo 2407-29E 4H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 usft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction
Reference Design:	Plan #3	Offset TVD Reference:	Offset Datum

Offset Design Apollo 2407-29E - Apollo 2407-29E 3H - OH - Plan #3													Offset Site Error:	0.00 usft
Survey Program: O-MWD+HDGM													Offset Well Error:	0.00 usft
Reference		Offset		Semi Major Axis			Distance						Warning	
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	Wellbore Centre +E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor		
0.00	0.00	0.00	0.00	0.00	0.00	-47.57	40.41	-44.21	59.89					
100.00	100.00	100.00	100.00	0.36	0.36	-47.57	40.41	-44.21	59.89	59.17	0.72	83.537		
200.00	200.00	200.00	200.00	0.72	0.72	-47.57	40.41	-44.21	59.89	58.46	1.43	41.769		
300.00	300.00	300.00	300.00	1.08	1.08	-47.57	40.41	-44.21	59.89	57.74	2.15	27.846		
400.00	400.00	400.00	400.00	1.43	1.43	-47.57	40.41	-44.21	59.89	57.02	2.87	20.884		
500.00	500.00	500.00	500.00	1.79	1.79	-47.57	40.41	-44.21	59.89	56.31	3.58	16.707		
600.00	600.00	600.00	600.00	2.15	2.15	-47.57	40.41	-44.21	59.89	55.59	4.30	13.923		
700.00	700.00	700.00	700.00	2.51	2.51	-47.57	40.41	-44.21	59.89	54.87	5.02	11.934		
800.00	800.00	800.00	800.00	2.87	2.87	-47.57	40.41	-44.21	59.89	54.16	5.74	10.442		
900.00	900.00	900.00	900.00	3.23	3.23	-47.57	40.41	-44.21	59.89	53.44	6.45	9.282		
1,000.00	1,000.00	1,000.00	1,000.00	3.58	3.58	-47.57	40.41	-44.21	59.89	52.72	7.17	8.354		
1,100.00	1,100.00	1,100.00	1,100.00	3.94	3.94	-47.57	40.41	-44.21	59.89	52.01	7.89	7.594 CC, ES		
1,200.00	1,199.98	1,199.98	1,199.98	4.29	4.30	-141.57	40.41	-44.21	61.25	52.66	8.59	7.127		
1,300.00	1,299.84	1,298.72	1,298.72	4.64	4.65	-144.33	40.66	-44.53	65.85	56.57	9.29	7.089		
1,400.00	1,399.45	1,395.64	1,395.57	4.99	5.00	-147.95	42.70	-47.11	76.49	66.52	9.97	7.672		
1,500.00	1,498.70	1,491.17	1,490.89	5.34	5.34	-151.38	46.71	-52.16	93.70	83.07	10.64	8.808		
1,600.00	1,597.47	1,586.50	1,585.77	5.71	5.68	-154.20	52.44	-59.41	117.10	105.79	11.31	10.353		
1,700.00	1,695.62	1,682.57	1,681.34	6.09	6.02	-156.57	58.50	-67.05	144.24	132.24	12.00	12.022		
1,800.00	1,793.06	1,777.64	1,775.92	6.49	6.37	-158.54	64.49	-74.62	174.69	162.00	12.69	13.770		
1,900.00	1,889.64	1,871.59	1,869.38	6.92	6.71	-160.20	70.42	-82.10	208.41	195.04	13.37	15.586		
2,000.00	1,985.27	1,964.30	1,961.61	7.37	7.05	-161.59	76.26	-89.48	245.38	231.32	14.06	17.458		
2,100.00	2,079.82	2,055.66	2,052.50	7.87	7.39	-162.76	82.02	-96.75	285.55	270.82	14.74	19.377		
2,200.00	2,173.17	2,145.57	2,141.94	8.41	7.72	-163.76	87.69	-103.90	328.89	313.48	15.41	21.337		
2,300.00	2,265.21	2,233.90	2,229.82	9.00	8.05	-164.62	93.26	-110.94	375.34	359.25	16.09	23.330		
