

RECEIVED

Form 3160-5
(June 2015)UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

MAY 14 2013

FORM APPROVED
OMB No. 1004-0137
Expires: January 31, 2018**SUNDRY NOTICES AND REPORTS ON WELLS**
Do not use this form for proposals to drill or to re-enter an abandoned well. Use Form 3160-3 (APD) for such proposals.5. Lease Serial No. NMNM18463
6. Indian, Allottee or Tribe Name

SUBMIT IN TRIPLICATE - Other instructions on page 2

1. Type of Well

☒ Oil Well ☐ Gas Well ☐ Other

2. Name of Operator LOGOS Operating, LLC

3a. Address 2010 Afton Place
Farmington, NM 874013b. Phone No. (include area code)
(505) 324-41454. Location of Well (Footage, Sec., T., R., M., or Survey Description)
1476 FSL & 300 FWL, NW/SW, L Sec 9 T23N R08W

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

8. Well Name and No. Heros 2308 09L 4H

9. API Well No. 30-045-35847

10. Field and Pool or Exploratory Area
Nageezi Gallup11. Country or Parish, State
San Juan County, NM

12. CHECK THE APPROPRIATE BOX(ES) TO INDICATE NATURE OF NOTICE, REPORT OR OTHER DATA

TYPE OF SUBMISSION	TYPE OF ACTION			
☒ Notice of Intent	☐ Acidize	☐ Deepen	☐ Production (Start/Resume)	☐ Water Shut-Off
☐ Subsequent Report	☐ Alter Casing	☐ Hydraulic Fracturing	☐ Reclamation	☐ Well Integrity
☐ Final Abandonment Notice	☐ Casing Repair	☐ New Construction	☐ Recomplete	☐ Other
	☒ Change Plans	☐ Plug and Abandon	☐ Temporarily Abandon	
	☐ Convert to Injection	☐ Plug Back	☐ Water Disposal	

13. Describe Proposed or Completed Operation: Clearly state all pertinent details, including estimated starting date of any proposed work and approximate duration thereof. If the proposal is to deepen directionally or recompleat horizontally, give subsurface locations and measured and true vertical depths of all pertinent markers and zones. Attach the Bond under which the work will be performed or provide the Bond No. on file with BLM/BIA. Required subsequent reports must be filed within 30 days following completion of the involved operations. If the operation results in a multiple completion or recompleat in a new interval, a Form 3160-4 must be filed once testing has been completed. Final Abandonment Notices must be filed only after all requirements, including reclamation, have been completed and the operator has determined that the site is ready for final inspection.)

ADHERE TO PREVIOUS NMOCD
CONDITIONS OF APPROVAL

LOGOS Operating LLC, request a change in plans to the Point of Entry (POE), Bottom-hole Location (BHL) and Total Depth(TD), per the attached C102 Plat, the Drilling and Directional Drill Plan.

NMOCD

MAY 16 2018

DISTRICT III

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 LANDS14. I hereby certify that the foregoing is true and correct. Name (Printed/Typed)
Marie E. Florez

Title Regulatory Specialist

Signature

Marie E. Florez

Date

05/14/2018

THE SPACE FOR FEDERAL OR STATE OFFICE USE

Approved by

[Signature]

Title

PE

Date

5/15/18

Conditions of approval, if any, are attached. Approval of this notice does not warrant or certify that the applicant holds legal or equitable title to those rights in the subject lease which would entitle the applicant to conduct operations thereon.

Office

FED

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.

(Instructions on page 2)

NMOCD

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DISTRICT IV
1220 S. St. Francis Dr., Santa Fe, NM 87505
Phone: (505) 476-3480 Fax: (505) 476-3482

1220 South St. Francis Dr.
Santa Fe, NM 87505

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

☐ AMENDED REPORT

15703

APD Drilling Plan
LOGOS Operating, LLC

Change of Plans
May 14, 2018

HEROS 2308 09L Com 4H
Lease Serial # NMNM18463

Surface Location: 1476 FSL, 300FWL

Legal Description: Sec 9, T23N, R8W (36.238493° N, 107.694637° W – NAD83)

Bottom Hole Location: 2113 FNL, 267 FEL

Legal Description: Sec 16, T23N, R8W (36.228584° N, 107.678928° W – NAD83)

San Juan County, NM

1. The elevation of the unprepared ground is 6,913 feet above sea level.
2. The geological name of the surface formation is the Nacimiento.
3. A rotary rig will be used to drill the well to a Proposed Total Depth of 5,187' TVD/10,666' MD.
4. Estimated top of important geological markers:

<u>Formation</u>	<u>Depth (TVD)(ft)</u>	<u>Depth (MD)(ft)</u>
Nacimiento	Surface	Surface
Ojo Alamo	861	861
Kirtland	1,066	1,066
Fruitland	1,197	1,197
Pictured Cliffs	1,551	1,552
Lewis	1,661	1,663
Cliff House	3,087	3,136
Menefee	3,112	3,162
Point Lookout	4,012	4,093
Mancos	4,188	4,275

5. Estimated depth at which anticipated water, oil, gas or other mineral bearing formations are expected to be encountered:

<u>Formation</u>	<u>Depth (TVD)(ft)</u>	<u>Water/HydroCarbon</u>
Fruitland	1,197	Gas
Pictured Cliffs	1,551	Gas
Cliffhouse	3,087	Gas
Point Lookout	4,012	Gas
Mancos	4,188	Oil/Gas

6. All proposed casing is new and the program is as follows:

Casing	Size	Depth		Grade	Weight	Connection	PSI		x1000 lbs
		MD	TVD				Burst	Collapse	Tension
Surface	9-5/8"	0-320'	0-320'	J-55	36.00	STC	3520	2020	423
Intermediate	7"	0-6,069'	0-5,242'	J-55	23.00	LTC	4360	3270	341
Production	4-1/2"	5,919'-10,666'	5,242'-5,187'	P-110	11.60	LTC	10690	7560	279

7. Cementing Program:

- a. 12-1/4" hole x 9-5/8" casing at 320' will have cement circulated to surface with 100sks (100% excess true hole) Class H Cement with 1.0 % CaCl₂, 1/2 #/sk Poly-E-Flake 15.8 ppg, 1.17 ft³/sk. Note: CEMENT MUST BE CIRCULATED TO SURFACE. STANDARD BOW SPRING CENTRALIZERS SHALL BE PLACED ON THE FIRST 3 (BOTTOM 3) JOINTS OF CASING (1 PER JOINT) AND 1 EVERY 3RD JOINT TO SURFACE. 20 BBLS OF WATER FOLLOWED BY 20 BBLS OF MUDFLUSH AHEAD OF CEMENT AS SPACER. Test Surface Casing to 1500 psi.
- a. 8-3/4" hole x 7" casing at 6,069'. Cement will be circulated to surface in a single stage with 529 sks (60% excess true hole) of HALCEM with 1.0 % CaCl₂, 1/4 #/sk Poly-E-Flake, 5 #/sk Kol-Seal (Gilsonite) -12.3 ppg, 1.95 ft³/sk followed by 317 sks (60% excess true hole) VARICEM with 0.15% Versaset, 0.30% HALAD-9, 1/4 #/sk Poly-E-Flake, 5 #/sk Kol-Seal - 13.5 ppg, 1.3 ft³/sk. ONE CENTRALIZER PER JOINT FOR THE FIRST 3 JOINTS, THEN EVERY OTHER JOINT TO KOP, THEN ONE EVERY 3RD JOINT TO SURFACE. 20 BBLS OF WATER FOLLOWED BY 30 BBLS OF MUDFLUSH AHEAD OF CEMENT AS SPACER. Test Intermediate Casing to 1500 psi. Cement additives subject to change based on wellbore conditions and cement design criteria.
- a. 6-1/8" hole x 4-1/2" liner at 10,666' MD in a single stage using excess of approximately 30% for TOC at 5919'. Base slurry to consist of 428 sks EXTENDACEM -13.3 ppg, 1.36 ft³/sk. CENTRALIZERS TO BE USED AT DISCRETION IN LATERAL TO ACHIEVE 70% STAND OFF. CENTRALIZERS TO BE USED TO TIE BACK DEPTH OF 6000' TO ACHIEVE 70% STAND OFF. PACKOFF SEAL ASSEMBLY TO BE USED FOR LINER TOP ISOLATION. Cement additives subject to change based on wellbore conditions and cement design criteria. Liner to be pressure tested during completion operations.

8. Pressure Control Equipment

- a. BOPE to be installed prior to Surface Casing drillout.
- b. Pressure control equipment will be used to meet 2,000 (2M) psi specifications.
- c. BOPE working pressure of 3,000 psi.
- d. Function test and visual inspection to be done at each casing size change prior to drill out.
- e. BOP annular to be tested to 50% of working pressure.
- f. All BOP and related equipment will be tested in accordance with the requirements outlined in Onshore Order No. 2 and Notice to Operators dated May 27, 2005.
- g. BOP remote controls to be located on rig floor and readily accessible, master control on ground at accumulator will be able to function all preventors.
- h. Kill line will be 2 in min and have two kill line valves, one being a check valve.
- i. Choke line will be 2 in min and have two choke line valves, choke manifold with have two adjustable chokes, one manual and one remote. All choke lines will be as straight as possible. Any turns will be properly targeted using block and/or running tees. Choke line and manifold to be pressure tested to 1,500 psi.
- j. Float sub and TIW valve will be on the rig floor at all times.
- k. If high pressure co-flex hoses are used, they will be run as straight as possible and anchored to prevent whip.
- l. The main discharge line (panic line) will be at least 100' from the choke manifold and discharged into an appropriately sized discharge facility.

9. Mud Program:

0' - 320'	Fresh water/Spud Mud. Paper for losses and seepage. 8.4 to 8.8 ppg, 32 to 44 vis, PV <8, YP 2 to 13, FLNC, LGS < 3%
320' – 6,069'	KCL WBM. As needed LCM for losses and seepage. 9.0 to 9.5 ppg, pH 9.0-9.5, 38 to 45 vis, PV 8-14, YP 8-14, FL <20cc/30min, LGS <6%
6,069' – 10,666'	LSND WBM. As needed LCM for losses and seepage. 8.8 to 9.0 ppg, PH 9.0-9.5, 34 to 38 vis, PV 4-8, YP 6-8, FL <8cc/30min, LGS < 4%

****During drilling operations, all necessary products will be sufficiently stored on location for abnormal situations. The characteristics, use, testing of drilling mud and the implementation of related drilling procedures shall be designed to prevent the loss of well control. Sufficient quantities of mud materials shall be maintained or readily accessible for the purpose of assuring well control.**

****A pH of 10 or above in the fresh water base mud system shall be maintained to control the effects corrosion has on metallurgy of equipment used.**

Operating and Maintenance

LOGOS Operating, LLC will be using all above ground steel pits for fluid and cuttings while drilling. If any tank develops a leak we will have immediate visual discovery, we would then transfer the fluid to another tank then remove any contaminated soil and dispose of it in the cuttings bins for transportation. 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. A trip/surge tank will be used to monitor returns for any “kicks” of formation fluids.

Equipment:

- (1) Grinder/Particle Sizer Package
- (2) HS-2172 Variable Speed/High Volume Centrifuges w/ HCCS Stand & Feed Pumps
- (1) DWU 250 – Dewatering Unit/Command Center
- (1) High-Sided Drive-In Tank

10. Testing, Logging and Coring Program:

- a. Testing Program: No drillstem tests are anticipated
- b. Electric Logging Program: TBD
- c. LWD Program: TBD
- d. Coring Program: None.
- e. CBL's and/or Temperature Surveys Will Be Performed as Needed or Required.

- 11. Bottom Hole Pressure expected to be 2,500 +/- psi
- 12. Bottom Hole Temperature expected to be 160 deg F.

Well Control Equipment Schematic for 2M Service

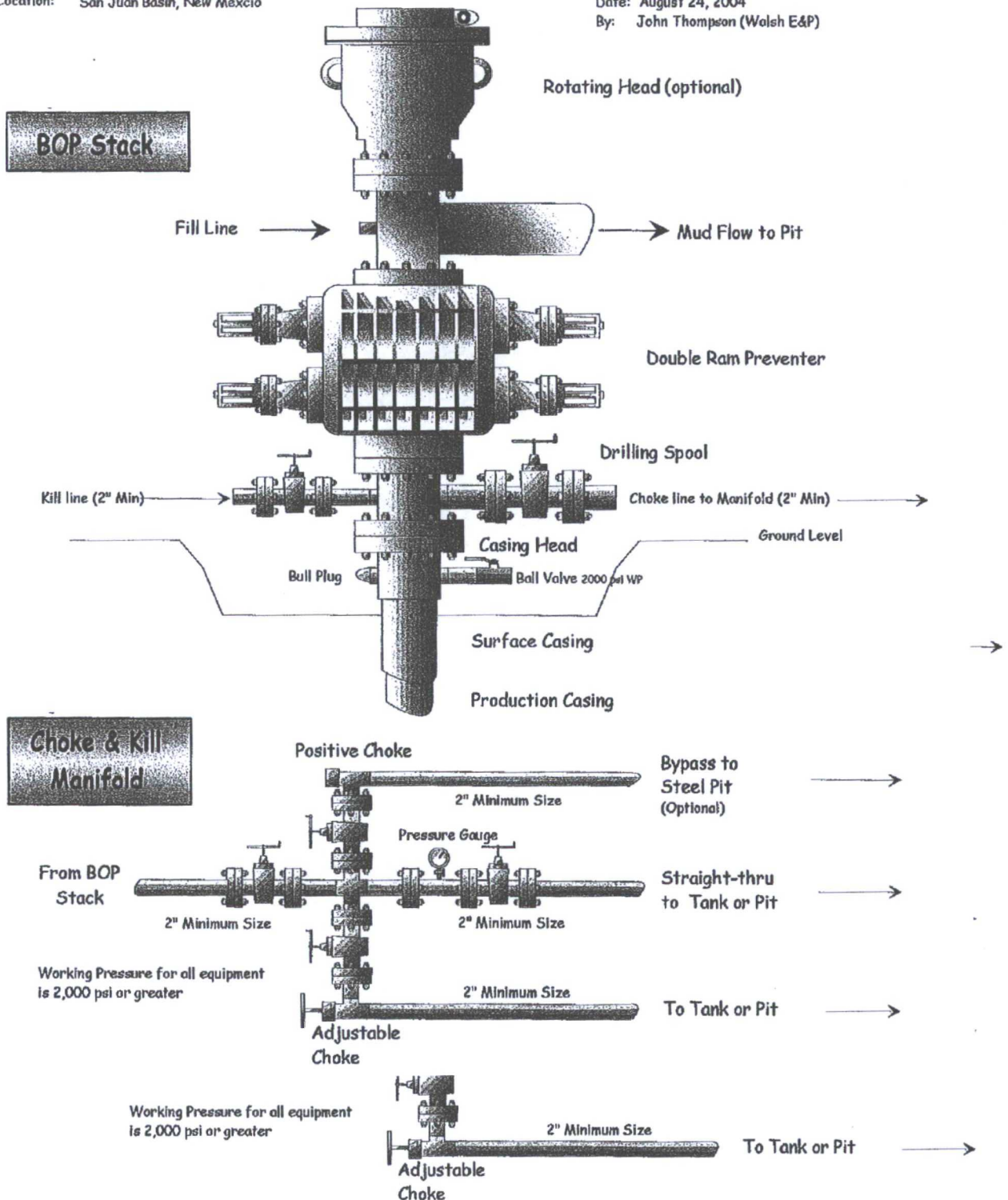
Attachment to Drilling Technical Program

Exhibit #1 Typical BOP setup

Location: San Juan Basin, New Mexico

Date: August 24, 2004

By: John Thompson (Walsh E&P)





Company: Logos Operating LLC
Project: San Juan, NM NAD83
Site: Heros 2308-09L
Well: Heros 2308-09L 4H
Wellbore: OH
Design: Plan #6

PROJECT DETAILS: San Juan, 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



Azimuths to True North
Magnetic North: 8.92°

Magnetic Field
Strength: 49561.8snT
Dip Angle: 62.83°
Date: 5/1/2018
Model: HDGM

WELL DETAILS: Heros 2308-09L 4H

GL 6913' & RKB 25' @ 6938.00usft (Aztec 1000)
+N/-S +E/-W Northing Easting Latitude Longitude
0.00 0.00 1906138.88 2763992.56 36.2384928 -107.6946365 4H

Plan: Plan #6 (Heros 2308-09L 4H/OH)

Created By: Janie Collins Date: 10:27, May 11 2018

DESIGN TARGET DETAILS

Name	TVD	+N/-S	+E/-W	Northing	Easting
Heros 2308-09L 4H LP	5242.00	-1383.92	644.02	1904755.88	2764638.56
Heros 2308-09L 4H T1	5200.00	-2573.28	2294.03	1903568.89	2766290.27
Heros 2308-09L 4H BHL	5187.00	-3606.63	4632.84	1902538.88	2768630.56
Heros 2308-09L 4H First Perf	5187.00	-3579.79	4557.50	1902565.62	2768555.18
Heros 2308-09L 4H Last Perf	5242.00	-1480.09	758.88	1904659.88	2764753.56