2,400.00	2,355.84	2,320.56	2,316.04	9.65	8.38	-165.34	98.72	-117.83	424.84	408.08	16.76	25.351		
2,500.00	2,444.94	2,405.44	2,400.48	10.36	8.69	-165.97	104.07	-124.59	477.34	459.91	17.42	27.397		
2,600.00	2,532.39	2,488.44	2,483.04	11.15	9.00	-166.50	109.30	-131.20	532.77	514.68	18.08	29.464		
2,672.68	2,594.87	2,547.52	2,541.81	11.77	9.23	-166.83	113.03	-135.90	574.85	556.30	18.56	30.975		
2,700.00	2,618.18	2,569.52	2,563.70	12.01	9.31	-167.03	114.41	-137.65	590.96	572.22	18.74	31.539		
2,800.00	2,703.48	2,650.07	2,643.83	12.92	9.61	-167.69	119.49	-144.06	649.94	630.56	19.38	33.530		
2,900.00	2,788.79	2,730.61	2,723.96	13.86	9.91	-168.24	124.57	-150.47	708.97	688.93	20.04	35.384		
3,000.00	2,874.09	2,811.16	2,804.09	14.82	10.22	-168.71	129.65	-156.88	768.03	747.34	20.69	37.114		
3,100.00	2,959.40	2,891.71	2,884.23	15.80	10.52	-169.11	134.73	-163.29	827.13	805.77	21.36	38.730		
3,200.00	3,044.71	2,972.25	2,964.36	16.79	10.83	-169.46	139.80	-169.71	886.24	864.22	22.02	40.241		
3,300.00	3,130.01	3,052.80	3,044.49	17.80	11.13	-169.76	144.88	-176.12	945.38	922.69	22.69	41.658		
7,900.00	6,058.24	5,675.30	5,644.63	71.27	21.30	44.72	328.67	-421.05	968.20	916.66	51.54	18.786		
8,000.00	6,057.28	5,700.00	5,666.77	73.72	21.43	46.70	334.07	-430.56	889.19	834.06	55.14	16.127		
8,100.00	6,056.32	5,700.00	5,666.77	76.20	21.43	46.70	334.07	-430.56	813.93	755.24	58.69	13.868		
8,200.00	6,055.36	5,729.98	5,693.13	78.72	21.60	49.20	341.07	-443.01	743.29	679.22	64.07	11.600		
8,300.00	6,054.39	5,750.00	5,710.38	81.27	21.71	50.93	346.02	-451.87	678.88	608.86	70.02	9.696		
8,340.72	6,054.00	5,762.37	5,720.90	82.32	21.79	52.01	349.19	-457.56	654.74	581.86	72.88	8.984		
8,358.49	6,053.82	5,766.83	5,724.67	82.78	21.82	52.57	350.35	-459.66	644.68	570.54	74.14	8.696		
8,400.00	6,053.40	5,777.60	5,733.69	83.85	21.88	53.53	353.20	-464.79	622.36	545.16	77.20	8.061		
8,500.00	6,052.39	5,800.00	5,752.18	86.46	22.02	55.54	359.31	-475.86	575.81	491.00	84.82	6.789		
8,600.00	6,051.37	5,837.68	5,782.36	89.09	22.27	58.97	370.17	-495.62	540.95	447.52	93.43	5.790		
8,700.00	6,050.36	5,873.80	5,810.14	91.74	22.53	62.26	381.23	-515.88	519.70	418.32	101.38	5.126		
8,796.59	6,049.38	5,913.36	5,839.19	94.32	22.83	65.81	394.04	-539.48	512.93	404.93	108.00	4.749		
8,800.00	6,049.34	5,914.86	5,840.26	94.41	22.84	66.94	394.54	-540.39	512.93	404.73	108.20	4.740		
8,900.00	6,048.33	5,961.61	5,872.55	97.11	23.24	69.96	410.59	-570.15	520.32	406.90	113.42	4.588 SF		
9,000.00	6,047.32	6,014.85	5,906.53	99.82	23.73	74.21	429.96	-606.24	540.21	423.12	117.09	4.614		
9,100.00	6,046.30	6,075.29	5,941.31	102.54	24.36	78.50	453.21	-649.84	570.07	450.34	119.72	4.762		
9,200.00	6,045.29	6,143.45	5,975.37	105.28	25.17	82.54	480.84	-701.97	607.10	485.10	122.00	4.976		

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



Scientific Drilling, Intl Anticollision Report



Company:	Logos Operating LLC	Local Co-ordinate Reference:	Well Apollo 2407-29E 4H - Slot A
Project:	Rio Arriba, NM NAD83	TVD Reference:	GL 7300' @ 7300.00usft
Reference Site:	Apollo 2407-29E	MD Reference:	GL 7300' @ 7300.00usft
Site Error:	0.00 usft	North Reference:	True
Reference Well:	Apollo 2407-29E 4H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 usft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction
Reference Design:	Plan #3	Offset TVD Reference:	Offset Datum

Offset Design Apollo 2407-29E - Apollo 2407-29E 3H - OH - Plan #3													Offset Site Error:	0.00 usft
Survey Program: 0-MWD+HDGM													Offset Well Error:	0.00 usft
Reference		Offset		Semi Major Axis		Highside Toolface (°)	Distance		Between Centres (usft)	Between Ellipses (usft)	Minimum Separation (usft)	Separation Factor	Warning	
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)		Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)						
9,300.00	6,044.27	6,219.43	6,006.55	108.04	26.20	86.03	513.12	-763.24	648.70	524.17	124.53	5.209		
9,400.00	6,043.26	6,302.66	6,032.07	110.80	27.48	88.68	549.86	-833.38	692.72	565.08	127.64	5.427		
9,500.00	6,042.24	6,391.71	6,049.01	113.68	29.01	90.30	590.19	-910.87	737.60	606.14	131.46	5.611		
9,600.00	6,041.23	6,484.22	6,055.00	116.37	30.74	90.84	632.57	-992.82	782.41	646.60	135.81	5.781		
9,700.00	6,040.21	6,573.77	6,054.89	119.17	32.53	90.85	673.61	-1,072.40	827.01	686.92	140.10	5.903		
9,800.00	6,039.20	6,663.27	6,054.78	121.98	34.42	90.85	714.62	-1,151.95	871.62	727.14	144.48	6.033		
9,900.00	6,038.18	6,752.77	6,054.67	124.80	36.40	90.86	755.64	-1,231.50	916.23	767.26	148.97	6.151		
10,000.00	6,037.17	6,842.26	6,054.56	127.62	38.45	90.87	796.65	-1,311.05	960.84	807.31	153.53	6.258		