SECTION DETAILS

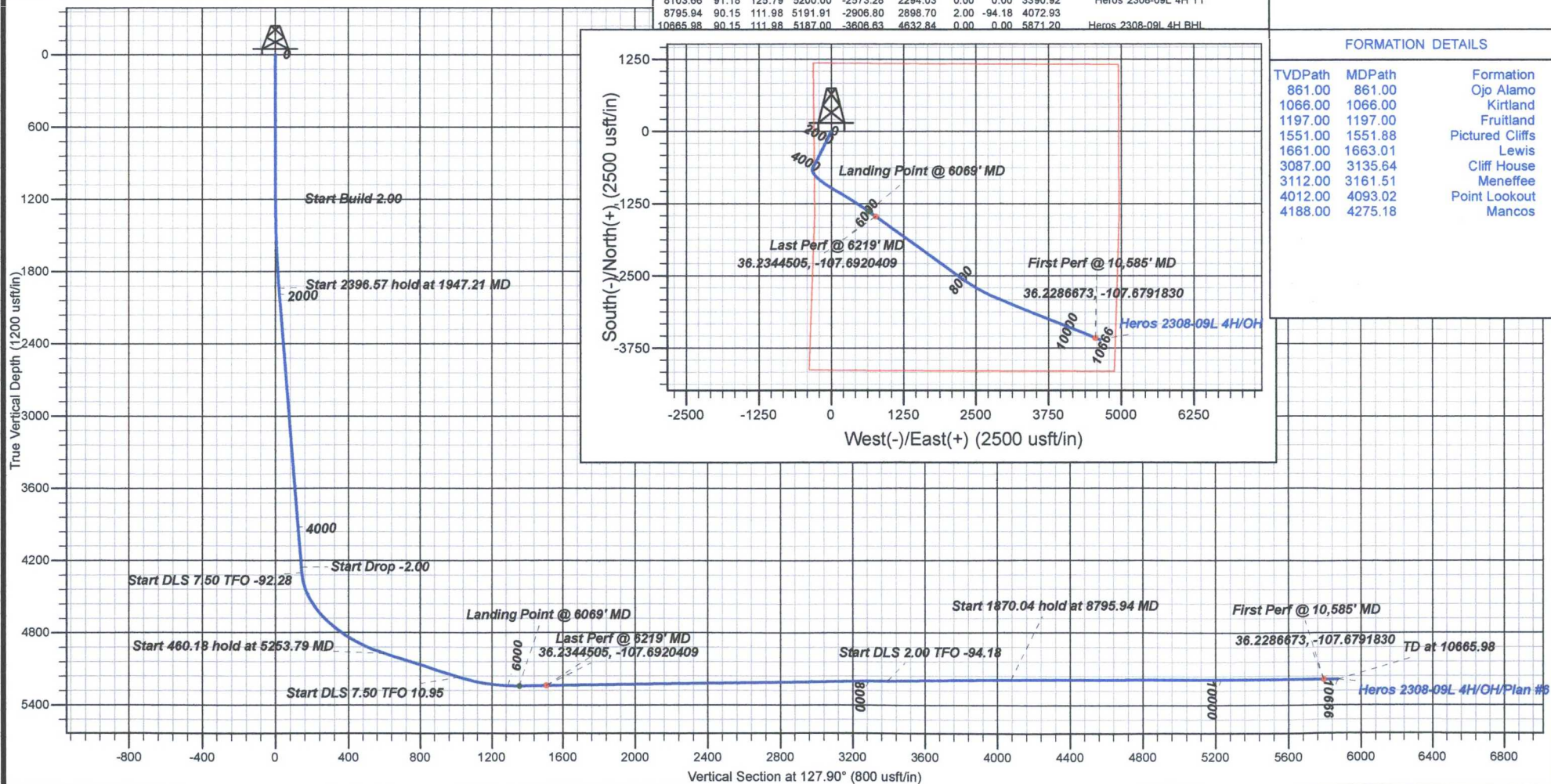
MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	VSECT	Target
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
1200.00	0.00	0.00	1200.00	0.00	0.00	0.00	0.00	0.00	
1947.21	14.94	206.57	1938.77	-86.67	-43.33	2.00	206.57	19.05	
4343.79	14.94	206.57	4254.28	-639.45	-319.72	0.00	0.00	140.52	
4391.00	14.00	206.57	4300.00	-650.00	-325.00	2.00	180.00	142.84	
5253.79	64.96	120.90	4974.41	-979.89	-1.11	7.50	-92.28	601.06	
5713.97	64.96	120.90	5169.17	-1193.99	356.65	0.00	0.00	1014.89	
6069.23	91.18	125.79	5242.00	-1383.92	644.02	7.50	10.95	1358.31	Heros 2308-09L 4H LP
8103.66	91.18	125.79	5200.00	-2573.28	2294.03	0.00	0.00	3390.92	Heros 2308-09L 4H T1
8795.94	90.15	111.98	5191.91	-2906.80	2898.70	2.00	-94.18	4072.93	
10665.98	90.15	111.98	5187.00	-3606.63	4632.84	0.00	0.00	5871.20	Heros 2308-09L 4H BHL

CASING DETAILS

TVD	MD	Name
-----	----	------

FORMATION DETAILS

TVDPath	MDPath	Formation
861.00	861.00	Ojo Alamo
1066.00	1066.00	Kirtland
1197.00	1197.00	Fruitland
1551.00	1551.88	Pictured Cliffs
1661.00	1663.01	Lewis
3087.00	3135.64	Cliff House
3112.00	3161.51	Meneffee
4012.00	4093.02	Point Lookout
4188.00	4275.18	Mancos





Logos Operating LLC

San Juan, NM NAD83

Heros 2308-09L

Heros 2308-09L 4H - Slot 4H

OH

Plan: Plan #6

Standard Planning Report

11 May, 2018



www.scientificdrilling.com



Scientific Drilling, Intl
Planning Report



Database:	Grand Junction District	Local Co-ordinate Reference:	Well Heros 2308-09L 4H - Slot 4H
Company:	Logos Operating LLC	TVD Reference:	GL 6913' & RKB 25' @ 6938.00usft (Aztec 1000)
Project:	San Juan, NM NAD83	MD Reference:	GL 6913' & RKB 25' @ 6938.00usft (Aztec 1000)
Site:	Heros 2308-09L	North Reference:	True
Well:	Heros 2308-09L 4H	Survey Calculation Method:	Minimum Curvature
Wellbore:	OH		
Design:	Plan #6		

Project	San Juan, 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	Heros 2308-09L			
Site Position:		Northing:	1,906,138.89 usft	Latitude: 36.2384930
From:	Map	Easting:	2,763,932.56 usft	Longitude: -107.6948400
Position Uncertainty:	0.00 usft	Slot Radius:	13.20 in	Grid Convergence: 0.08 °

Well	Heros 2308-09L 4H - Slot 4H			
Well Position	+N/-S	-0.09 usft	Northing:	1,906,138.89 usft
	+E/-W	60.00 usft	Easting:	2,763,992.56 usft
Position Uncertainty		0.00 usft	Wellhead Elevation:	0.00 usft
			Ground Level:	6,913.00 usft

Wellbore	OH				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	HDGM	5/1/2018	8.92	62.83	49,562

Design	Plan #6			
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	127.90

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
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
1,200.00	0.00	0.00	1,200.00	0.00	0.00	0.00	0.00	0.00	0.00	
1,947.21	14.94	206.57	1,938.77	-86.67	-43.33	2.00	2.00	0.00	206.57	
4,343.79	14.94	206.57	4,254.28	-639.45	-319.72	0.00	0.00	0.00	0.00	
4,391.00	14.00	206.57	4,300.00	-650.00	-325.00	2.00	-2.00	0.00	180.00	
5,253.79	64.96	120.90	4,974.41	-979.89	-1.11	7.50	5.91	-9.93	-92.28	
5,713.97	64.96	120.90	5,169.17	-1,193.99	356.65	0.00	0.00	0.00	0.00	
6,069.23	91.18	125.79	5,242.00	-1,383.92	644.02	7.50	7.38	1.38	10.95	Heros 2308-09L 4H L
8,103.66	91.18	125.79	5,200.00	-2,573.28	2,294.03	0.00	0.00	0.00	0.00	Heros 2308-09L 4H T
8,795.94	90.15	111.98	5,191.91	-2,906.80	2,898.70	2.00	-0.15	-1.99	-94.18	
10,665.98	90.15	111.98	5,187.00	-3,606.63	4,632.84	0.00	0.00	0.00	0.00	Heros 2308-09L 4H B



Scientific Drilling, Intl
Planning Report



Database:	Grand Junction District	Local Co-ordinate Reference:	Well Heros 2308-09L 4H - Slot 4H
Company:	Logos Operating LLC	TVD Reference:	GL 6913' & RKB 25' @ 6938.00usft (Aztec 1000)
Project:	San Juan, NM NAD83	MD Reference:	GL 6913' & RKB 25' @ 6938.00usft (Aztec 1000)
Site:	Heros 2308-09L	North Reference:	True
Well:	Heros 2308-09L 4H	Survey Calculation Method:	Minimum Curvature
Wellbore:	OH		
Design:	Plan #6		

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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00
200.00	0.00	0.00	200.00	0.00	0.00	0.00	0.00	0.00	0.00
300.00	0.00	0.00	300.00	0.00	0.00	0.00	0.00	0.00	0.00
400.00	0.00	0.00	400.00	0.00	0.00	0.00	0.00	0.00	0.00
500.00	0.00	0.00	500.00	0.00	0.00	0.00	0.00	0.00	0.00
600.00	0.00	0.00	600.00	0.00	0.00	0.00	0.00	0.00	0.00
700.00	0.00	0.00	700.00	0.00	0.00	0.00	0.00	0.00	0.00
800.00	0.00	0.00	800.00	0.00	0.00	0.00	0.00	0.00	0.00
861.00	0.00	0.00	861.00	0.00	0.00	0.00	0.00	0.00	0.00
Ojo Alamo									
900.00	0.00	0.00	900.00	0.00	0.00	0.00	0.00	0.00	0.00
1,000.00	0.00	0.00	1,000.00	0.00	0.00	0.00	0.00	0.00	0.00
1,066.00	0.00	0.00	1,066.00	0.00	0.00	0.00	0.00	0.00	0.00
Kirtland									
1,100.00	0.00	0.00	1,100.00	0.00	0.00	0.00	0.00	0.00	0.00
1,197.00	0.00	0.00	1,197.00	0.00	0.00	0.00	0.00	0.00	0.00
Fruittland									
1,200.00	0.00	0.00	1,200.00	0.00	0.00	0.00	0.00	0.00	0.00
Start Build 2.00									
1,300.00	2.00	206.57	1,299.98	-1.56	-0.78	0.34	2.00	2.00	0.00
1,400.00	4.00	206.57	1,399.84	-6.24	-3.12	1.37	2.00	2.00	0.00
1,500.00	6.00	206.57	1,499.45	-14.04	-7.02	3.08	2.00	2.00	0.00
1,551.88	7.04	206.57	1,551.00	-19.31	-9.65	4.24	2.00	2.00	0.00
Pictured Cliffs									
1,600.00	8.00	206.57	1,598.70	-24.94	-12.47	5.48	2.00	2.00	0.00
1,663.01	9.26	206.57	1,661.00	-33.39	-16.70	7.34	2.00	2.00	0.00
Lewis									
1,700.00	10.00	206.57	1,697.47	-38.93	-19.46	8.55	2.00	2.00	0.00
1,800.00	12.00	206.57	1,795.62	-55.99	-28.00	12.30	2.00	2.00	0.00
1,900.00	14.00	206.57	1,893.06	-76.11	-38.06	16.73	2.00	2.00	0.00
1,947.21	14.94	206.57	1,938.77	-86.67	-43.33	19.05	2.00	2.00	0.00
Start 2396.57 hold at 1947.21 MD									
2,000.00	14.94	206.57	1,989.77	-98.84	-49.42	21.72	0.00	0.00	0.00
2,100.00	14.94	206.57	2,086.39	-121.91	-60.95	26.79	0.00	0.00	0.00
2,200.00	14.94	206.57	2,183.01	-144.97	-72.49	31.86	0.00	0.00	0.00
2,300.00	14.94	206.57	2,279.62	-168.04	-84.02	36.93	0.00	0.00	0.00
2,400.00	14.94	206.57	2,376.24	-191.10	-95.55	42.00	0.00	0.00	0.00
2,500.00	14.94	206.57	2,472.86	-214.17	-107.08	47.06	0.00	0.00	0.00
2,600.00	14.94	206.57	2,569.48	-237.23	-118.62	52.13	0.00	0.00	0.00
2,700.00	14.94	206.57	2,666.10	-260.30	-130.15	57.20	0.00	0.00	0.00
2,800.00	14.94	206.57	2,762.71	-283.37	-141.68	62.27	0.00	0.00	0.00
2,900.00	14.94	206.57	2,859.33	-306.43	-153.22	67.34	0.00	0.00	0.00
3,000.00	14.94	206.57	2,955.95	-329.50	-164.75	72.41	0.00	0.00	0.00
3,100.00	14.94	206.57	3,052.57	-352.56	-176.28	77.48	0.00	0.00	0.00
3,135.64	14.94	206.57	3,087.00	-360.78	-180.39	79.28	0.00	0.00	0.00
Cliff House									
3,161.51	14.94	206.57	3,112.00	-366.75	-183.38	80.59	0.00	0.00	0.00
Meneffee									
3,200.00	14.94	206.57	3,149.18	-375.63	-187.81	82.54	0.00	0.00	0.00
3,300.00	14.94	206.57	3,245.80	-398.69	-199.35	87.61	0.00	0.00	0.00



Scientific Drilling, Intl
Planning Report



Database:	Grand Junction District	Local Co-ordinate Reference:	Well Heros 2308-09L 4H - Slot 4H
Company:	Logos Operating LLC	TVD Reference:	GL 6913' & RKB 25' @ 6938.00usft (Aztec 1000)
Project:	San Juan, NM NAD83	MD Reference:	GL 6913' & RKB 25' @ 6938.00usft (Aztec 1000)
Site:	Heros 2308-09L	North Reference:	True
Well:	Heros 2308-09L 4H	Survey Calculation Method:	Minimum Curvature
Wellbore:	OH		
Design:	Plan #6		

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)	
3,400.00	14.94	206.57	3,342.42	-421.76	-210.88	92.68	0.00	0.00	0.00	
3,500.00	14.94	206.57	3,439.04	-444.82	-222.41	97.75	0.00	0.00	0.00	
3,600.00	14.94	206.57	3,535.65	-467.89	-233.94	102.82	0.00	0.00	0.00	
3,700.00	14.94	206.57	3,632.27	-490.95	-245.48	107.89	0.00	0.00	0.00	
3,800.00	14.94	206.57	3,728.89	-514.02	-257.01	112.96	0.00	0.00	0.00	
3,900.00	14.94	206.57	3,825.51	-537.09	-268.54	118.03	0.00	0.00	0.00	
4,000.00	14.94	206.57	3,922.13	-560.15	-280.08	123.09	0.00	0.00	0.00	
4,093.02	14.94	206.57	4,012.00	-581.61	-290.80	127.81	0.00	0.00	0.00	
Point Lookout										
4,100.00	14.94	206.57	4,018.74	-583.22	-291.61	128.16	0.00	0.00	0.00	
4,200.00	14.94	206.57	4,115.36	-606.28	-303.14	133.23	0.00	0.00	0.00	
4,275.18	14.94	206.57	4,188.00	-623.62	-311.81	137.04	0.00	0.00	0.00	
Mancos										
4,300.00	14.94	206.57	4,211.98	-629.35	-314.67	138.30	0.00	0.00	0.00	
4,343.79	14.94	206.57	4,254.28	-639.45	-319.72	140.52	0.00	0.00	0.00	
Start Drop -2.00										
4,391.00	14.00	206.57	4,300.00	-650.00	-325.00	142.84	2.00	-2.00	0.00	
Start DLS 7.50 TFO -92.28										
4,400.00	13.99	203.77	4,308.73	-651.97	-325.93	143.32	7.50	-0.12	-31.01	
4,500.00	15.89	175.30	4,405.48	-676.71	-329.68	155.55	7.50	1.90	-28.48	
4,600.00	20.48	156.06	4,500.54	-706.38	-321.45	180.27	7.50	4.59	-19.24	
4,700.00	26.39	144.35	4,592.30	-740.47	-301.37	217.06	7.50	5.91	-11.71	
4,800.00	32.92	136.85	4,679.19	-778.41	-269.79	265.29	7.50	6.53	-7.51	
4,900.00	39.76	131.64	4,759.71	-819.54	-227.24	324.12	7.50	6.84	-5.21	
5,000.00	46.78	127.76	4,832.50	-863.16	-174.46	392.57	7.50	7.02	-3.88	
5,100.00	53.89	124.68	4,896.29	-908.52	-112.35	469.44	7.50	7.12	-3.07	
5,200.00	61.08	122.13	4,950.01	-954.85	-41.97	553.44	7.50	7.18	-2.56	
5,253.79	64.96	120.90	4,974.41	-979.89	-1.11	601.06	7.50	7.22	-2.28	
Start 460.18 hold at 5253.79 MD										
5,300.00	64.96	120.90	4,993.97	-1,001.39	34.82	642.62	0.00	0.00	0.00	
5,400.00	64.96	120.90	5,036.29	-1,047.92	112.56	732.55	0.00	0.00	0.00	
5,500.00	64.96	120.90	5,078.62	-1,094.44	190.31	822.47	0.00	0.00	0.00	
5,600.00	64.96	120.90	5,120.94	-1,140.97	268.05	912.40	0.00	0.00	0.00	
5,700.00	64.96	120.90	5,163.26	-1,187.49	345.80	1,002.33	0.00	0.00	0.00	
5,713.97	64.96	120.90	5,169.17	-1,193.99	356.65	1,014.89	0.00	0.00	0.00	
Start DLS 7.50 TFO 10.95										
5,800.00	71.30	122.19	5,201.20	-1,235.76	424.65	1,094.20	7.50	7.37	1.50	
5,900.00	78.68	123.58	5,227.08	-1,288.18	505.70	1,190.35	7.50	7.38	1.39	
6,000.00	86.07	124.89	5,240.34	-1,343.90	587.58	1,289.19	7.50	7.39	1.32	
6,069.23	91.18	125.79	5,242.00	-1,383.92	644.02	1,358.31	7.50	7.39	1.29	
Landing Point @ 6069' MD - Heros 2308-09L 4H LP										
6,100.00	91.18	125.79	5,241.36	-1,401.91	668.97	1,389.05	0.00	0.00	0.00	
6,200.00	91.18	125.79	5,239.30	-1,460.37	750.08	1,488.96	0.00	0.00	0.00	
6,218.61	91.18	125.79	5,238.92	-1,471.25	765.17	1,507.56	0.00	0.00	0.00	
Heros 2308-09L 4H Last Perf										
6,219.00	91.18	125.79	5,238.91	-1,471.48	765.49	1,507.95	0.00	0.00	0.00	
Last Perf @ 6219' MD - 36.2344505, -107.6920409										
6,300.00	91.18	125.79	5,237.24	-1,518.83	831.18	1,588.87	0.00	0.00	0.00	
6,400.00	91.18	125.79	5,235.17	-1,577.30	912.28	1,688.78	0.00	0.00	0.00	
6,500.00	91.18	125.79	5,233.11	-1,635.76	993.39	1,788.70	0.00	0.00	0.00	
6,600.00	91.18	125.79	5,231.04	-1,694.22	1,074.49	1,888.61	0.00	0.00	0.00	



Scientific Drilling, Intl
Planning Report



Database:	Grand Junction District	Local Co-ordinate Reference:	Well Heros 2308-09L 4H - Slot 4H
Company:	Logos Operating LLC	TVD Reference:	GL 6913' & RKB 25' @ 6938.00usft (Aztec 1000)
Project:	San Juan, NM NAD83	MD Reference:	GL 6913' & RKB 25' @ 6938.00usft (Aztec 1000)
Site:	Heros 2308-09L	North Reference:	True
Well:	Heros 2308-09L 4H	Survey Calculation Method:	Minimum Curvature
Wellbore:	OH		
Design:	Plan #6		

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)
6,700.00	91.18	125.79	5,228.98	-1,752.68	1,155.60	1,988.52	0.00	0.00	0.00
6,800.00	91.18	125.79	5,226.91	-1,811.14	1,236.70	2,088.43	0.00	0.00	0.00
6,900.00	91.18	125.79	5,224.85	-1,869.61	1,317.81	2,188.34	0.00	0.00	0.00
7,000.00	91.18	125.79	5,222.78	-1,928.07	1,398.91	2,288.25	0.00	0.00	0.00
7,100.00	91.18	125.79	5,220.72	-1,986.53	1,480.01	2,388.16	0.00	0.00	0.00
7,200.00	91.18	125.79	5,218.66	-2,044.99	1,561.12	2,488.07	0.00	0.00	0.00
7,300.00	91.18	125.79	5,216.59	-2,103.46	1,642.22	2,587.98	0.00	0.00	0.00
7,400.00	91.18	125.79	5,214.53	-2,161.92	1,723.33	2,687.89	0.00	0.00	0.00
7,500.00	91.18	125.79	5,212.46	-2,220.38	1,804.43	2,787.80	0.00	0.00	0.00
7,600.00	91.18	125.79	5,210.40	-2,278.84	1,885.54	2,887.71	0.00	0.00	0.00
7,700.00	91.18	125.79	5,208.33	-2,337.30	1,966.64	2,987.62	0.00	0.00	0.00
7,800.00	91.18	125.79	5,206.27	-2,395.77	2,047.74	3,087.53	0.00	0.00	0.00
7,900.00	91.18	125.79	5,204.20	-2,454.23	2,128.85	3,187.44	0.00	0.00	0.00
8,000.00	91.18	125.79	5,202.14	-2,512.69	2,209.95	3,287.35	0.00	0.00	0.00
8,100.00	91.18	125.79	5,200.08	-2,571.15	2,291.06	3,387.26	0.00	0.00	0.00
8,103.66	91.18	125.79	5,200.00	-2,573.29	2,294.02	3,390.92	0.00	0.00	0.00
Start DLS 2.00 TFO -94.18 - Heros 2308-09L 4H T1									
8,200.00	91.04	123.86	5,198.13	-2,628.29	2,373.10	3,487.10	2.00	-0.15	-2.00
8,300.00	90.89	121.87	5,196.44	-2,682.54	2,457.08	3,586.69	2.00	-0.15	-1.99
8,400.00	90.75	119.87	5,195.01	-2,733.84	2,542.90	3,685.93	2.00	-0.15	-1.99
8,500.00	90.60	117.88	5,193.84	-2,782.13	2,630.46	3,784.68	2.00	-0.15	-1.99
8,600.00	90.45	115.88	5,192.93	-2,827.34	2,719.64	3,882.82	2.00	-0.15	-1.99
8,700.00	90.30	113.89	5,192.28	-2,869.42	2,810.35	3,980.25	2.00	-0.15	-1.99
8,795.94	90.15	111.98	5,191.91	-2,906.80	2,898.70	4,072.93	2.00	-0.15	-1.99
Start 1870.04 hold at 8795.94 MD									
8,800.00	90.15	111.98	5,191.90	-2,908.32	2,902.47	4,076.83	0.00	0.00	0.00
8,900.00	90.15	111.98	5,191.63	-2,945.75	2,995.20	4,173.00	0.00	0.00	0.00
9,000.00	90.15	111.98	5,191.37	-2,983.17	3,087.93	4,269.16	0.00	0.00	0.00
9,100.00	90.15	111.98	5,191.11	-3,020.59	3,180.66	4,365.32	0.00	0.00	0.00
9,200.00	90.15	111.98	5,190.85	-3,058.02	3,273.40	4,461.48	0.00	0.00	0.00
9,300.00	90.15	111.98	5,190.58	-3,095.44	3,366.13	4,557.65	0.00	0.00	0.00
9,400.00	90.15	111.98	5,190.32	-3,132.86	3,458.86	4,653.81	0.00	0.00	0.00
9,500.00	90.15	111.98	5,190.06	-3,170.29	3,551.60	4,749.97	0.00	0.00	0.00
9,600.00	90.15	111.98	5,189.80	-3,207.71	3,644.33	4,846.13	0.00	0.00	0.00
9,700.00	90.15	111.98	5,189.53	-3,245.13	3,737.06	4,942.30	0.00	0.00	0.00
9,800.00	90.15	111.98	5,189.27	-3,282.56	3,829.80	5,038.46	0.00	0.00	0.00
9,900.00	90.15	111.98	5,189.01	-3,319.98	3,922.53	5,134.62	0.00	0.00	0.00
10,000.00	90.15	111.98	5,188.75	-3,357.40	4,015.26	5,230.78	0.00	0.00	0.00
10,100.00	90.15	111.98	5,188.49	-3,394.83	4,108.00	5,326.95	0.00	0.00	0.00
10,200.00	90.15	111.98	5,188.22	-3,432.25	4,200.73	5,423.11	0.00	0.00	0.00
10,300.00	90.15	111.98	5,187.96	-3,469.67	4,293.46	5,519.27	0.00	0.00	0.00
10,400.00	90.15	111.98	5,187.70	-3,507.10	4,386.19	5,615.43	0.00	0.00	0.00
10,500.00	90.15	111.98	5,187.44	-3,544.52	4,478.93	5,711.60	0.00	0.00	0.00
10,585.00	90.15	111.98	5,187.21	-3,576.33	4,557.75	5,793.34	0.00	0.00	0.00
First Perf @ 10,585' MD - 36.2286673, -107.6791830									
10,586.07	90.15	111.98	5,187.21	-3,576.73	4,558.74	5,794.36	0.00	0.00	0.00
Heros 2308-09L 4H First Perf									
10,600.00	90.15	111.98	5,187.17	-3,581.94	4,571.66	5,807.76	0.00	0.00	0.00
10,665.98	90.15	111.98	5,187.00	-3,606.63	4,632.84	5,871.20	0.00	0.00	0.00
TD at 10665.98 - Heros 2308-09L 4H BHL									



Scientific Drilling, Intl
Planning Report



Database:	Grand Junction District	Local Co-ordinate Reference:	Well Heros 2308-09L 4H - Slot 4H
Company:	Logos Operating LLC	TVD Reference:	GL 6913' & RKB 25' @ 6938.00usft (Aztec 1000)
Project:	San Juan, NM NAD83	MD Reference:	GL 6913' & RKB 25' @ 6938.00usft (Aztec 1000)
Site:	Heros 2308-09L	North Reference:	True
Well:	Heros 2308-09L 4H	Survey Calculation Method:	Minimum Curvature
Wellbore:	OH		
Design:	Plan #6		

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
Heros 2308-09L 4H BHL - plan hits target center - Point	0.00	0.00	5,187.00	-3,606.63	4,632.84	1,902,538.89	2,768,630.56	36.2285840	-107.6789284
Heros 2308-09L 4H First - plan misses target center by 3.31usft at 10586.07usft MD (5187.21 TVD, -3576.73 N, 4558.74 E) - Point	0.00	0.00	5,187.00	-3,579.79	4,557.50	1,902,565.62	2,768,555.18	36.2286578	-107.6791838
Heros 2308-09L 4H T1 - plan misses target center by 0.01usft at 8103.66usft MD (5200.00 TVD, -2573.29 N, 2294.02 E) - Point	0.00	0.00	5,200.00	-2,573.28	2,294.03	1,903,568.89	2,766,290.28	36.2314235	-107.6868581
Heros 2308-09L 4H LP - plan hits target center - Point	0.00	0.00	5,242.00	-1,383.92	644.02	1,904,755.89	2,764,638.56	36.2346910	-107.6924528
Heros 2308-09L 4H Last - plan misses target center by 11.27usft at 6218.61usft MD (5238.92 TVD, -1471.25 N, 765.17 E) - Point	0.00	0.00	5,242.00	-1,480.09	758.88	1,904,659.89	2,764,753.56	36.2344268	-107.6920633

Formations

Measured Depth (usft)	Vertical Depth (usft)	Name	Lithology	Dip (°)	Dip Direction (°)
861.00	861.00	Ojo Alamo		0.00	0.00
1,066.00	1,066.00	Kirtland		0.00	0.00
1,197.00	1,197.00	Fruitland		0.00	0.00
1,551.88	1,551.00	Pictured Cliffs		0.00	0.00
1,663.01	1,661.00	Lewis		0.00	0.00
3,135.64	3,087.00	Cliff House		0.00	0.00
3,161.51	3,112.00	Meneffee		0.00	0.00
4,093.02	4,012.00	Point Lookout		0.00	0.00
4,275.18	4,188.00	Mancos		0.00	0.00

Plan Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
1,200.00	1,200.00	0.00	0.00	Start Build 2.00
1,947.21	1,938.77	-86.67	-43.33	Start 2396.57 hold at 1947.21 MD
4,343.79	4,254.28	-639.45	-319.72	Start Drop -2.00
4,391.00	4,300.00	-650.00	-325.00	Start DLS 7.50 TFO -92.28
5,253.79	4,974.41	-979.89	-1.11	Start 460.18 hold at 5253.79 MD
5,713.97	5,169.17	-1,193.99	356.65	Start DLS 7.50 TFO 10.95
6,069.23	5,242.00	-1,383.92	644.02	Landing Point @ 6069' MD
6,219.00	5,238.91	-1,471.48	765.49	Last Perf @ 6219' MD
6,219.00	5,238.91	-1,471.48	765.49	36.2344505, -107.6920409
8,103.66	5,200.00	-2,573.28	2,294.03	Start DLS 2.00 TFO -94.18
8,795.94	5,191.91	-2,906.80	2,898.70	Start 1870.04 hold at 8795.94 MD
10,585.00	5,187.21	-3,576.33	4,557.75	First Perf @ 10,585' MD
10,585.00	5,187.21	-3,576.33	4,557.75	36.2286673, -107.6791830
10,665.98	5,187.00	-3,606.63	4,632.84	TD at 10665.98



Logos Operating LLC

San Juan, NM NAD83

Heros 2308-09L

Heros 2308-09L 4H

OH

Plan #6

Anticollision Report

10 May, 2018



www.scientificdrilling.com



Scientific Drilling, Intl
Anticollision Report



Company:	Logos Operating LLC	Local Co-ordinate Reference:	Well Heros 2308-09L 4H - Slot 4H
Project:	San Juan, NM NAD83	TVD Reference:	GL 6913' & RKB 25' @ 6938.00usft (Aztec 1000)
Reference Site:	Heros 2308-09L	MD Reference:	GL 6913' & RKB 25' @ 6938.00usft (Aztec 1000)
Site Error:	0.00 usft	North Reference:	True
Reference Well:	Heros 2308-09L 4H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 usft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction District
Reference Design:	Plan #6	Offset TVD Reference:	Offset Datum

Reference	Plan #6		
Filter type:	NO GLOBAL FILTER: Using user defined selection & filtering criteria		
Interpolation Method:	MD Interval 100.00usft	Error Model:	ISCWSA
Depth Range:	Unlimited	Scan Method:	Closest Approach 3D
Results Limited by:	Maximum center-center distance of 15,000.00 usft	Error Surface:	Elliptical Conic
Warning Levels Evaluated at:	2.00 Sigma	Casing Method:	Not applied

Survey Tool Program		Date	5/10/2018		
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
0.00	10,665.97	Plan #6 (OH)	MWD+HDGM	OWSG MWD + HDGM	

Site Name	Reference Measured Depth (usft)	Offset Measured Depth (usft)	Distance Between Centres (usft)	Distance Between Ellipses (usft)	Separation Factor	Warning
Offset Well - Wellbore - Design						
Heros 2308-09L						
Heros 2308-09L 1H - OH - OH	759.15	737.26	88.84	84.46	20.304	CC
Heros 2308-09L 1H - OH - OH	800.00	777.74	88.95	84.28	19.066	ES
Heros 2308-09L 1H - OH - OH	5,600.00	7,730.75	207.41	153.93	3.878	SF
Heros 2308-09L 2H - OH - Plan #6	500.00	500.00	60.00	56.86	19.129	CC
Heros 2308-09L 2H - OH - Plan #6	600.00	599.23	60.63	56.78	15.731	ES
Heros 2308-09L 2H - OH - Plan #6	900.00	894.55	74.36	68.26	12.180	SF
Heros 2308-09L 3H - OH - Plan #6	1,200.00	1,200.00	30.02	21.86	3.681	CC
Heros 2308-09L 3H - OH - Plan #6	1,300.00	1,299.24	30.46	21.60	3.440	ES, SF
Heros 2308-09L 5H - OH - Plan #2	1,525.22	1,527.68	24.34	13.93	2.339	CC, ES, SF
State NM 16 #21 Unit C - OH - OH	7,571.86	5,186.27	138.94	-87.89	0.613	Level 1, CC, ES, SF

Offset Design		Heros 2308-09L - Heros 2308-09L 1H - OH - OH										Offset Site Error:		0.00 usft
Survey Program:		404-MWD										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)	+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	-89.94	0.10	-90.09	92.74					
100.00	100.00	78.06	78.06	0.13	0.14	-89.95	0.08	-90.07	90.07	89.79	0.27	327.951		
200.00	200.00	178.13	178.13	0.49	0.32	-89.99	0.02	-89.96	89.96	89.15	0.81	110.723		
300.00	300.00	278.21	278.20	0.85	0.50	-90.06	-0.09	-89.77	89.78	88.42	1.35	66.481		
400.00	400.00	378.28	378.28	1.21	0.68	-90.16	-0.25	-89.51	89.51	87.62	1.89	47.399		
471.51	471.51	449.51	449.51	1.47	0.88	-90.20	-0.32	-89.35	89.35	87.00	2.35	38.074		
500.00	500.00	477.92	477.91	1.57	0.98	-90.18	-0.27	-89.37	89.37	86.82	2.55	35.100		
600.00	600.00	578.17	578.17	1.93	1.32	-90.17	-0.26	-89.36	89.36	86.11	3.25	27.494		
700.00	700.00	678.41	678.38	2.29	1.67	-89.10	1.40	-89.00	89.01	85.06	3.96	22.493		
759.15	759.15	737.26	737.15	2.50	1.88	-87.06	4.55	-88.72	88.84	84.46	4.38	20.304 CC		
800.00	800.00	777.74	777.55	2.64	2.02	-85.40	7.13	-88.66	88.95	84.28	4.67	19.066 ES		
900.00	900.00	877.34	876.81	3.00	2.38	-80.16	15.33	-88.41	89.73	84.35	5.38	16.664		
1,000.00	1,000.00	976.32	975.25	3.36	2.74	-73.78	25.65	-88.16	91.85	85.74	6.12	15.016		
1,100.00	1,100.00	1,074.71	1,072.99	3.72	3.12	-67.33	36.91	-88.38	95.91	89.04	6.86	13.978		
1,200.00	1,200.00	1,172.61	1,169.90	4.08	3.50	-60.08	50.78	-88.26	102.15	94.53	7.62	13.403		
1,300.00	1,299.98	1,268.60	1,264.32	4.42	3.89	101.71	68.02	-88.18	112.55	104.16	8.39	13.418		

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



Scientific Drilling, Intl
Anticollision Report



Company:	Logos Operating LLC	Local Co-ordinate Reference:	Well Heros 2308-09L 4H - Slot 4H
Project:	San Juan, NM NAD83	TVD Reference:	GL 6913' & RKB 25' @ 6938.00usft (Aztec 1000)
Reference Site:	Heros 2308-09L	MD Reference:	GL 6913' & RKB 25' @ 6938.00usft (Aztec 1000)
Site Error:	0.00 usft	North Reference:	True
Reference Well:	Heros 2308-09L 4H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 usft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction District
Reference Design:	Plan #6	Offset TVD Reference:	Offset Datum