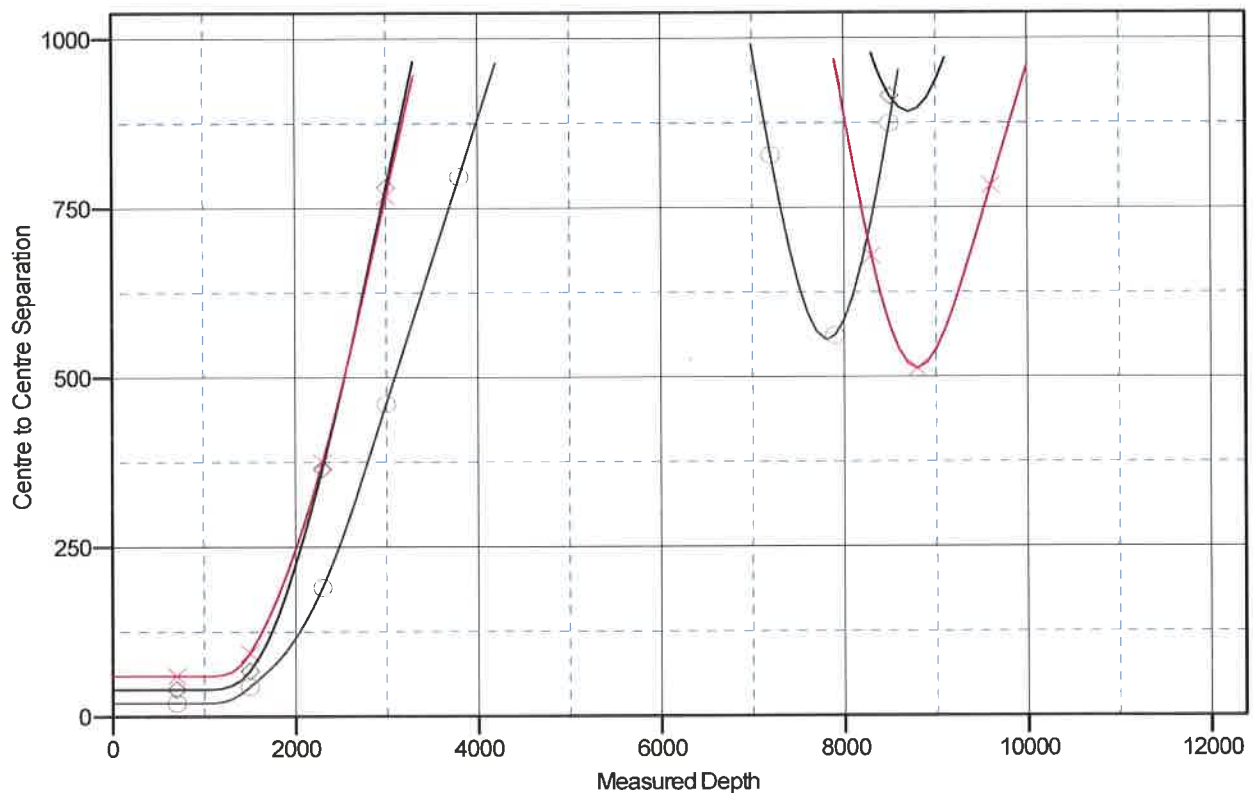
CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation

Company:	Logos Operating LLC	Local Co-ordinate Reference:	Well Apollo 2407-29E 4H - Slot A
Project:	Rio Arriba, NM NAD83	TVD Reference:	GL 7300' @ 7300.00usft
Reference Site:	Apollo 2407-29E	MD Reference:	GL 7300' @ 7300.00usft
Site Error:	0.00 usft	North Reference:	True
Reference Well:	Apollo 2407-29E 4H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 usft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction
Reference Design:	Plan #3	Offset TVD Reference:	Offset Datum

Reference Depths are relative to GL 7300' @ 7300.00usft
Offset Depths are relative to Offset Datum
Central Meridian is -107.8333334

Coordinates are relative to: Apollo 2407-29E 4H - Slot A
Coordinate System is US State Plane 1983, New Mexico Western Zone
Grid Convergence at Surface is: 0.13°