Offset Design Heros 2308-09L - Heros 2308-09L 1H - OH - OH													Offset Site Error: 0.00 usft
Survey Program: 404-MWD													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)					
1,400.00	1,399.84	1,364.20	1,357.71	4.75	4.31	111.33	88.34	-86.69	127.81	118.68	9.13	13.997	
1,500.00	1,499.45	1,456.58	1,447.26	5.08	4.74	120.71	110.83	-83.60	149.57	139.69	9.87	15.150	
1,600.00	1,598.70	1,544.45	1,531.65	5.42	5.17	128.63	135.03	-80.05	179.40	168.81	10.59	16.939	
1,700.00	1,697.47	1,626.00	1,609.48	5.78	5.59	134.34	159.26	-77.67	216.84	205.57	11.27	19.239	
1,800.00	1,795.62	1,703.51	1,682.39	6.14	6.03	138.67	185.48	-75.76	262.51	250.62	11.89	22.075	
1,900.00	1,893.06	1,778.97	1,752.43	6.53	6.48	142.11	213.45	-73.53	314.92	302.46	12.46	25.268	
2,000.00	1,989.77	1,856.22	1,823.59	6.93	6.96	145.25	243.45	-71.45	372.07	359.05	13.02	28.585	
2,100.00	2,086.39	1,936.87	1,897.91	7.35	7.47	147.92	274.73	-69.99	430.25	416.67	13.58	31.688	
2,200.00	2,183.01	2,007.07	1,962.37	7.78	7.93	149.61	302.52	-69.57	489.61	475.51	14.09	34.740	
2,300.00	2,279.62	2,072.34	2,021.70	8.22	8.37	150.81	329.72	-69.65	551.02	536.45	14.58	37.804	
2,400.00	2,376.24	2,135.48	2,078.41	8.67	8.82	151.83	357.48	-69.32	614.59	599.55	15.04	40.866	
2,500.00	2,472.86	2,202.52	2,138.09	9.13	9.31	152.74	388.03	-68.86	679.65	664.12	15.53	43.759	
2,600.00	2,569.48	2,270.25	2,198.06	9.59	9.82	153.47	419.51	-68.77	745.58	729.55	16.04	46.497	
2,700.00	2,666.10	2,358.83	2,276.41	10.06	10.49	154.33	460.80	-68.00	811.81	795.08	16.73	48.536	
2,800.00	2,762.71	2,436.81	2,346.09	10.53	11.08	155.12	495.72	-65.48	876.64	859.31	17.33	50.579	
2,900.00	2,859.33	2,498.91	2,401.29	11.01	11.55	155.74	524.02	-62.61	942.33	924.52	17.80	52.931	
3,000.00	2,955.95	2,589.05	2,481.35	11.49	12.24	156.60	565.11	-57.38	1,008.31	989.78	18.53	54.406	
3,100.00	3,052.57	2,704.73	2,585.75	11.97	13.09	157.70	614.15	-48.68	1,071.76	1,052.27	19.49	54.990	
3,200.00	3,149.18	2,829.49	2,700.35	12.46	13.97	158.64	662.77	-40.70	1,132.30	1,111.78	20.51	55.198	
3,300.00	3,245.80	2,900.14	2,765.77	12.95	14.45	159.03	689.26	-37.51	1,191.48	1,170.40	21.08	56.524	
3,400.00	3,342.42	2,983.01	2,842.15	13.44	15.03	159.41	721.24	-34.48	1,251.52	1,229.76	21.75	57.531	
3,500.00	3,439.04	3,111.77	2,962.14	13.93	15.89	159.87	767.82	-31.31	1,309.18	1,286.37	22.81	57.387	
3,600.00	3,535.65	3,197.49	3,042.61	14.43	16.45	160.11	797.34	-30.18	1,365.36	1,341.85	23.51	58.072	
3,700.00	3,632.27	3,250.17	3,091.80	14.92	16.80	160.23	816.20	-29.63	1,422.70	1,398.76	23.94	59.435	
3,800.00	3,728.89	3,316.05	3,152.95	15.42	17.25	160.37	840.70	-28.78	1,481.29	1,456.81	24.47	60.525	
3,900.00	3,825.51	3,382.51	3,217.24	15.92	17.73	160.49	865.73	-27.88	1,539.88	1,514.40	25.00	61.639	
4,000.00	3,922.13	3,449.04	3,284.14	16.42	18.24	160.59	891.24	-26.93	1,597.97	1,572.49	25.53	62.777	
4,100.00	4,018.74	3,515.56	3,351.04	16.92	18.75	160.67	917.16	-26.00	1,655.66	1,630.17	26.06	63.938	
4,200.00	4,115.36	3,582.07	3,417.94	17.42	19.26	160.73	943.46	-25.08	1,713.35	1,687.86	26.59	65.121	
4,300.00	4,211.98	3,648.58	3,484.84	17.92	19.77	160.78	969.96	-24.17	1,771.04	1,745.35	27.12	66.316	
4,400.00	4,308.60	3,715.09	3,551.74	18.42	20.28	160.81	996.66	-23.27	1,828.73	1,802.05	27.65	67.522	
4,500.00	4,405.22	3,781.60	3,618.64	18.92	20.79	160.82	1,023.56	-22.38	1,886.42	1,859.74	28.18	68.738	
4,600.00	4,501.84	3,848.11	3,685.54	19.42	21.30	160.81	1,050.56	-21.50	1,944.11	1,917.42	28.71	69.964	
4,700.00	4,598.46	3,914.62	3,752.44	19.92	21.81	160.78	1,077.66	-20.63	2,001.70	1,974.93	29.24	71.199	
4,800.00	4,695.08	3,981.13	3,819.34	20.42	22.32	160.73	1,104.86	-19.78	2,059.29	2,032.05	29.77	72.444	
4,900.00	4,791.70	4,047.64	3,886.24	20.92	22.83	160.67	1,132.16	-18.93	2,116.88	2,089.16	30.30	73.699	
5,000.00	4,888.32	4,114.15	3,953.14	21.42	23.34	160.59	1,159.56	-18.10	2,174.47	2,146.85	30.83	74.964	
5,100.00	4,984.94	4,180.66	4,019.04	21.92	23.85	160.49	1,186.86	-17.28	2,232.06	2,204.34	31.36	76.229	
5,200.00	5,081.56	4,247.17	4,085.94	22.42	24.36	160.37	1,214.16	-16.48	2,289.65	2,261.93	31.89	77.504	
5,300.00	5,178.18	4,313.68	4,152.84	22.92	24.87	160.23	1,241.46	-15.68	2,347.24	2,319.52	32.42	78.779	
5,400.00	5,274.80	4,380.19	4,219.74	23.42	25.38	160.07	1,268.76	-14.88	2,404.83	2,377.11	32.95	80.054	
5,500.00	5,371.42	4,446.70	4,286.64	23.92	25.89	159.89	1,296.06	-14.10	2,462.42	2,434.70	33.48	81.329	
5,600.00	5,468.04	4,513.21	4,353.54	24.42	26.40	159.69	1,323.36	-13.33	2,519.91	2,492.19	34.01	82.604	
5,700.00	5,564.66	4,579.72	4,420.44	24.92	26.91	159.47	1,350.66	-12.58	2,577.50	2,549.78	34.54	83.879	
5,800.00	5,661.28	4,646.23	4,487.34	25.42	27.42	159.23	1,377.96	-11.83	2,635.09	2,607.57	35.07	85.154	
5,900.00	5,757.90	4,712.74	4,554.24	25.92	27.93	158.97	1,405.26	-11.10	2,692.68	2,665.05	35.60	86.429	
6,000.00	5,854.52	4,779.25	4,621.14	26.42	28.44	158.69	1,432.56	-10.38	2,750.27	2,722.64	36.13	87.704	
6,100.00	5,951.14	4,845.76	4,688.04	26.92	28.95	158.39	1,459.86	-9.68	2,807.86	2,780.23	36.66	88.979	
6,200.00	6,047.76	4,912.27	4,754.94	27.42	29.46	158.07	1,487.16	-8.98	2,865.45	2,837.82	37.19	90.254	

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 Heros 2308-09L 4H - Slot 4H
Project:	San Juan, NM NAD83	TVD Reference:	GL 6913' & RKB 25' @ 6938.00usft (Aztec 1000)
Reference Site:	Heros 2308-09L	MD Reference:	GL 6913' & RKB 25' @ 6938.00usft (Aztec 1000)
Site Error:	0.00 usft	North Reference:	True
Reference Well:	Heros 2308-09L 4H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 usft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction District
Reference Design:	Plan #6	Offset TVD Reference:	Offset Datum

Offset Design Heros 2308-09L - Heros 2308-09L 1H - OH - OH														Offset Site Error:	0.00 usft
Survey Program: 404-MWD														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)							
6,300.00	5,237.24	8,174.92	5,220.46	41.31	44.45	89.35	-1,597.27	148.73	686.96	608.85	78.11	8.795			
6,400.00	5,235.17	8,231.45	5,219.50	43.76	45.31	89.38	-1,653.47	154.76	761.37	681.18	80.19	9.494			
6,500.00	5,233.11	8,292.32	5,219.37	46.24	46.25	89.51	-1,714.07	160.54	836.57	754.08	82.48	10.142			
6,600.00	5,231.04	8,357.48	5,218.44	48.76	47.25	89.54	-1,778.93	166.64	911.84	826.86	84.99	10.729			
6,700.00	5,228.98	8,452.29	5,216.44	51.30	48.74	89.53	-1,873.21	176.40	986.63	897.85	88.78	11.113			
6,800.00	5,226.91	8,544.41	5,216.45	53.86	50.22	89.68	-1,964.50	188.69	1,059.23	966.73	92.51	11.450			
6,900.00	5,224.85	8,629.54	5,214.91	56.45	51.61	89.68	-2,048.62	201.67	1,130.46	1,034.48	95.98	11.778			
7,000.00	5,222.78	8,779.39	5,212.94	59.05	54.13	89.73	-2,195.73	229.95	1,199.28	1,097.26	102.01	11.756			
7,100.00	5,220.72	8,897.44	5,211.01	61.66	56.17	89.75	-2,310.29	258.30	1,263.95	1,157.14	106.81	11.834			
7,200.00	5,218.66	9,004.44	5,207.79	64.29	58.06	89.68	-2,413.28	287.15	1,326.18	1,214.95	111.23	11.922			
7,300.00	5,216.59	9,117.42	5,203.78	66.93	60.09	89.59	-2,521.35	319.83	1,386.88	1,270.98	115.90	11.966			
7,400.00	5,214.53	9,229.61	5,200.00	69.58	62.13	89.52	-2,627.89	354.75	1,445.75	1,325.17	120.57	11.990			
7,500.00	5,212.46	9,402.25	5,199.03	72.24	65.34	89.65	-2,789.76	414.71	1,501.87	1,374.65	127.22	11.805			
7,600.00	5,210.40	9,600.38	5,200.39	74.90	69.13	89.88	-2,970.01	496.78	1,551.29	1,416.86	134.43	11.540			
7,700.00	5,208.33	9,689.72	5,198.66	77.58	70.87	89.88	-3,049.91	536.75	1,597.67	1,459.07	138.61	11.527			
7,800.00	5,206.27	9,790.65	5,197.51	80.26	72.85	89.91	-3,140.06	582.10	1,643.86	1,500.73	143.13	11.485			
7,900.00	5,204.20	9,889.94	5,195.99	82.95	74.82	89.92	-3,228.53	627.16	1,689.61	1,541.97	147.64	11.444			
8,000.00	5,202.14	9,967.39	5,195.22	85.64	76.37	89.95	-3,297.52	662.35	1,735.30	1,583.75	151.55	11.450			
8,099.98	5,200.08	10,105.93	5,193.93	88.33	79.17	90.00	-3,420.03	726.98	1,779.65	1,622.42	157.23	11.319			
8,200.00	5,198.13	10,170.49	5,193.77	91.05	80.48	90.07	-3,476.93	757.51	1,825.00	1,664.17	160.83	11.347			
8,300.00	5,196.44	10,212.00	5,193.75	93.79	81.33	90.14	-3,513.83	776.51	1,875.03	1,711.36	163.67	11.456			
8,400.00	5,195.01	10,276.00	5,192.74	96.56	82.63	90.20	-3,571.31	804.62	1,929.60	1,762.49	167.11	11.547			
8,500.00	5,193.84	10,320.22	5,191.50	99.34	83.53	90.26	-3,611.37	823.30	1,988.42	1,818.60	169.82	11.709			
8,600.00	5,192.93	10,382.62	5,189.87	102.13	84.80	90.32	-3,668.22	848.99	2,051.04	1,877.94	173.09	11.849			
8,700.00	5,192.28	10,465.80	5,187.42	104.93	86.50	90.36	-3,744.03	883.12	2,116.46	1,939.37	177.09	11.951			
8,800.00	5,191.90	10,592.00	5,185.32	107.74	89.11	90.41	-3,857.89	937.49	2,182.44	1,999.80	182.64	11.950			
8,900.00	5,191.63	10,592.00	5,185.32	110.55	89.11	90.41	-3,857.89	937.49	2,250.87	2,067.25	183.62	12.258			
9,000.00	5,191.37	10,592.00	5,185.32	113.36	89.11	90.41	-3,857.89	937.49	2,321.59	2,137.22	184.37	12.592			
9,100.00	5,191.11	10,592.00	5,185.32	116.19	89.11	90.41	-3,857.89	937.49	2,394.40	2,209.47	184.93	12.948			
9,200.00	5,190.85	10,592.00	5,185.32	119.02	89.11	90.41	-3,857.89	937.49	2,469.11	2,283.80	185.32	13.324			
9,300.00	5,190.58	10,592.00	5,185.32	121.85	89.11	90.41	-3,857.89	937.49	2,545.56	2,360.00	185.56	13.718			
9,400.00	5,190.32	10,592.00	5,185.32	124.69	89.11	90.41	-3,857.89	937.49	2,623.60	2,437.91	185.69	14.129			
9,500.00	5,190.06	10,592.00	5,185.32	127.54	89.11	90.41	-3,857.89	937.49	2,703.08	2,517.37	185.71	14.556			
9,600.00	5,189.80	10,592.00	5,185.32	130.39	89.11	90.41	-3,857.89	937.49	2,783.88	2,598.24	185.65	14.996			
9,700.00	5,189.53	10,592.00	5,185.32	133.25	89.11	90.41	-3,857.89	937.49	2,865.90	2,680.39	185.51	15.448			
9,800.00	5,189.27	10,592.00	5,185.32	136.11	89.11	90.41	-3,857.89	937.49	2,949.03	2,763.70	185.32	15.913			
9,900.00	5,189.01	10,592.00	5,185.32	138.97	89.11	90.41	-3,857.89	937.49	3,033.17	2,848.09	185.08	16.388			
10,000.00	5,188.75	10,592.00	5,185.32	141.84	89.11	90.41	-3,857.89	937.49	3,118.25	2,933.45	184.81	16.873			
10,100.00	5,188.49	10,592.00	5,185.32	144.71	89.11	90.41	-3,857.89	937.49	3,204.20	3,019.70	184.50	17.367			
10,200.00	5,188.22	10,592.00	5,185.32	147.58	89.11	90.41	-3,857.89	937.49	3,290.93	3,106.77	184.16	17.870			
10,300.00	5,187.96	10,592.00	5,185.32	150.46	89.11	90.41	-3,857.89	937.49	3,378.41	3,194.60	183.81	18.380			
10,400.00	5,187.70	10,592.00	5,185.32	153.34	89.11	90.41	-3,857.89	937.49	3,466.55	3,283.12	183.44	18.898			
10,500.00	5,187.44	10,592.00	5,185.32	156.22	89.11	90.41	-3,857.89	937.49	3,555.33	3,372.27	183.06	19.422			
10,600.00	5,187.17	10,592.00	5,185.32	159.11	89.11	90.41	-3,857.89	937.49	3,644.69	3,462.02	182.67	19.953			
10,665.98	5,187.00	10,592.00	5,185.32	161.01	89.11	90.41	-3,857.89	937.49	3,703.94	3,521.53	182.41	20.306			



Scientific Drilling, Intl
Anticollision Report



Company:	Logos Operating LLC	Local Co-ordinate Reference:	Well Heros 2308-09L 4H - Slot 4H
Project:	San Juan, NM NAD83	TVD Reference:	GL 6913' & RKB 25' @ 6938.00usft (Aztec 1000)
Reference Site:	Heros 2308-09L	MD Reference:	GL 6913' & RKB 25' @ 6938.00usft (Aztec 1000)
Site Error:	0.00 usft	North Reference:	True
Reference Well:	Heros 2308-09L 4H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 usft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction District
Reference Design:	Plan #6	Offset TVD Reference:	Offset Datum

Offset Design Heros 2308-09L - Heros 2308-09L 2H - OH - Plan #6												Offset Site Error: 0.00 usft	
Survey Program: C-MWD+HDGM												Offset Well Error: 0.00 usft	
Reference		Offset		Semi Major Axis		Highside Toolface (°)	Offset Wellbore Centre		Distance		Minimum Separation (usft)	Separation Factor	Warning
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)		+N/-S (usft)	+E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)			
0.00	0.00	0.00	0.00	0.00	0.00	-89.92	0.09	-60.00	60.00				
100.00	100.00	100.00	100.00	0.13	0.13	-89.92	0.09	-60.00	60.00	59.73	0.27	223.169	
200.00	200.00	200.00	200.00	0.49	0.49	-89.92	0.09	-60.00	60.00	59.01	0.99	60.864	
300.00	300.00	300.00	300.00	0.85	0.85	-89.92	0.09	-60.00	60.00	58.30	1.70	35.237	
400.00	400.00	400.00	400.00	1.21	1.21	-89.92	0.09	-60.00	60.00	57.58	2.42	24.797	
500.00	500.00	500.00	500.00	1.57	1.57	-89.92	0.09	-60.00	60.00	56.86	3.14	19.129 CC	
600.00	600.00	599.23	599.21	1.93	1.92	-88.40	1.69	-60.60	60.63	56.78	3.85	15.731 ES	
700.00	700.00	698.21	698.06	2.29	2.28	-84.05	6.50	-62.41	62.78	58.20	4.58	13.700	
800.00	800.00	796.73	796.20	2.64	2.64	-77.53	14.46	-65.40	67.09	61.76	5.33	12.586	
900.00	900.00	894.55	893.30	3.00	3.00	-69.88	25.48	-69.54	74.36	68.26	6.11	12.180 SF	
1,000.00	1,000.00	991.45	989.04	3.36	3.36	-62.19	39.45	-74.79	85.27	78.36	6.90	12.356	
1,100.00	1,100.00	1,087.23	1,083.13	3.72	3.74	-55.27	56.23	-81.10	100.12	92.42	7.70	13.003	
1,200.00	1,200.00	1,182.50	1,176.09	4.08	4.14	-49.42	75.75	-88.43	118.87	110.40	8.47	14.033	
1,300.00	1,299.98	1,279.57	1,270.60	4.42	4.55	108.79	96.48	-96.23	139.95	130.80	9.15	15.288	
1,400.00	1,399.84	1,375.98	1,364.46	4.75	4.97	113.29	117.08	-103.97	163.19	153.37	9.82	16.620	
1,500.00	1,499.45	1,471.62	1,457.57	5.08	5.40	117.47	137.51	-111.64	188.86	178.38	10.48	18.021	
1,600.00	1,598.70	1,566.36	1,549.81	5.42	5.82	121.29	157.75	-119.25	217.18	206.04	11.14	19.493	
1,700.00	1,697.47	1,660.09	1,641.07	5.78	6.24	124.75	177.78	-126.77	248.31	236.50	11.81	21.033	
1,800.00	1,795.62	1,752.69	1,731.23	6.14	6.67	127.86	197.56	-134.21	282.34	269.87	12.47	22.636	
1,900.00	1,893.06	1,844.06	1,820.19	6.53	7.09	130.63	217.08	-141.54	319.34	306.20	13.14	24.294	
2,000.00	1,889.77	1,934.28	1,908.03	6.93	7.50	133.38	236.35	-148.79	359.04	345.22	13.82	25.977	
2,100.00	2,086.39	2,024.35	1,995.72	7.35	7.92	135.88	255.60	-156.02	399.71	385.21	14.50	27.567	
2,200.00	2,183.01	2,114.42	2,083.40	7.78	8.34	137.92	274.84	-163.25	440.91	425.72	15.18	29.036	
2,300.00	2,279.62	2,204.48	2,171.09	8.22	8.75	139.63	294.08	-170.48	482.50	466.62	15.88	30.390	
2,400.00	2,376.24	2,294.55	2,258.78	8.67	9.17	141.06	313.32	-177.71	524.39	507.82	16.57	31.639	
2,500.00	2,472.86	2,384.61	2,346.47	9.13	9.60	142.29	332.56	-184.94	566.52	549.25	17.28	32.792	
2,600.00	2,569.48	2,474.68	2,434.16	9.59	10.02	143.34	351.80	-192.17	608.84	590.86	17.98	33.856	
2,700.00	2,666.10	2,564.75	2,521.85	10.06	10.44	144.26	371.04	-199.40	651.30	632.61	18.69	34.841	
2,800.00	2,762.71	2,654.81	2,609.54	10.53	10.86	145.07	390.28	-206.63	693.89	674.48	19.41	35.755	
2,900.00	2,859.33	2,744.88	2,697.23	11.01	11.29	145.79	409.53	-213.87	736.58	716.46	20.12	36.603	
3,000.00	2,955.95	2,834.95	2,784.92	11.49	11.71	146.43	428.77	-221.10	779.35	758.51	20.84	37.392	
3,100.00	3,052.57	2,925.01	2,872.61	11.97	12.14	147.00	448.01	-228.33	822.20	800.63	21.56	38.127	
3,200.00	3,149.18	3,015.08	2,960.30	12.46	12.56	147.51	467.25	-235.56	865.10	842.81	22.29	38.814	
3,300.00	3,245.80	3,105.14	3,047.99	12.95	12.99	147.98	486.49	-242.79	908.06	885.04	23.01	39.457	
3,400.00	3,342.42	3,195.21	3,135.68	13.44	13.41	148.41	505.73	-250.02	951.06	927.32	23.74	40.060	
3,500.00	3,439.04	3,285.28	3,223.36	13.93	13.84	148.79	524.97	-257.25	994.10	969.63	24.47	40.625	
3,600.00	3,535.65	3,375.34	3,311.05	14.43	14.26	149.15	544.22	-264.48	1,037.18	1,011.98	25.20	41.157	
3,700.00	3,632.27	3,465.41	3,398.74	14.92	14.69	149.48	563.46	-271.71	1,080.28	1,054.35	25.93	41.658	
3,800.00	3,728.89	3,555.47	3,486.43	15.42	15.12	149.78	582.70	-278.94	1,123.41	1,096.75	26.66	42.131	
3,900.00	3,825.51	3,645.54	3,574.12	15.92	15.54	150.06	601.94	-286.17	1,166.57	1,139.17	27.40	42.578	
4,000.00	3,922.13	3,735.61	3,661.81	16.42	15.97	150.32	621.18	-293.40	1,209.75	1,181.61	28.13	43.000	
4,100.00	4,018.74	3,825.67	3,749.50	16.92	16.40	150.57	640.42	-300.63	1,252.94	1,224.07	28.87	43.400	
4,200.00	4,115.36	3,915.74	3,837.19	17.42	16.83	150.79	659.66	-307.87	1,296.16	1,266.55	29.61	43.780	
4,300.00	4,211.98	4,005.80	3,924.88	17.93	17.25	151.00	678.91	-315.10	1,339.38	1,309.04	30.34	44.141	
4,400.00	4,308.73	4,096.08	4,012.77	18.43	17.68	151.39	698.19	-322.34	1,382.22	1,351.14	31.08	44.473	
4,500.00	4,405.48	4,185.28	4,099.62	18.91	18.11	-174.78	717.25	-329.51	1,427.12	1,395.33	31.79	44.892	
4,600.00	4,500.54	4,270.84	4,182.92	19.36	18.51	-153.16	735.53	-336.37	1,476.55	1,444.11	32.44	45.519	
4,700.00	4,592.30	4,351.29	4,261.24	19.78	18.89	-138.97	752.71	-342.83	1,530.01	1,496.99	33.02	46.336	
4,800.00	4,679.19	4,495.92	4,402.72	20.18	19.55	-130.30	780.76	-353.37	1,585.69	1,551.60	34.09	46.511	
4,900.00	4,759.71	4,635.24	4,540.20	20.56	20.11	-123.99	802.28	-353.61	1,641.48	1,606.45	35.03	46.859	
5,000.00	4,832.50	4,792.42	4,693.15	20.94	20.59	-118.95	821.55	-324.41	1,697.10	1,661.15	35.95	47.209	

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 Heros 2308-09L 4H - Slot 4H
Project:	San Juan, NM NAD83	TVD Reference:	GL 6913' & RKB 25' @ 6938.00usft (Aztec 1000)
Reference Site:	Heros 2308-09L	MD Reference:	GL 6913' & RKB 25' @ 6938.00usft (Aztec 1000)
Site Error:	0.00 usft	North Reference:	True
Reference Well:	Heros 2308-09L 4H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 usft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction District
Reference Design:	Plan #6	Offset TVD Reference:	Offset Datum

Offset Design Heros 2308-09L - Heros 2308-09L 2H - OH - Plan #6														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)							
5,100.00	4,896.29	4,980.79	4,864.77	21.35	21.01	-114.77	836.65	-249.41	1,750.83	1,713.89	36.94	47.397			
5,200.00	4,950.01	5,207.83	5,040.84	21.85	21.34	-110.92	842.12	-107.51	1,800.45	1,762.08	38.37	46.925			
5,300.00	4,993.97	5,447.63	5,174.34	22.58	21.80	-108.69	832.48	90.28	1,843.55	1,802.41	41.15	44.806			
5,400.00	5,036.29	5,645.43	5,234.43	23.60	24.45	-107.31	815.11	277.35	1,880.76	1,835.58	45.18	41.631			
5,500.00	5,078.62	5,775.98	5,248.31	24.92	26.91	-105.67	800.10	406.20	1,914.34	1,865.35	48.99	39.075			
5,600.00	5,120.94	5,861.53	5,254.41	26.45	28.70	-104.55	789.90	490.92	1,948.27	1,896.06	52.21	37.315			
5,700.00	5,163.26	6,006.50	5,262.02	28.14	31.95	-102.65	771.58	634.47	1,982.69	1,925.54	57.15	34.695			
5,800.00	5,201.20	6,091.61	5,262.15	29.99	33.96	-99.80	759.17	718.67	2,017.39	1,956.56	60.84	33.160			
5,900.00	5,227.08	6,179.48	5,262.30	32.06	36.11	-96.33	746.35	805.60	2,056.81	1,992.02	64.80	31.743			
6,000.00	5,240.34	6,268.63	5,262.44	34.27	38.36	-92.63	733.35	893.80	2,099.81	2,030.88	68.93	30.463			
6,100.00	5,241.36	6,357.62	5,262.58	36.56	40.65	-90.03	720.37	981.84	2,145.32	2,072.17	73.15	29.328			
6,200.00	5,239.30	6,446.38	5,262.72	38.91	42.98	-90.08	707.42	1,069.65	2,191.34	2,113.88	77.46	28.290			
6,300.00	5,237.24	6,535.14	5,262.87	41.31	45.34	-90.13	694.47	1,157.46	2,237.37	2,155.51	81.87	27.329			
6,400.00	5,235.17	6,623.90	5,263.01	43.76	47.74	-90.17	681.53	1,245.27	2,283.40	2,197.05	86.35	26.442			
6,500.00	5,233.11	6,712.66	5,263.15	46.24	50.17	-90.22	668.58	1,333.08	2,329.43	2,238.53	90.91	25.624			
6,600.00	5,231.04	6,801.42	5,263.29	48.76	52.61	-90.26	655.63	1,420.89	2,375.47	2,279.94	95.52	24.868			
6,700.00	5,228.98	6,890.18	5,263.44	51.30	55.08	-90.31	642.69	1,508.70	2,421.50	2,321.31	100.19	24.169			
6,800.00	5,226.91	6,978.95	5,263.58	53.86	57.57	-90.35	629.74	1,596.52	2,467.54	2,362.63	104.90	23.522			
6,900.00	5,224.85	7,067.71	5,263.72	56.45	60.08	-90.38	616.79	1,684.33	2,513.57	2,403.92	109.65	22.923			
7,000.00	5,222.78	7,156.47	5,263.87	59.05	62.59	-90.42	603.85	1,772.14	2,559.61	2,445.17	114.43	22.368			
7,100.00	5,220.72	7,245.23	5,264.01	61.66	65.12	-90.46	590.90	1,859.95	2,605.64	2,486.40	119.24	21.851			
7,200.00	5,218.66	7,333.99	5,264.15	64.29	67.66	-90.49	577.95	1,947.76	2,651.68	2,527.60	124.08	21.371			
7,300.00	5,216.59	7,422.75	5,264.29	66.93	70.21	-90.53	565.01	2,035.57	2,697.72	2,568.78	128.94	20.922			
7,400.00	5,214.53	7,511.51	5,264.44	69.58	72.77	-90.56	552.06	2,123.38	2,743.76	2,609.94	133.82	20.504			
7,500.00	5,212.46	7,600.27	5,264.58	72.24	75.33	-90.59	539.11	2,211.19	2,789.80	2,651.08	138.72	20.112			
7,600.00	5,210.40	7,689.03	5,264.72	74.90	77.91	-90.62	526.17	2,299.01	2,835.84	2,692.21	143.63	19.744			
7,700.00	5,208.33	7,777.79	5,264.86	77.58	80.49	-90.65	513.22	2,386.82	2,881.88	2,733.32	148.56	19.399			
7,800.00	5,206.27	7,866.55	5,265.01	80.26	83.07	-90.68	500.28	2,474.63	2,927.92	2,774.42	153.50	19.074			
7,900.00	5,204.20	7,955.31	5,265.15	82.95	85.66	-90.71	487.33	2,562.44	2,973.97	2,815.51	158.45	18.769			
8,000.00	5,202.14	8,044.07	5,265.29	85.64	88.26	-90.74	474.38	2,650.25	3,020.01	2,856.59	163.42	18.480			
8,099.98	5,200.08	8,132.82	5,265.43	88.33	90.86	-90.76	461.44	2,738.05	3,066.05	2,897.65	168.39	18.208			
8,200.00	5,198.13	8,222.33	5,265.58	91.05	93.48	-90.88	448.38	2,826.60	3,110.64	2,937.21	173.43	17.936			
8,300.00	5,196.44	8,313.32	5,265.73	93.79	96.16	-90.98	435.11	2,916.62	3,152.10	2,973.51	178.59	17.650			
8,400.00	5,195.01	8,405.70	5,265.87	96.56	98.87	-91.07	421.64	3,008.01	3,190.36	3,006.50	183.86	17.352			
8,500.00	5,193.84	8,499.37	5,266.02	99.34	101.63	-91.15	407.97	3,100.67	3,225.38	3,036.14	189.24	17.043			
8,600.00	5,192.93	8,594.19	5,266.18	102.13	104.43	-91.21	394.14	3,194.48	3,257.12	3,062.40	194.72	16.727			
8,700.00	5,192.28	8,690.06	5,266.33	104.93	107.26	-91.26	380.16	3,289.33	3,285.53	3,085.24	200.29	16.404			
8,800.00	5,191.90	8,786.87	5,266.49	107.74	110.12	-91.29	366.04	3,385.10	3,310.58	3,104.65	205.93	16.076			
8,900.00	5,191.63	8,884.07	5,266.64	110.55	112.99	-91.29	351.86	3,481.26	3,334.08	3,122.47	211.61	15.756			
9,000.00	5,191.37	8,981.27	5,266.80	113.36	115.87	-91.29	337.68	3,577.42	3,357.58	3,140.28	217.30	15.451			
9,100.00	5,191.11	9,078.47	5,266.96	116.19	118.75	-91.29	323.51	3,673.58	3,381.08	3,158.09	222.99	15.162			
9,200.00	5,190.85	9,175.67	5,267.11	119.02	121.63	-91.28	309.33	3,769.74	3,404.59	3,175.89	228.69	14.887			
9,300.00	5,190.58	9,272.87	5,267.27	121.85	124.52	-91.28	295.15	3,865.90	3,428.09	3,193.69	234.40	14.625			
9,400.00	5,190.32	9,370.06	5,267.42	124.69	127.40	-91.28	280.98	3,962.06	3,451.59	3,211.48	240.10	14.375			
9,500.00	5,190.06	9,467.26	5,267.58	127.54	130.29	-91.28	266.80	4,058.22	3,475.09	3,229.27	245.81	14.137			
9,600.00	5,189.80	9,564.46	5,267.74	130.39	133.18	-91.28	252.62	4,154.38	3,498.59	3,247.06	251.53	13.909			
9,700.00	5,189.53	9,661.66	5,267.89	133.25	136.07	-91.28	238.44	4,250.54	3,522.09	3,264.84	257.25	13.691			
9,800.00	5,189.27	9,758.86	5,268.05	136.11	138.96	-91.27	224.27	4,346.70	3,545.59	3,282.62	262.97	13.483			
9,900.00	5,189.01	9,856.06	5,268.21	138.97	141.86	-91.27	210.09	4,442.86	3,569.09	3,300.39	268.70	13.283			
10,000.00	5,188.75	9,953.26	5,268.36	141.84	144.75	-91.27	195.91	4,539.02	3,592.59	3,318.17	274.43	13.091			

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 Heros 2308-09L 4H - Slot 4H
Project:	San Juan, NM NAD83	TVD Reference:	GL 6913' & RKB 25' @ 6938.00usft (Aztec 1000)
Reference Site:	Heros 2308-09L	MD Reference:	GL 6913' & RKB 25' @ 6938.00usft (Aztec 1000)
Site Error:	0.00 usft	North Reference:	True
Reference Well:	Heros 2308-09L 4H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 usft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction District
Reference Design:	Plan #6	Offset TVD Reference:	Offset Datum

Offset Design Heros 2308-09L - Heros 2308-09L 2H - OH - Plan #6													Offset Site Error:	0.00 usft
Survey Program: 0-MWD+HDGM													Offset Well Error:	0.00 usft
Reference		Offset		Semi Major Axis			Distance							
Measured Depth	Vertical Depth	Measured Depth	Vertical Depth	Reference	Offset	Highside Toolface	Offset Wellbore Centre	Between Centres	Between Ellipses	Minimum Separation	Separation Factor	Warning		
(usft)	(usft)	(usft)	(usft)	(usft)	(usft)	(°)	+N/-S (usft)	+E/-W (usft)	(usft)	(usft)	(usft)			
10,100.00	5,188.49	10,050.46	5,268.52	144.71	147.65	-91.27	181.73	4,635.18	3,616.09	3,335.93	280.16	12.907		
10,200.00	5,188.22	10,147.66	5,268.67	147.58	150.54	-91.27	167.56	4,731.34	3,639.59	3,353.70	285.89	12.731		
10,300.00	5,187.96	10,244.86	5,268.83	150.46	153.44	-91.27	153.38	4,827.50	3,663.09	3,371.47	291.63	12.561		
10,400.00	5,187.70	10,342.06	5,268.99	153.34	156.34	-91.26	139.20	4,923.66	3,686.59	3,389.23	297.36	12.398		
10,500.00	5,187.44	10,350.70	5,269.00	156.22	156.60	-91.26	137.94	4,932.20	3,711.15	3,412.11	299.04	12.410		
10,600.00	5,187.17	10,350.70	5,269.00	159.11	156.60	-91.26	137.94	4,932.20	3,738.21	3,438.09	300.12	12.456		
10,665.98	5,187.00	10,350.70	5,269.00	161.01	156.60	-91.26	137.94	4,932.20	3,757.42	3,456.70	300.72	12.495		



Scientific Drilling, Intl
Anticollision Report



Company:	Logos Operating LLC	Local Co-ordinate Reference:	Well Heros 2308-09L 4H - Slot 4H
Project:	San Juan, NM NAD83	TVD Reference:	GL 6913' & RKB 25' @ 6938.00usft (Aztec 1000)
Reference Site:	Heros 2308-09L	MD Reference:	GL 6913' & RKB 25' @ 6938.00usft (Aztec 1000)
Site Error:	0.00 usft	North Reference:	True
Reference Well:	Heros 2308-09L 4H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 usft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction District
Reference Design:	Plan #6	Offset TVD Reference:	Offset Datum