Ladder Plot



LEGEND

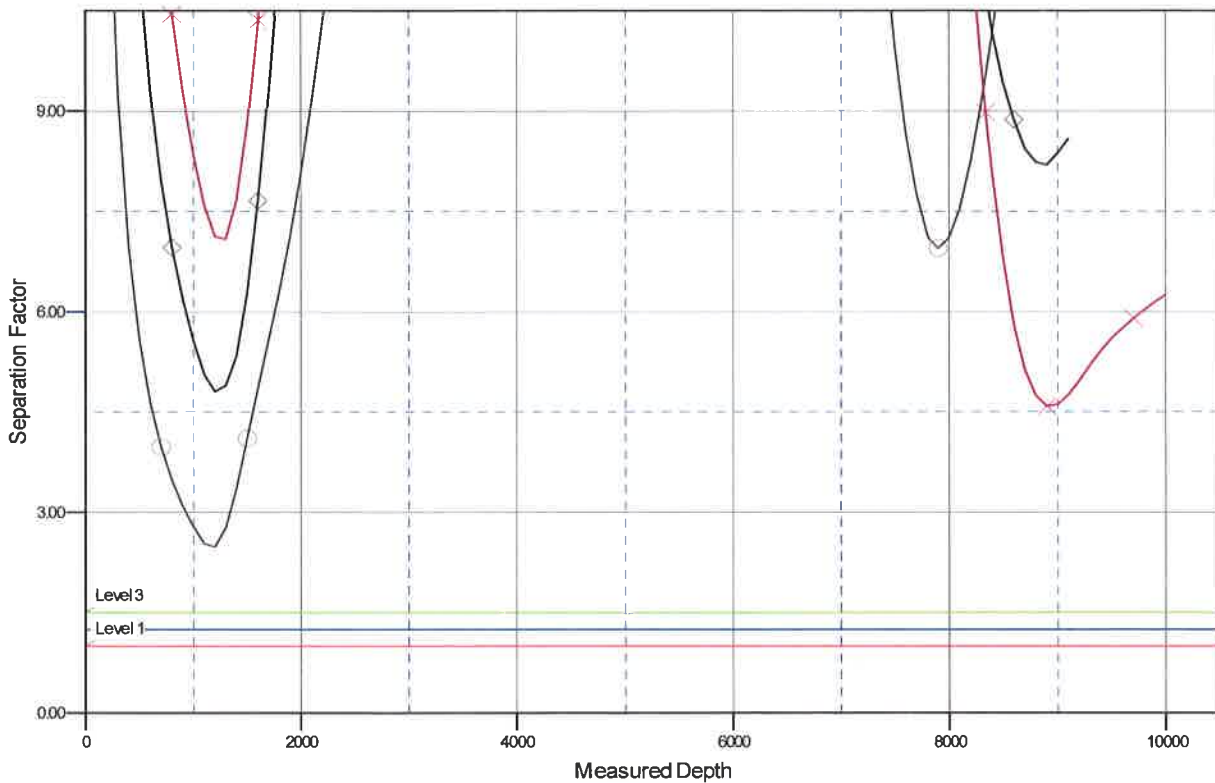
—○— Apollo 2407-29E 1H, OH, Plan #3 V0 —◆— Apollo 2407-29E 2H, OH, Plan #3 V0 —×— Apollo 2407-29E 3H, OH, Plan #3 V0

Company:	Logos Operating LLC	Local Co-ordinate Reference:	Well Apollo 2407-29E 4H - Slot A
Project:	Rio Arriba, NM NAD83	TVD Reference:	GL 7300' @ 7300.00usft
Reference Site:	Apollo 2407-29E	MD Reference:	GL 7300' @ 7300.00usft
Site Error:	0.00 usft	North Reference:	True
Reference Well:	Apollo 2407-29E 4H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 usft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction
Reference Design:	Plan #3	Offset TVD Reference:	Offset Datum

Reference Depths are relative to GL 7300' @ 7300.00usft
Offset Depths are relative to Offset Datum
Central Meridian is -107.8333334

Coordinates are relative to: Apollo 2407-29E 4H - Slot A
Coordinate System is US State Plane 1983, New Mexico Western Zone
Grid Convergence at Surface is: 0.13°