Offset Design Heros 2308-09L - Heros 2308-09L 3H - OH - Plan #6													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)					
0.00	0.00	0.00	0.00	0.00	0.00	-91.83	-0.96	-30.00	30.02				
100.00	100.00	100.00	100.00	0.13	0.13	-91.83	-0.96	-30.00	30.02	29.75	0.27	111.647	
200.00	200.00	200.00	200.00	0.49	0.49	-91.83	-0.96	-30.00	30.02	29.03	0.99	30.449	
300.00	300.00	300.00	300.00	0.85	0.85	-91.83	-0.96	-30.00	30.02	28.31	1.70	17.628	
400.00	400.00	400.00	400.00	1.21	1.21	-91.83	-0.96	-30.00	30.02	27.60	2.42	12.405	
500.00	500.00	500.00	500.00	1.57	1.57	-91.83	-0.96	-30.00	30.02	26.88	3.14	9.570	
600.00	600.00	600.00	600.00	1.93	1.93	-91.83	-0.96	-30.00	30.02	26.16	3.85	7.789	
700.00	700.00	700.00	700.00	2.29	2.29	-91.83	-0.96	-30.00	30.02	25.45	4.57	6.567	
800.00	800.00	800.00	800.00	2.64	2.64	-91.83	-0.96	-30.00	30.02	24.73	5.29	5.677	
900.00	900.00	900.00	900.00	3.00	3.00	-91.83	-0.96	-30.00	30.02	24.01	6.00	4.999	
1,000.00	1,000.00	1,000.00	1,000.00	3.36	3.36	-91.83	-0.96	-30.00	30.02	23.30	6.72	4.466	
1,100.00	1,100.00	1,100.00	1,100.00	3.72	3.72	-91.83	-0.96	-30.00	30.02	22.58	7.44	4.035	
1,200.00	1,200.00	1,200.00	1,200.00	4.08	4.08	-91.83	-0.96	-30.00	30.02	21.86	8.16	3.681 CC	
1,300.00	1,299.98	1,299.24	1,299.22	4.42	4.43	66.91	0.30	-31.17	30.46	21.60	8.85	3.440 ES, SF	
1,400.00	1,399.84	1,397.99	1,397.83	4.75	4.78	81.30	4.05	-34.65	33.23	23.69	9.54	3.482	
1,500.00	1,499.45	1,495.78	1,495.26	5.08	5.13	98.80	10.22	-40.38	41.46	31.22	10.25	4.047	
1,600.00	1,598.70	1,592.79	1,591.58	5.42	5.48	112.95	18.62	-48.18	56.77	45.83	10.94	5.189	
1,700.00	1,697.47	1,690.08	1,688.10	5.78	5.84	122.88	27.57	-56.50	76.69	65.07	11.62	6.598	
1,800.00	1,795.62	1,786.82	1,783.87	6.14	6.20	130.04	36.46	-64.75	100.19	87.87	12.31	8.136	
1,900.00	1,893.06	1,882.28	1,878.78	6.53	6.55	135.43	45.27	-72.93	127.10	114.09	13.01	9.769	
2,000.00	1,889.77	1,977.11	1,972.86	6.93	6.91	139.73	54.01	-81.04	157.00	143.29	13.71	11.451	
2,100.00	2,086.39	2,071.83	2,066.82	7.35	7.27	142.87	62.73	-89.14	187.80	173.38	14.41	13.031	
2,200.00	2,183.01	2,166.54	2,160.79	7.78	7.63	145.12	71.45	-97.24	218.96	203.84	15.12	14.484	
2,300.00	2,279.62	2,261.25	2,254.75	8.22	7.99	146.81	80.17	-105.33	250.36	234.53	15.83	15.816	
2,400.00	2,376.24	2,355.97	2,348.71	8.67	8.35	148.13	88.89	-113.43	281.91	265.37	16.55	17.038	
2,500.00	2,472.86	2,450.68	2,442.67	9.13	8.71	149.18	97.61	-121.53	313.57	296.31	17.27	18.160	
2,600.00	2,569.48	2,545.40	2,536.84	9.59	9.08	150.04	106.34	-129.63	345.31	327.32	17.99	19.193	
2,700.00	2,666.10	2,640.11	2,630.60	10.06	9.45	150.76	115.06	-137.73	377.11	358.39	18.72	20.145	
2,800.00	2,762.71	2,734.82	2,724.56	10.53	9.81	151.36	123.78	-145.83	408.95	389.50	19.45	21.025	
2,900.00	2,859.33	2,829.54	2,818.53	11.01	10.18	151.88	132.50	-153.93	440.82	420.64	20.18	21.841	
3,000.00	2,955.95	2,924.25	2,912.49	11.49	10.55	152.33	141.22	-162.03	472.73	451.81	20.92	22.598	
3,100.00	3,052.57	3,018.97	3,006.45	11.97	10.92	152.72	149.94	-170.12	504.65	483.00	21.66	23.302	
3,200.00	3,149.18	3,113.68	3,100.42	12.46	11.29	153.06	158.67	-178.22	536.60	514.20	22.40	23.959	
3,300.00	3,245.80	3,208.39	3,194.38	12.95	11.65	153.37	167.39	-186.32	568.56	545.42	23.14	24.573	
3,400.00	3,342.42	3,303.11	3,288.34	13.44	12.02	153.64	176.11	-194.42	600.53	576.65	23.88	25.148	
3,500.00	3,439.04	3,397.82	3,382.31	13.93	12.40	153.88	184.83	-202.52	632.52	607.89	24.62	25.687	
3,600.00	3,535.65	3,492.54	3,476.27	14.43	12.77	154.11	193.55	-210.62	664.51	639.14	25.37	26.193	
3,700.00	3,632.27	3,587.25	3,570.23	14.92	13.14	154.31	202.27	-218.72	696.51	670.40	26.12	26.670	
3,800.00	3,728.89	3,681.96	3,664.20	15.42	13.51	154.49	211.00	-226.81	728.52	701.66	26.86	27.120	
3,900.00	3,825.51	3,776.68	3,758.16	15.92	13.88	154.66	219.72	-234.91	760.54	732.93	27.61	27.544	
4,000.00	3,922.13	3,871.39	3,852.12	16.42	14.25	154.81	228.44	-243.01	792.56	764.20	28.36	27.945	
4,100.00	4,018.74	3,966.11	3,946.09	16.92	14.62	154.96	237.16	-251.11	824.58	795.47	29.11	28.325	
4,200.00	4,115.36	4,060.82	4,040.05	17.42	15.00	155.09	245.88	-259.21	856.61	826.75	29.86	28.685	
4,300.00	4,211.98	4,155.53	4,134.01	17.93	15.37	155.21	254.60	-267.31	888.65	858.03	30.61	29.027	
4,400.00	4,308.73	4,250.40	4,228.13	18.43	15.74	155.35	263.34	-275.42	920.24	888.87	31.36	29.340	
4,500.00	4,405.48	4,344.42	4,321.40	18.91	16.11	-172.01	272.00	-283.46	953.54	921.44	32.10	29.706	
4,600.00	4,500.54	4,457.38	4,433.61	19.36	16.55	-152.19	281.67	-291.93	990.75	957.78	32.97	30.054	
4,700.00	4,592.30	4,609.51	4,585.12	19.78	17.04	-140.13	287.22	-282.80	1,027.88	993.94	33.95	30.280	
4,800.00	4,679.19	4,772.54	4,742.49	20.18	17.48	-131.84	282.24	-241.74	1,062.90	1,028.17	34.74	30.599	
4,900.00	4,759.71	4,944.55	4,895.25	20.56	17.92	-125.39	264.98	-165.38	1,094.71	1,059.27	35.44	30.888	
5,000.00	4,832.50	5,121.74	5,030.35	20.94	18.62	-119.85	235.25	-55.30	1,122.43	1,086.03	36.40	30.835	

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 Heros 2308-09L 4H - Slot 4H
Project:	San Juan, NM NAD83	TVD Reference:	GL 6913' & RKB 25' @ 6938.00usft (Aztec 1000)
Reference Site:	Heros 2308-09L	MD Reference:	GL 6913' & RKB 25' @ 6938.00usft (Aztec 1000)
Site Error:	0.00 usft	North Reference:	True
Reference Well:	Heros 2308-09L 4H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 usft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction District
Reference Design:	Plan #6	Offset TVD Reference:	Offset Datum

Offset Design Heros 2308-09L - Heros 2308-09L 3H - OH - Plan #6														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		Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	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)										
5,100.00	4,896.29	5,298.68	5,135.60	21.35	19.96	-114.79	195.02	80.61	1,145.56	1,107.42	38.14	30.039			
5,200.00	4,950.01	5,405.96	5,182.53	21.85	21.22	-110.78	168.06	173.14	1,166.73	1,126.57	40.16	29.053			
5,300.00	4,993.97	5,510.09	5,214.77	22.58	22.77	-108.27	142.62	268.74	1,188.37	1,145.63	42.74	27.803			
5,400.00	5,036.29	5,607.84	5,232.56	23.60	24.51	-106.79	119.82	362.03	1,210.11	1,164.36	45.75	26.451			
5,500.00	5,078.62	5,697.85	5,239.80	24.92	26.28	-105.06	99.85	449.49	1,232.68	1,183.70	48.97	25.170			
5,600.00	5,120.94	5,786.72	5,246.05	26.45	28.19	-103.36	80.24	535.95	1,256.49	1,204.05	52.44	23.959			
5,700.00	5,163.26	5,876.10	5,248.98	28.14	30.21	-101.56	60.70	623.08	1,281.49	1,225.39	56.11	22.840			
5,800.00	5,201.20	5,963.51	5,248.90	29.99	32.28	-98.60	41.75	708.42	1,309.51	1,249.61	59.90	21.860			
5,900.00	5,227.08	6,053.97	5,248.82	32.06	34.49	-95.29	22.13	796.72	1,342.42	1,278.44	63.98	20.983			
6,000.00	5,240.34	6,145.97	5,248.74	34.27	36.81	-91.99	2.19	886.54	1,378.91	1,310.65	68.26	20.200			
6,100.00	5,241.36	6,238.01	5,248.66	36.56	39.19	-89.81	-17.77	976.38	1,417.89	1,345.22	72.67	19.511			
6,200.00	5,239.30	6,329.86	5,248.57	38.91	41.61	-89.89	-37.68	1,066.05	1,457.39	1,380.21	77.18	18.883			
6,300.00	5,237.24	6,421.71	5,248.49	41.31	44.08	-89.96	-57.59	1,155.72	1,496.89	1,415.10	81.79	18.302			
6,400.00	5,235.17	6,513.56	5,248.41	43.76	46.57	-90.03	-77.51	1,245.38	1,536.39	1,449.92	86.47	17.767			
6,500.00	5,233.11	6,605.42	5,248.32	46.24	49.10	-90.09	-97.42	1,335.05	1,575.89	1,484.67	91.23	17.274			
6,600.00	5,231.04	6,697.27	5,248.24	48.76	51.64	-90.16	-117.34	1,424.72	1,615.40	1,519.36	96.04	16.820			
6,700.00	5,228.98	6,789.12	5,248.16	51.30	54.21	-90.21	-137.25	1,514.39	1,654.91	1,554.00	100.90	16.401			
6,800.00	5,226.91	6,880.97	5,248.08	53.86	56.80	-90.27	-157.17	1,604.05	1,694.42	1,588.61	105.81	16.014			
6,900.00	5,224.85	6,972.82	5,247.99	56.45	59.41	-90.32	-177.08	1,693.72	1,733.93	1,623.17	110.75	15.656			
7,000.00	5,222.78	7,064.68	5,247.91	59.05	62.02	-90.37	-196.99	1,783.39	1,773.44	1,657.71	115.72	15.325			
7,100.00	5,220.72	7,156.53	5,247.83	61.66	64.65	-90.42	-216.91	1,873.05	1,812.95	1,692.22	120.73	15.017			
7,200.00	5,218.66	7,248.38	5,247.74	64.29	67.29	-90.47	-236.82	1,962.72	1,852.46	1,726.71	125.75	14.731			
7,300.00	5,216.59	7,340.23	5,247.66	66.93	69.94	-90.52	-256.74	2,052.39	1,891.98	1,761.17	130.80	14.464			
7,400.00	5,214.53	7,432.08	5,247.58	69.58	72.59	-90.56	-276.65	2,142.06	1,931.49	1,795.62	135.87	14.216			
7,500.00	5,212.46	7,523.94	5,247.50	72.24	75.26	-90.60	-296.56	2,231.72	1,971.01	1,830.05	140.96	13.983			
7,600.00	5,210.40	7,615.79	5,247.41	74.90	77.93	-90.64	-316.48	2,321.39	2,010.53	1,864.47	146.06	13.765			
7,700.00	5,208.33	7,707.64	5,247.33	77.58	80.60	-90.68	-336.39	2,411.06	2,050.04	1,898.87	151.17	13.561			
7,800.00	5,206.27	7,799.49	5,247.25	80.26	83.29	-90.71	-356.31	2,500.73	2,089.56	1,933.26	156.30	13.369			
7,900.00	5,204.20	7,891.34	5,247.17	82.95	85.97	-90.75	-376.22	2,590.39	2,129.08	1,967.64	161.44	13.188			
8,000.00	5,202.14	7,983.20	5,247.08	85.64	88.67	-90.78	-396.14	2,680.06	2,168.60	2,002.02	166.59	13.018			
8,099.98	5,200.08	8,075.03	5,247.00	88.33	91.36	-90.82	-416.05	2,769.71	2,208.12	2,036.37	171.74	12.857			
8,200.00	5,198.13	8,167.53	5,246.92	91.05	94.08	-90.93	-436.10	2,860.01	2,246.14	2,069.18	176.96	12.693			
8,300.00	5,196.44	8,261.27	5,246.83	93.79	96.84	-91.03	-456.42	2,951.52	2,280.92	2,098.64	182.28	12.513			
8,400.00	5,195.01	8,356.18	5,246.75	96.56	99.63	-91.11	-477.00	3,044.17	2,312.42	2,124.71	187.71	12.319			
8,500.00	5,193.84	8,452.12	5,246.66	99.34	102.46	-91.18	-497.80	3,137.83	2,340.59	2,147.37	193.23	12.113			
8,600.00	5,192.93	8,548.99	5,246.57	102.13	105.32	-91.23	-518.80	3,232.39	2,365.41	2,166.58	198.83	11.897			
8,700.00	5,192.28	8,646.66	5,246.48	104.93	108.21	-91.27	-539.98	3,327.74	2,386.83	2,182.33	204.50	11.671			
8,800.00	5,191.90	8,745.02	5,246.40	107.74	111.12	-91.29	-561.30	3,423.76	2,404.83	2,194.59	210.24	11.438			
8,900.00	5,191.63	8,843.66	5,246.31	110.55	114.04	-91.29	-582.69	3,520.06	2,421.26	2,205.25	216.01	11.209			
9,000.00	5,191.37	8,942.30	5,246.22	113.36	116.96	-91.28	-604.08	3,616.35	2,437.69	2,215.90	221.79	10.991			
9,100.00	5,191.11	9,040.94	5,246.13	116.19	119.88	-91.28	-625.46	3,712.65	2,454.12	2,226.55	227.57	10.784			
9,200.00	5,190.85	9,139.59	5,246.04	119.02	122.81	-91.27	-646.85	3,808.94	2,470.54	2,237.19	233.35	10.587			
9,300.00	5,190.58	9,238.23	5,245.95	121.85	125.74	-91.27	-668.23	3,905.24	2,486.97	2,247.83	239.14	10.400			
9,400.00	5,190.32	9,336.87	5,245.86	124.69	128.67	-91.26	-689.62	4,001.53	2,503.40	2,258.47	244.94	10.221			
9,500.00	5,190.06	9,435.51	5,245.77	127.54	131.60	-91.26	-711.01	4,097.83	2,519.83	2,269.10	250.73	10.050			
9,600.00	5,189.80	9,534.15	5,245.68	130.39	134.53	-91.26	-732.39	4,194.12	2,536.26	2,279.72	256.53	9.887			
9,700.00	5,189.53	9,632.79	5,245.60	133.25	137.46	-91.25	-753.78	4,290.42	2,552.68	2,290.35	262.34	9.730			
9,800.00	5,189.27	9,731.43	5,245.51	136.11	140.40	-91.25	-775.16	4,386.71	2,569.11	2,300.97	268.15	9.581			
9,900.00	5,189.01	9,830.07	5,245.42	138.97	143.33	-91.24	-796.55	4,483.01	2,585.54	2,311.58	273.96	9.438			
10,000.00	5,188.75	9,928.72	5,245.33	141.84	146.27	-91.24	-817.94	4,579.30	2,601.97	2,322.20	279.77	9.300			

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



Scientific Drilling, Intl
Anticollision Report



Company:	Logos Operating LLC	Local Co-ordinate Reference:	Well Heros 2308-09L 4H - Slot 4H
Project:	San Juan, NM NAD83	TVD Reference:	GL 6913' & RKB 25' @ 6938.00usft (Aztec 1000)
Reference Site:	Heros 2308-09L	MD Reference:	GL 6913' & RKB 25' @ 6938.00usft (Aztec 1000)
Site Error:	0.00 usft	North Reference:	True
Reference Well:	Heros 2308-09L 4H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 usft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction District
Reference Design:	Plan #6	Offset TVD Reference:	Offset Datum

Offset Design Heros 2308-09L - Heros 2308-09L 3H - OH - Plan #6													Offset Site Error: 0.00 usft
Survey Program: 0-MWD+HDGM													Offset Well Error: 0.00 usft
Reference		Offset		Semi Major Axis		Highside Toolface (°)	Offset Wellbore Centre		Distance		Minimum Separation (usft)	Separation Factor	Warning
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)		+N/-S (usft)	+E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)			
10,100.00	5,188.49	10,027.36	5,245.24	144.71	149.21	-91.23	-839.32	4,675.60	2,618.40	2,332.81	285.59	9.169	
10,200.00	5,188.22	10,126.00	5,245.15	147.58	152.15	-91.23	-860.71	4,771.89	2,634.82	2,343.42	291.40	9.042	
10,300.00	5,187.96	10,223.83	5,245.06	150.46	155.06	-91.23	-881.91	4,867.40	2,651.26	2,354.07	297.18	8.921	
10,400.00	5,187.70	10,293.81	5,245.00	153.34	157.15	-91.22	-897.06	4,935.72	2,667.87	2,366.26	301.61	8.846	
10,500.00	5,187.44	10,293.81	5,245.00	156.22	157.15	-91.22	-897.06	4,935.72	2,687.19	2,384.85	302.34	8.888	
10,600.00	5,187.17	10,293.81	5,245.00	159.11	157.15	-91.22	-897.06	4,935.72	2,710.07	2,407.39	302.68	8.954	
10,665.98	5,187.00	10,293.81	5,245.00	161.01	157.15	-91.22	-897.06	4,935.72	2,727.06	2,424.37	302.69	9.009	



Scientific Drilling, Intl Anticollision Report



Company:	Logos Operating LLC	Local Co-ordinate Reference:	Well Heros 2308-09L 4H - Slot 4H
Project:	San Juan, NM NAD83	TVD Reference:	GL 6913' & RKB 25' @ 6938.00usft (Aztec 1000)
Reference Site:	Heros 2308-09L	MD Reference:	GL 6913' & RKB 25' @ 6938.00usft (Aztec 1000)
Site Error:	0.00 usft	North Reference:	True
Reference Well:	Heros 2308-09L 4H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 usft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction District
Reference Design:	Plan #6	Offset TVD Reference:	Offset Datum