Separation Factor Plot



LEGEND

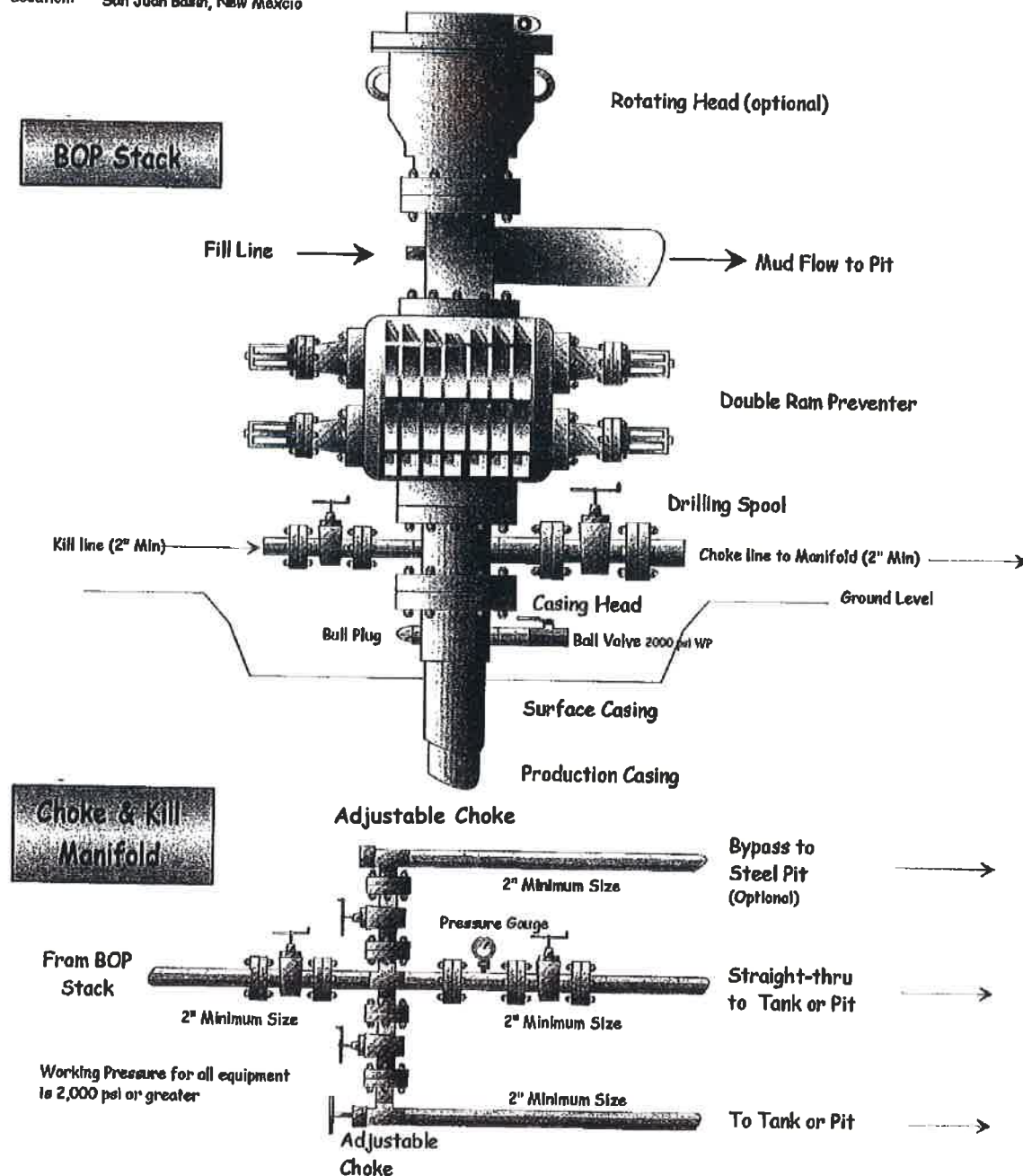
—○— Apollo 2407-29E 1H, OH, Plan #3 V0 —●— Apollo 2407-29E 2H, OH, Plan #3 V0 —×— Apollo 2407-29E 3H, OH, Plan #3 V0

Well Control Equipment Schematic for 2M Service

Attachment to Drilling Technical Program

Exhibit #1 Typical BOP setup

Location: San Juan Basin, New Mexico



Directions from the Intersection of US Hwy 550 & US Hwy 64

in Bloomfield, NM to Logos Operating, LLC Apollo 2407 29E #4H

2188' FNL & 93' FWL, Section 29, T24N, R7W, N.M.P.M., Rio Arriba County, NM

Latitude: 36.286109°N Longitude: 107.606383°W Datum: NAD1983

From the intersection of US Hwy 550 & US Hwy 64 in Bloomfield, NM, @ Farmer's Market travel Southerly on US Hwy 550 for 46.8 miles to Mile Marker 104.9;

Go Left (Northerly) on County Road #377 for 0.1 mile to fork in roadway;

Go Left (Northerly) which is straight remaining on County Road #377 for 4.1 miles to fork in roadway;

Go Left (Northerly) which is straight remaining on County Road #377 for 0.6 miles to begin proposed access on left-hand side of roadway which continues for 4599.6' to staked Logos Apollo 2407 29E #4H location.

District I
1625 N. French Dr., Hobbs, NM 88240
District II
811 S. First St., 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 Department

Submit Original
to Appropriate
District Office

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

GAS CAPTURE PLAN

Date February 5, 2020

☐ Original

Operator & OGRID No.: LOGOS Operating, LLC / 289408

☒ Amended - Reason for Amendment:

This Gas Capture Plan outlines actions to be taken by the Operator to reduce well/production facility flaring/venting for new completion (new drill, recomple to new zone, re-frac) activity.

Note: Form C-129 must be submitted and approved prior to exceeding 60 days allowed by Rule (Subsection A of 19.15.18.12 NMAC).

Well(s)/Production Facility – Name of facility

The well(s) that will be located at the production facility are shown in the table below.

Well Name	API	Well Location (ULSTR)	Footages	Expected MCF/D	Flared or Vented	Comments
Federal 2407 29E 1H	30-039-31379	E-29-24N-07W	2188 FNL, 93 FWL	439	Flared	
Apollo 2407 29E 2H	30-039-	E-29-24N-07W	2162 FNL, 64 FWL	516	Flared	
Apollo 2407 29E 3H	30-039-	E-29-24N-07W	2149 FNL, 49 FWL	351	Flared	
Apollo 2407 29E 4H	30-039-	E-29-24N-07W	2188 FNL, 93 FWL	469	Flared	

Gathering System and Pipeline Notification

Well(s) will be connected to a production facility after flowback operations are complete, if gas transporter system is in place. The gas produced from production facility is dedicated to Whiptail/Harvest and will be connected to Whiptail/Harvest low/high pressure gathering system located in San Juan County, New Mexico. It will require 250' of pipeline to connect the facility to low/high pressure gathering system. LOGOS provides (periodically) to Whiptail/Harvest a drilling, completion and estimated first production date for wells that are scheduled to be drilled in the foreseeable future. In addition, LOGOS and Whiptail/Harvest have periodic conference calls to discuss changes to drilling and completion schedules. Gas from these wells will be processed at Harvest Ignacio Processing Plant located in Sec. 35/36, Twn. 34N, Rng. 9W, LaPlata County, Colorado. The actual flow of the gas will be based on compression operating parameters and gathering system pressures.

Flowback Strategy

After the fracture treatment/completion operations, well(s) will be produced to temporary production tanks and gas will be flared or vented. During flowback, the fluids and sand content will be monitored. When the produced fluids contain minimal sand, the wells will be turned to production facilities. Gas sales should start as soon as the wells start flowing through the production facilities, unless there are operational issues on Whiptail/Harvest system at that time. Based on current information, it is LOGOS's belief the system can take this gas upon completion of the well(s).

Safety requirements during cleanout operations from the use of underbalanced air cleanout systems may necessitate that sand and non-pipeline quality gas be vented and/or flared rather than sold on a temporary basis.

Alternatives to Reduce Flaring

Below are alternatives considered from a conceptual standpoint to reduce the amount of gas flared.

- Power Generation – On lease
 - Only a portion of gas is consumed operating the generator, remainder of gas will be flared
- Compressed Natural Gas – On lease
 - Gas flared would be minimal, but might be uneconomical to operate when gas volume declines
- NGL Removal – On lease
 - Plants are expensive, residue gas is still flared, and uneconomical to operate when gas volume declines