Offset Design Heros 2308-09L - Heros 2308-09L 5H - OH - Plan #2														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)							
0.00	0.00	0.00	0.00	0.00	0.00	90.08	-0.04	30.00	30.00						
100.00	100.00	100.00	100.00	0.13	0.13	90.08	-0.04	30.00	30.00	29.73	0.27	111.585			
200.00	200.00	200.00	200.00	0.49	0.49	90.08	-0.04	30.00	30.00	29.01	0.99	30.432			
300.00	300.00	300.00	300.00	0.85	0.85	90.08	-0.04	30.00	30.00	28.30	1.70	17.619			
400.00	400.00	400.00	400.00	1.21	1.21	90.08	-0.04	30.00	30.00	27.58	2.42	12.398			
500.00	500.00	500.00	500.00	1.57	1.57	90.08	-0.04	30.00	30.00	26.86	3.14	9.564			
600.00	600.00	600.00	600.00	1.93	1.93	90.08	-0.04	30.00	30.00	26.15	3.85	7.785			
700.00	700.00	700.00	700.00	2.29	2.29	90.08	-0.04	30.00	30.00	25.43	4.57	6.564			
800.00	800.00	800.00	800.00	2.64	2.64	90.08	-0.04	30.00	30.00	24.71	5.29	5.674			
900.00	900.00	900.00	900.00	3.00	3.00	90.08	-0.04	30.00	30.00	24.00	6.00	4.996			
1,000.00	1,000.00	1,000.00	1,000.00	3.36	3.36	90.08	-0.04	30.00	30.00	23.28	6.72	4.463			
1,100.00	1,100.00	1,100.00	1,100.00	3.72	3.72	90.08	-0.04	30.00	30.00	22.56	7.44	4.033			
1,200.00	1,200.00	1,200.00	1,200.00	4.08	4.08	90.08	-0.04	30.00	30.00	21.84	8.16	3.679			
1,300.00	1,299.98	1,301.02	1,301.00	4.42	4.43	-119.17	-0.26	28.23	29.06	20.20	8.86	3.282			
1,400.00	1,399.84	1,401.88	1,401.71	4.75	4.78	-128.25	-0.92	22.94	26.67	17.13	9.54	2.795			
1,500.00	1,499.45	1,502.40	1,501.84	5.08	5.13	-146.29	-2.02	14.18	24.48	14.25	10.23	2.392			
1,525.22	1,524.52	1,527.68	1,526.97	5.17	5.22	-152.40	-2.36	11.42	24.34	13.93	10.41	2.339 CC, ES, SF			
1,600.00	1,598.70	1,602.39	1,601.07	5.42	5.48	-172.50	-3.54	2.01	25.94	15.03	10.92	2.376			
1,700.00	1,697.47	1,701.41	1,699.14	5.78	5.84	166.62	-5.23	-11.52	34.66	23.05	11.61	2.986			
1,800.00	1,795.62	1,800.09	1,796.88	6.14	6.21	156.59	-6.92	-25.01	49.18	36.86	12.32	3.992			
1,900.00	1,893.06	1,898.31	1,894.17	6.53	6.57	152.52	-8.60	-38.43	67.53	54.48	13.05	5.176			
2,000.00	1,989.77	1,996.04	1,990.97	6.93	6.94	151.18	-10.27	-51.78	88.61	74.84	13.78	6.431			
2,100.00	2,086.39	2,093.71	2,087.71	7.35	7.32	150.51	-11.93	-65.13	110.06	95.54	14.52	7.581			
2,200.00	2,183.01	2,191.38	2,184.45	7.78	7.69	150.06	-13.60	-78.48	131.51	116.25	15.27	8.615			
2,300.00	2,279.62	2,289.05	2,281.18	8.22	8.07	149.74	-15.27	-91.83	152.97	136.95	16.02	9.548			
2,400.00	2,376.24	2,386.71	2,377.92	8.67	8.45	149.49	-16.94	-105.17	174.44	157.65	16.78	10.393			
2,500.00	2,472.86	2,484.38	2,474.65	9.13	8.83	149.30	-18.61	-118.52	195.90	178.35	17.55	11.161			
2,600.00	2,569.48	2,582.05	2,571.39	9.59	9.22	149.15	-20.28	-131.87	217.37	199.04	18.33	11.861			
2,700.00	2,666.10	2,679.71	2,668.13	10.06	9.60	149.02	-21.94	-145.21	238.84	219.73	19.11	12.501			
2,800.00	2,762.71	2,777.38	2,764.86	10.53	9.99	148.92	-23.61	-158.56	260.31	240.42	19.89	13.088			
2,900.00	2,859.33	2,875.05	2,861.60	11.01	10.38	148.83	-25.28	-171.91	281.78	261.10	20.68	13.629			
3,000.00	2,955.95	2,972.72	2,958.34	11.49	10.77	148.75	-26.95	-185.25	303.25	281.78	21.47	14.128			
3,100.00	3,052.57	3,070.38	3,055.07	11.97	11.16	148.68	-28.62	-198.60	324.72	302.46	22.26	14.589			
3,200.00	3,149.18	3,168.05	3,151.81	12.46	11.55	148.63	-30.29	-211.95	346.19	323.14	23.05	15.017			
3,300.00	3,245.80	3,265.72	3,248.55	12.95	11.94	148.58	-31.96	-225.29	367.66	343.81	23.85	15.416			
3,400.00	3,342.42	3,363.38	3,345.28	13.44	12.33	148.53	-33.62	-238.64	389.14	364.49	24.65	15.787			
3,500.00	3,439.04	3,461.05	3,442.02	13.93	12.72	148.49	-35.29	-251.99	410.61	385.16	25.45	16.133			
3,600.00	3,535.65	3,558.72	3,538.76	14.43	13.11	148.45	-36.96	-265.34	432.08	405.83	26.25	16.458			
3,700.00	3,632.27	3,656.39	3,635.49	14.92	13.51	148.42	-38.63	-278.68	453.55	426.50	27.06	16.762			
3,800.00	3,728.89	3,754.05	3,732.23	15.42	13.90	148.39	-40.30	-292.03	475.03	447.16	27.86	17.048			
3,900.00	3,825.51	3,851.72	3,828.96	15.92	14.29	148.36	-41.97	-305.38	496.50	467.83	28.67	17.317			
4,000.00	3,922.13	3,949.39	3,925.70	16.42	14.69	148.34	-43.63	-318.72	517.97	488.49	29.48	17.570			
4,100.00	4,018.74	4,047.05	4,022.44	16.92	15.08	148.31	-45.30	-332.07	539.45	509.16	30.29	17.809			
4,200.00	4,115.36	4,144.72	4,119.17	17.42	15.48	148.29	-46.97	-345.42	560.92	529.82	31.10	18.036			
4,300.00	4,211.98	4,242.39	4,215.91	17.93	15.88	148.27	-48.64	-358.76	582.39	550.48	31.91	18.250			
4,400.00	4,308.73	4,347.20	4,319.84	18.43	16.30	151.23	-50.45	-372.18	603.39	570.62	32.77	18.412			
4,500.00	4,405.48	4,505.85	4,477.83	18.91	16.81	-179.28	-61.26	-372.58	621.17	587.48	33.69	18.438			
4,600.00	4,500.54	4,604.79	4,631.88	19.36	17.22	-158.37	-85.14	-343.06	635.34	601.20	34.14	18.610			
4,700.00	4,592.30	4,820.81	4,772.54	19.78	17.59	-144.48	-120.28	-286.17	646.03	611.66	34.37	18.796			
4,800.00	4,679.19	4,971.22	4,892.75	20.18	18.02	-134.42	-163.77	-207.36	653.67	618.93	34.74	18.817			
4,900.00	4,759.71	5,114.21	4,988.69	20.56	18.74	-126.46	-212.32	-113.43	658.86	623.26	35.60	18.507			

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 Heros 2308-09L 4H - Slot 4H
Project:	San Juan, NM NAD83	TVD Reference:	GL 6913' & RKB 25' @ 6938.00usft (Aztec 1000)
Reference Site:	Heros 2308-09L	MD Reference:	GL 6913' & RKB 25' @ 6938.00usft (Aztec 1000)
Site Error:	0.00 usft	North Reference:	True
Reference Well:	Heros 2308-09L 4H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 usft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction District
Reference Design:	Plan #6	Offset TVD Reference:	Offset Datum

Offset Design Heros 2308-09L - Heros 2308-09L 5H - OH - Plan #2														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		Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	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)										
5,000.00	4,832.50	5,248.91	5,059.66	20.94	19.91	-119.77	-262.94	-10.97	662.27	625.05	37.21	17.796			
5,100.00	4,896.29	5,375.21	5,107.08	21.35	21.54	-113.95	-313.28	94.54	664.49	624.85	39.64	16.764			
5,200.00	4,950.01	5,474.47	5,134.61	21.85	23.14	-109.71	-353.70	180.91	667.18	624.86	42.32	15.765			
5,300.00	4,993.97	5,572.39	5,161.56	22.58	24.90	-107.34	-393.59	266.19	671.59	626.31	45.28	14.831			
5,400.00	5,036.29	5,670.69	5,188.61	23.60	26.82	-105.86	-433.64	351.79	676.59	627.99	48.59	13.923			
5,500.00	5,078.62	5,768.99	5,215.66	24.92	28.86	-104.40	-473.68	437.39	682.04	629.84	52.20	13.067			
5,600.00	5,120.94	5,873.86	5,240.80	26.45	31.17	-102.56	-516.49	529.70	687.60	631.32	56.28	12.217			
5,700.00	5,163.26	5,974.43	5,262.15	28.14	33.53	-99.79	-557.50	620.74	693.10	632.51	60.59	11.439			
5,800.00	5,201.20	6,067.51	5,252.70	29.99	35.80	-96.75	-594.95	705.94	701.72	636.90	64.81	10.827			
5,900.00	5,227.08	6,162.64	5,252.16	32.06	38.18	-93.95	-633.15	793.06	715.73	646.53	69.20	10.343			
6,000.00	5,240.34	6,259.93	5,251.61	34.27	40.66	-91.67	-672.22	882.16	733.53	659.73	73.80	9.939			
6,100.00	5,241.36	6,357.76	5,251.05	36.56	43.21	-90.50	-711.50	971.75	753.94	675.38	78.56	9.597			
6,200.00	5,239.30	6,455.52	5,250.49	38.91	45.79	-90.59	-750.76	1,061.28	774.94	691.51	83.43	9.289			
6,300.00	5,237.24	6,553.28	5,249.94	41.31	48.40	-90.68	-790.02	1,150.82	795.93	707.55	88.38	9.006			
6,400.00	5,235.17	6,651.05	5,249.38	43.76	51.04	-90.77	-829.27	1,240.35	816.93	723.52	93.40	8.746			
6,500.00	5,233.11	6,748.81	5,248.83	46.24	53.71	-90.85	-868.53	1,329.89	837.92	739.44	98.49	8.508			
6,600.00	5,231.04	6,846.58	5,248.27	48.76	56.40	-90.92	-907.79	1,419.42	858.92	755.30	103.62	8.289			
6,700.00	5,228.98	6,944.34	5,247.71	51.30	59.10	-90.99	-947.05	1,508.96	879.92	771.12	108.80	8.088			
6,800.00	5,226.91	7,042.10	5,247.16	53.86	61.82	-91.06	-986.30	1,598.49	900.92	786.91	114.01	7.902			
6,900.00	5,224.85	7,139.87	5,246.60	56.45	64.55	-91.13	-1,025.56	1,688.02	921.93	802.66	119.26	7.730			
7,000.00	5,222.78	7,237.63	5,246.04	59.05	67.29	-91.19	-1,064.82	1,777.56	942.93	818.39	124.54	7.571			
7,100.00	5,220.72	7,335.40	5,245.49	61.66	70.04	-91.25	-1,104.07	1,867.09	963.94	834.09	129.84	7.424			
7,200.00	5,218.66	7,433.16	5,244.93	64.29	72.80	-91.31	-1,143.33	1,956.63	984.94	849.77	135.17	7.287			
7,300.00	5,216.59	7,530.93	5,244.37	66.93	75.57	-91.36	-1,182.59	2,046.16	1,005.95	865.44	140.51	7.159			
7,400.00	5,214.53	7,628.69	5,243.82	69.58	78.35	-91.42	-1,221.85	2,135.69	1,026.96	881.08	145.87	7.040			
7,500.00	5,212.46	7,726.45	5,243.26	72.24	81.14	-91.47	-1,261.10	2,225.23	1,047.96	896.72	151.25	6.929			
7,600.00	5,210.40	7,824.22	5,242.71	74.90	83.93	-91.52	-1,300.36	2,314.76	1,068.97	912.34	156.64	6.824			
7,700.00	5,208.33	7,921.98	5,242.15	77.58	86.72	-91.56	-1,339.62	2,404.30	1,089.98	927.94	162.04	6.727			
7,800.00	5,206.27	8,019.75	5,241.59	80.26	89.52	-91.61	-1,378.88	2,493.83	1,110.99	943.54	167.45	6.635			
7,900.00	5,204.20	8,117.51	5,241.04	82.95	92.32	-91.65	-1,418.13	2,583.37	1,132.01	959.13	172.88	6.548			
8,000.00	5,202.14	8,215.27	5,240.48	85.64	95.13	-91.70	-1,457.39	2,672.90	1,153.02	974.71	178.31	6.466			
8,099.98	5,200.08	8,313.02	5,239.92	88.33	97.94	-91.74	-1,496.64	2,762.42	1,174.03	990.28	183.75	6.389			
8,200.00	5,198.13	8,411.13	5,239.37	91.05	100.77	-91.82	-1,536.04	2,852.27	1,193.44	1,004.21	189.23	6.307			
8,300.00	5,196.44	8,509.83	5,238.80	93.79	103.61	-91.90	-1,575.67	2,942.66	1,209.44	1,014.66	194.78	6.209			
8,400.00	5,195.01	8,609.04	5,238.24	96.56	106.48	-91.96	-1,615.51	3,033.52	1,221.99	1,021.59	200.40	6.098			
8,500.00	5,193.84	8,708.62	5,237.67	99.34	109.35	-92.00	-1,655.49	3,124.71	1,231.07	1,024.99	206.07	5.974			
8,600.00	5,192.93	8,808.46	5,237.10	102.13	112.24	-92.03	-1,695.58	3,216.15	1,236.67	1,024.88	211.79	5.839			
8,700.00	5,192.28	8,908.43	5,236.54	104.93	115.13	-92.05	-1,735.73	3,307.70	1,238.78	1,021.25	217.54	5.695			
8,800.00	5,191.90	9,008.42	5,235.97	107.74	118.03	-92.05	-1,775.88	3,399.27	1,237.41	1,014.10	223.31	5.541			
8,900.00	5,191.63	9,108.37	5,235.40	110.55	120.92	-92.04	-1,816.02	3,490.81	1,234.44	1,005.34	229.10	5.388			
9,000.00	5,191.37	9,208.33	5,234.83	113.36	123.82	-92.03	-1,856.15	3,582.36	1,231.47	996.58	234.89	5.243			
9,100.00	5,191.11	9,308.28	5,234.26	116.19	126.72	-92.02	-1,896.29	3,673.90	1,228.50	987.81	240.68	5.104			
9,200.00	5,190.85	9,408.24	5,233.69	119.02	129.62	-92.01	-1,936.43	3,765.44	1,225.52	979.04	246.48	4.972			
9,300.00	5,190.58	9,508.19	5,233.12	121.85	132.52	-92.00	-1,976.56	3,856.98	1,222.55	970.26	252.29	4.846			
9,400.00	5,190.32	9,608.15	5,232.55	124.69	135.43	-91.99	-2,016.70	3,948.52	1,219.58	961.48	258.09	4.725			
9,500.00	5,190.06	9,708.10	5,231.99	127.54	138.33	-91.98	-2,056.84	4,040.06	1,216.60	952.70	263.90	4.610			
9,600.00	5,189.80	9,808.06	5,231.42	130.39	141.24	-91.97	-2,096.98	4,131.60	1,213.63	943.91	269.72	4.500			
9,700.00	5,189.53	9,908.02	5,230.85	133.25	144.14	-91.96	-2,137.11	4,223.14	1,210.66	935.12	275.54	4.394			
9,800.00	5,189.27	10,007.97	5,230.28	136.11	147.05	-91.95	-2,177.25	4,314.69	1,207.68	926.33	281.36	4.292			
9,900.00	5,189.01	10,107.93	5,229.71	138.97	149.96	-91.94	-2,217.39	4,406.23	1,204.71	917.53	287.18	4.195			

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 Heros 2308-09L 4H - Slot 4H
Project:	San Juan, NM NAD83	TVD Reference:	GL 6913' & RKB 25' @ 6938.00usft (Aztec 1000)
Reference Site:	Heros 2308-09L	MD Reference:	GL 6913' & RKB 25' @ 6938.00usft (Aztec 1000)
Site Error:	0.00 usft	North Reference:	True
Reference Well:	Heros 2308-09L 4H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 usft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction District
Reference Design:	Plan #6	Offset TVD Reference:	Offset Datum

Offset Design Heros 2308-09L - Heros 2308-09L 5H - OH - Plan #2												Offset Site Error:	0.00 usft
Survey Program: 0-MWD+HDGM												Offset Well Error:	0.00 usft
Reference		Offset		Semi Major Axis		Highside Toolface (°)	Offset Wellbore Centre		Distance		Minimum Separation (usft)	Separation Factor	Warning
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)		+N/-S (usft)	+E/-W (usft)	Between Centres (usft)	Between Ellipses (usft)			
10,000.00	5,188.75	10,207.88	5,229.14	141.84	152.87	-91.93	-2,257.53	4,497.77	1,201.74	908.74	293.00	4.101	
10,100.00	5,188.49	10,307.53	5,228.57	144.71	155.78	-91.92	-2,297.54	4,589.02	1,198.77	899.95	298.82	4.012	
10,200.00	5,188.22	10,407.48	5,228.01	147.58	158.69	-91.91	-2,337.65	4,680.58	1,195.82	891.18	304.65	3.925	
10,236.14	5,188.13	10,408.39	5,228.00	148.62	158.71	-91.91	-2,338.01	4,681.41	1,195.27	890.34	304.93	3.920	
10,300.00	5,187.96	10,408.39	5,228.00	150.46	158.71	-91.91	-2,338.01	4,681.41	1,196.98	892.29	304.69	3.928	
10,400.00	5,187.70	10,408.39	5,228.00	153.34	158.71	-91.91	-2,338.01	4,681.41	1,206.45	903.82	302.64	3.986	
10,500.00	5,187.44	10,408.39	5,228.00	156.22	158.71	-91.91	-2,338.01	4,681.41	1,224.05	925.39	298.66	4.098	
10,600.00	5,187.17	10,408.39	5,228.00	159.11	158.71	-91.91	-2,338.01	4,681.41	1,249.43	956.42	293.00	4.264	
10,665.98	5,187.00	10,408.39	5,228.00	161.01	158.71	-91.91	-2,338.01	4,681.41	1,270.21	981.71	288.50	4.403	



Scientific Drilling, Intl Anticollision Report



Company:	Logos Operating LLC	Local Co-ordinate Reference:	Well Heros 2308-09L 4H - Slot 4H
Project:	San Juan, NM NAD83	TVD Reference:	GL 6913' & RKB 25' @ 6938.00usft (Aztec 1000)
Reference Site:	Heros 2308-09L	MD Reference:	GL 6913' & RKB 25' @ 6938.00usft (Aztec 1000)
Site Error:	0.00 usft	North Reference:	True
Reference Well:	Heros 2308-09L 4H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 usft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction District
Reference Design:	Plan #6	Offset TVD Reference:	Offset Datum

Offset Design Heros 2308-09L - State NM 16 #21 Unit C - OH - OH													Offset Site Error: 0.00 usft
Survey Program: 313-INCLINOMETER													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)					
0.00	0.00	0.00	0.00	0.00	0.00	143.13	-2,375.11	1,781.47	2,969.07				
100.00	100.00	75.00	75.00	0.13	1.14	143.13	-2,375.11	1,781.47	2,968.97	2,967.69	1.27	2,331.482	
200.00	200.00	175.00	175.00	0.49	2.66	143.13	-2,375.11	1,781.47	2,968.97	2,965.82	3.15	942.441	
300.00	300.00	275.00	275.00	0.85	4.18	143.13	-2,375.11	1,781.47	2,968.97	2,963.94	5.03	590.585	
400.00	400.00	375.00	375.00	1.21	6.64	143.13	-2,375.11	1,781.47	2,968.97	2,961.12	7.85	378.431	
500.00	500.00	475.00	475.00	1.57	9.67	143.13	-2,375.11	1,781.47	2,968.97	2,957.73	11.24	264.125	
600.00	600.00	575.00	575.00	1.93	12.71	143.13	-2,375.11	1,781.47	2,968.97	2,954.33	14.64	202.853	
700.00	700.00	675.00	675.00	2.29	15.75	143.13	-2,375.11	1,781.47	2,968.97	2,950.94	18.03	164.656	
800.00	800.00	775.00	775.00	2.64	18.78	143.13	-2,375.11	1,781.47	2,968.97	2,947.54	21.43	138.564	
900.00	900.00	875.00	875.00	3.00	21.82	143.13	-2,375.11	1,781.47	2,968.97	2,944.15	24.82	119.610	
1,000.00	1,000.00	975.00	975.00	3.36	24.86	143.13	-2,375.11	1,781.47	2,968.97	2,940.75	28.22	105.218	
1,100.00	1,100.00	1,075.00	1,075.00	3.72	27.89	143.13	-2,375.11	1,781.47	2,968.97	2,937.35	31.61	93.917	
1,200.00	1,200.00	1,175.00	1,175.00	4.08	30.93	143.13	-2,375.11	1,781.47	2,968.97	2,933.96	35.01	84.808	
1,300.00	1,299.98	1,274.98	1,274.98	4.42	33.97	-63.48	-2,375.11	1,781.47	2,968.19	2,929.80	38.39	77.326	
1,400.00	1,399.84	1,374.84	1,374.84	4.75	37.00	-63.61	-2,375.11	1,781.47	2,965.85	2,924.11	41.75	71.044	
1,500.00	1,499.45	1,474.47	1,474.45	5.08	40.02	-63.83	-2,375.11	1,781.47	2,961.98	2,916.88	45.11	65.666	
1,600.00	1,598.70	1,573.72	1,573.70	5.42	43.04	-64.14	-2,375.11	1,781.47	2,956.61	2,908.14	48.46	61.008	
1,700.00	1,697.47	1,672.48	1,672.47	5.78	46.04	-64.54	-2,375.11	1,781.47	2,949.76	2,897.95	51.81	56.931	
1,800.00	1,795.62	1,770.64	1,770.62	6.14	49.02	-65.02	-2,375.11	1,781.47	2,941.51	2,886.35	55.16	53.330	
1,900.00	1,893.06	1,868.07	1,868.06	6.53	51.98	-65.58	-2,375.11	1,781.47	2,931.90	2,873.41	58.49	50.123	
2,000.00	1,889.77	1,864.79	1,864.77	6.93	54.91	-66.11	-2,375.11	1,781.47	2,921.22	2,859.40	61.83	47.248	
2,100.00	2,086.39	2,061.40	2,061.39	7.35	57.85	-66.57	-2,375.11	1,781.47	2,910.57	2,845.40	65.17	44.662	
2,200.00	2,183.01	2,158.02	2,158.01	7.78	60.78	-67.02	-2,375.11	1,781.47	2,900.11	2,831.59	68.52	42.323	
2,300.00	2,279.62	2,254.64	2,254.62	8.22	63.72	-67.48	-2,375.11	1,781.47	2,889.84	2,817.96	71.89	40.200	
2,400.00	2,376.24	2,351.26	2,351.24	8.67	66.65	-67.94	-2,375.11	1,781.47	2,879.77	2,804.51	75.26	38.264	
2,500.00	2,472.86	2,447.87	2,447.86	9.13	69.58	-68.40	-2,375.11	1,781.47	2,869.89	2,791.25	78.64	36.494	
2,600.00	2,569.48	2,544.49	2,544.48	9.59	72.52	-68.87	-2,375.11	1,781.47	2,860.22	2,778.19	82.03	34.869	
2,700.00	2,666.10	2,641.17	2,641.10	10.06	75.45	-69.34	-2,375.11	1,781.47	2,850.74	2,765.32	85.42	33.373	
2,800.00	2,762.71	2,737.79	2,737.71	10.53	78.39	-69.81	-2,375.11	1,781.47	2,841.46	2,752.64	88.82	31.991	
2,900.00	2,859.33	2,834.41	2,834.33	11.01	81.32	-70.28	-2,375.11	1,781.47	2,832.39	2,740.17	92.22	30.712	
3,000.00	2,955.95	2,931.02	2,930.95	11.49	84.26	-70.76	-2,375.11	1,781.47	2,823.52	2,727.89	95.63	29.525	
3,100.00	3,052.57	3,027.64	3,027.57	11.97	87.19	-71.24	-2,375.11	1,781.47	2,814.87	2,715.83	99.04	28.421	
3,200.00	3,149.18	3,124.26	3,124.18	12.46	90.13	-71.72	-2,375.11	1,781.47	2,806.42	2,703.96	102.46	27.391	
3,300.00	3,245.80	3,220.88	3,220.80	12.95	93.06	-72.21	-2,375.11	1,781.47	2,798.19	2,692.31	105.88	26.429	
3,400.00	3,342.42	3,317.49	3,317.42	13.44	95.99	-72.70	-2,375.11	1,781.47	2,790.17	2,680.87	109.30	25.528	
3,500.00	3,439.04	3,414.11	3,414.04	13.93	98.93	-73.19	-2,375.11	1,781.47	2,782.36	2,669.64	112.72	24.683	
3,600.00	3,535.65	3,510.73	3,510.65	14.43	101.86	-73.68	-2,375.11	1,781.47	2,774.77	2,658.63	116.15	23.890	
3,700.00	3,632.27	3,607.35	3,607.27	14.92	104.80	-74.18	-2,375.11	1,781.47	2,767.41	2,647.83	119.58	23.143	
3,800.00	3,728.89	3,703.97	3,703.89	15.42	107.73	-74.68	-2,375.11	1,781.47	2,760.26	2,637.25	123.01	22.439	
3,900.00	3,825.51	3,800.58	3,800.51	15.92	110.66	-75.18	-2,375.11	1,781.47	2,753.34	2,626.89	126.44	21.775	
4,000.00	3,922.13	3,897.20	3,897.13	16.42	113.60	-75.68	-2,375.11	1,781.47	2,746.64	2,616.76	129.88	21.147	
4,100.00	4,018.74	3,993.82	3,993.74	16.92	116.53	-76.19	-2,375.11	1,781.47	2,740.17	2,606.85	133.32	20.554	
4,200.00	4,115.36	4,090.44	4,090.36	17.42	119.47	-76.70	-2,375.11	1,781.47	2,733.92	2,597.17	136.76	19.991	
4,300.00	4,211.98	4,187.05	4,186.98	17.93	122.40	-77.21	-2,375.11	1,781.47	2,727.91	2,587.71	140.20	19.458	
4,400.00	4,308.73	4,283.81	4,283.73	18.43	125.34	-77.74	-2,375.11	1,781.47	2,722.19	2,578.55	143.64	18.951	
4,500.00	4,405.48	4,380.55	4,380.48	18.91	128.28	-78.28	-2,375.11	1,781.47	2,709.52	2,562.47	147.05	18.425	
4,600.00	4,500.54	4,483.00	4,482.71	19.36	131.39	-78.82	-2,375.11	1,781.47	2,684.58	2,533.99	150.59	17.827	
4,700.00	4,592.30	4,567.59	4,567.30	19.78	133.96	-79.36	-2,375.11	1,781.47	2,647.69	2,494.14	153.55	17.243	
4,800.00	4,679.19	4,654.48	4,654.19	20.18	136.60	-79.90	-2,375.11	1,781.47	2,599.44	2,442.92	156.52	16.608	
4,900.00	4,759.71	4,735.00	4,734.71	20.56	139.04	-80.44	-2,375.11	1,781.47	2,540.61	2,381.36	159.25	15.954	
5,000.00	4,832.50	4,807.78	4,807.50	20.94	141.25	-80.98	-2,375.11	1,781.47	2,472.18	2,310.48	161.69	15.289	

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 Heros 2308-09L 4H - Slot 4H
Project:	San Juan, NM NAD83	TVD Reference:	GL 6913' & RKB 25' @ 6938.00usft (Aztec 1000)
Reference Site:	Heros 2308-09L	MD Reference:	GL 6913' & RKB 25' @ 6938.00usft (Aztec 1000)
Site Error:	0.00 usft	North Reference:	True
Reference Well:	Heros 2308-09L 4H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 usft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction District
Reference Design:	Plan #6	Offset TVD Reference:	Offset Datum

Offset Design Heros 2308-09L - State NM 16 #21 Unit C - OH - OH													Offset Site Error: 0.00 usft
Survey Program: 313-INCLINOMETER													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)					
5,100.00	4,896.29	4,871.58	4,871.29	21.35	143.19	5.20	-2,375.11	1,781.47	2,395.29	2,231.49	163.80	14.623	
5,200.00	4,950.01	4,925.30	4,925.01	21.85	144.82	11.84	-2,375.11	1,781.47	2,311.29	2,145.74	165.55	13.962	
5,300.00	4,993.97	4,969.26	4,968.97	22.58	146.15	16.81	-2,375.11	1,781.47	2,222.14	2,055.20	166.94	13.311	
5,400.00	5,036.29	5,011.58	5,011.29	23.60	147.44	17.49	-2,375.11	1,781.47	2,132.30	1,964.03	168.27	12.672	
5,500.00	5,078.62	5,053.90	5,053.62	24.92	148.73	18.22	-2,375.11	1,781.47	2,042.52	1,872.92	169.60	12.043	
5,600.00	5,120.94	5,096.22	5,095.94	26.45	150.01	19.01	-2,375.11	1,781.47	1,952.83	1,781.88	170.95	11.424	
5,700.00	5,163.26	5,138.55	5,138.26	28.14	151.30	19.88	-2,375.11	1,781.47	1,863.22	1,690.92	172.30	10.814	
5,800.00	5,201.20	5,176.49	5,176.20	29.99	152.45	23.22	-2,375.11	1,781.47	1,771.74	1,598.21	173.53	10.210	
5,900.00	5,227.08	5,202.37	5,202.08	32.06	153.23	31.49	-2,375.11	1,781.47	1,676.01	1,501.64	174.37	9.612	
6,000.00	5,240.34	5,215.63	5,215.34	34.27	153.64	56.56	-2,375.11	1,781.47	1,577.58	1,402.78	174.80	9.025	
6,100.00	5,241.36	5,216.65	5,216.36	36.56	153.67	102.33	-2,375.11	1,781.47	1,478.10	1,303.25	174.84	8.454	
6,200.00	5,239.30	5,214.59	5,214.30	38.91	153.61	101.52	-2,375.11	1,781.47	1,378.59	1,203.81	174.78	7.887	
6,300.00	5,237.24	5,212.52	5,212.24	41.31	153.54	100.70	-2,375.11	1,781.47	1,279.16	1,104.42	174.74	7.320	
6,400.00	5,235.17	5,210.46	5,210.17	43.76	153.48	99.88	-2,375.11	1,781.47	1,179.82	1,005.10	174.72	6.753	
6,500.00	5,233.11	5,208.39	5,208.11	46.24	153.42	99.05	-2,375.11	1,781.47	1,080.61	905.87	174.74	6.184	
6,600.00	5,231.04	5,206.33	5,206.04	48.76	153.35	98.22	-2,375.11	1,781.47	981.54	806.74	174.80	5.615	
6,700.00	5,228.98	5,204.26	5,203.98	51.30	153.29	97.38	-2,375.11	1,781.47	882.68	707.74	174.95	5.045	
6,800.00	5,226.91	5,202.20	5,201.91	53.86	153.23	96.54	-2,375.11	1,781.47	784.11	608.89	175.22	4.475	
6,900.00	5,224.85	5,200.14	5,199.85	56.45	153.17	95.70	-2,375.11	1,781.47	685.94	510.22	175.72	3.904	
7,000.00	5,222.78	5,198.07	5,197.78	59.05	153.10	94.86	-2,375.11	1,781.47	588.38	411.79	176.59	3.332	
7,100.00	5,220.72	5,196.01	5,195.72	61.66	153.04	94.01	-2,375.11	1,781.47	491.80	313.63	178.16	2.760	
7,200.00	5,218.66	5,193.94	5,193.66	64.29	152.98	93.16	-2,375.11	1,781.47	396.90	215.84	181.06	2.192	
7,300.00	5,216.59	5,191.88	5,191.59	66.93	152.92	92.31	-2,375.11	1,781.47	305.26	118.66	186.60	1.636	
7,400.00	5,214.53	5,189.81	5,189.53	69.58	152.85	91.46	-2,375.11	1,781.47	220.97	23.51	197.46	1.119 Level 2	
7,500.00	5,212.46	5,187.75	5,187.46	72.24	152.79	90.61	-2,375.11	1,781.47	156.42	-59.88	216.30	0.723 Level 1	
7,571.86	5,210.98	5,186.27	5,185.98	74.15	152.75	90.00	-2,375.11	1,781.47	138.94	-87.89	226.83	0.613 Level 1, CC, ES, SF	
7,600.00	5,210.40	5,185.68	5,185.40	74.90	152.73	89.76	-2,375.11	1,781.47	141.76	-85.03	226.79	0.625 Level 1	
7,700.00	5,208.33	5,183.62	5,183.33	77.58	152.66	88.91	-2,375.11	1,781.47	188.99	-24.45	213.44	0.885 Level 1	
7,800.00	5,206.27	5,181.56	5,181.27	80.26	152.60	88.06	-2,375.11	1,781.47	267.07	66.55	200.52	1.332 Level 3	
7,900.00	5,204.20	5,179.49	5,179.20	82.95	152.54	87.21	-2,375.11	1,781.47	356.28	163.46	192.81	1.848	
8,000.00	5,202.14	5,177.43	5,177.14	85.64	152.48	86.36	-2,375.11	1,781.47	450.03	261.85	188.19	2.391	
8,099.98	5,200.08	5,175.36	5,175.08	88.33	152.41	85.51	-2,375.11	1,781.47	545.98	360.75	185.23	2.948	
8,200.00	5,198.13	5,173.42	5,173.13	91.05	152.35	84.50	-2,375.11	1,781.47	643.53	460.18	183.34	3.510	
8,300.00	5,196.44	5,171.73	5,171.44	93.79	152.30	83.15	-2,375.11	1,781.47	742.27	560.05	182.22	4.073	
8,400.00	5,195.01	5,170.29	5,170.01	96.56	152.26	80.90	-2,375.11	1,781.47	841.71	660.12	181.58	4.635	
8,500.00	5,193.84	5,169.12	5,168.84	99.34	152.22	75.26	-2,375.11	1,781.47	941.51	760.25	181.26	5.194	
8,600.00	5,192.93	5,168.21	5,167.93	102.13	152.20	18.43	-2,375.11	1,781.47	1,041.48	860.32	181.16	5.749	
8,700.00	5,192.28	5,167.57	5,167.28	104.93	152.18	-80.54	-2,375.11	1,781.47	1,141.46	960.25	181.22	6.299	
8,800.00	5,191.90	5,167.18	5,166.90	107.74	152.17	-87.52	-2,375.11	1,781.47	1,241.35	1,059.94	181.41	6.843	
8,900.00	5,191.63	5,166.92	5,166.63	110.55	152.16	-87.32	-2,375.11	1,781.47	1,341.18	1,159.55	181.63	7.384	
9,000.00	5,191.37	5,166.66	5,166.37	113.36	152.15	-87.12	-2,375.11	1,781.47	1,441.04	1,259.21	181.82	7.925	
9,100.00	5,191.11	5,166.40	5,166.11	116.19	152.14	-86.92	-2,375.11	1,781.47	1,540.91	1,358.91	182.00	8.467	
9,200.00	5,190.85	5,166.13	5,165.85	119.02	152.13	-86.72	-2,375.11	1,781.47	1,640.80	1,458.65	182.15	9.008	
9,300.00	5,190.58	5,165.87	5,165.58	121.85	152.13	-86.52	-2,375.11	1,781.47	1,740.70	1,558.41	182.29	9.549	
9,400.00	5,190.32	5,165.61	5,165.32	124.69	152.12	-86.32	-2,375.11	1,781.47	1,840.61	1,658.19	182.42	10.090	
9,500.00	5,190.06	5,165.35	5,165.06	127.54	152.11	-86.12	-2,375.11	1,781.47	1,940.53	1,758.00	182.54	10.631	
9,600.00	5,189.80	5,165.08	5,164.80	130.39	152.10	-85.92	-2,375.11	1,781.47	2,040.46	1,857.82	182.64	11.172	
9,700.00	5,189.53	5,164.82	5,164.53	133.25	152.09	-85.72	-2,375.11	1,781.47	2,140.40	1,957.65	182.74	11.713	
9,800.00	5,189.27	5,164.56	5,164.27	136.11	152.09	-85.52	-2,375.11	1,781.47	2,240.34	2,057.50	182.84	12.253	
9,900.00	5,189.01	5,164.30	5,164.01	138.97	152.08	-85.32	-2,375.11	1,781.47	2,340.28	2,157.36	182.93	12.794	

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 Heros 2308-09L 4H - Slot 4H
Project:	San Juan, NM NAD83	TVD Reference:	GL 6913' & RKB 25' @ 6938.00usft (Aztec 1000)
Reference Site:	Heros 2308-09L	MD Reference:	GL 6913' & RKB 25' @ 6938.00usft (Aztec 1000)
Site Error:	0.00 usft	North Reference:	True
Reference Well:	Heros 2308-09L 4H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 usft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction District
Reference Design:	Plan #6	Offset TVD Reference:	Offset Datum

Offset Design Heros 2308-09L - State NM 16 #21 Unit C - OH - OH													Offset Site Error: 0.00 usft
Survey Program: 313-INCLINOMETER													Offset Well Error: 0.00 usft
Reference		Offset		Semi Major Axis		Highside Toolface (°)	Offset Wellbore Centre		Distance		Minimum Separation (usft)	Separation Factor	Warning
Measured Depth (usft)	Vertical Depth (usft)	Measured Depth (usft)	Vertical Depth (usft)	Reference (usft)	Offset (usft)		+N-S (usft)	+E-W (usft)	Between Centres (usft)	Between Ellipses (usft)			
10,000.00	5,188.75	5,164.03	5,163.75	141.84	152.07	-85.12	-2,375.11	1,781.47	2,440.23	2,257.22	183.01	13.334	
10,100.00	5,188.49	5,163.77	5,163.49	144.71	152.06	-84.92	-2,375.11	1,781.47	2,540.19	2,357.10	183.09	13.874	
10,200.00	5,188.22	5,163.51	5,163.22	147.58	152.05	-84.72	-2,375.11	1,781.47	2,640.14	2,456.98	183.16	14.414	
10,300.00	5,187.96	5,163.25	5,162.96	150.46	152.05	-84.52	-2,375.11	1,781.47	2,740.11	2,556.87	183.23	14.954	
10,400.00	5,187.70	5,162.98	5,162.70	153.34	152.04	-84.32	-2,375.11	1,781.47	2,840.07	2,656.77	183.30	15.494	
10,500.00	5,187.44	5,162.72	5,162.44	156.22	152.03	-84.13	-2,375.11	1,781.47	2,940.04	2,756.67	183.37	16.033	
10,600.00	5,187.17	5,162.46	5,162.17	159.11	152.02	-83.93	-2,375.11	1,781.47	3,040.00	2,856.57	183.43	16.573	
10,665.98	5,187.00	5,162.29	5,162.00	161.01	152.02	-83.80	-2,375.11	1,781.47	3,105.96	2,922.48	183.47	16.929	

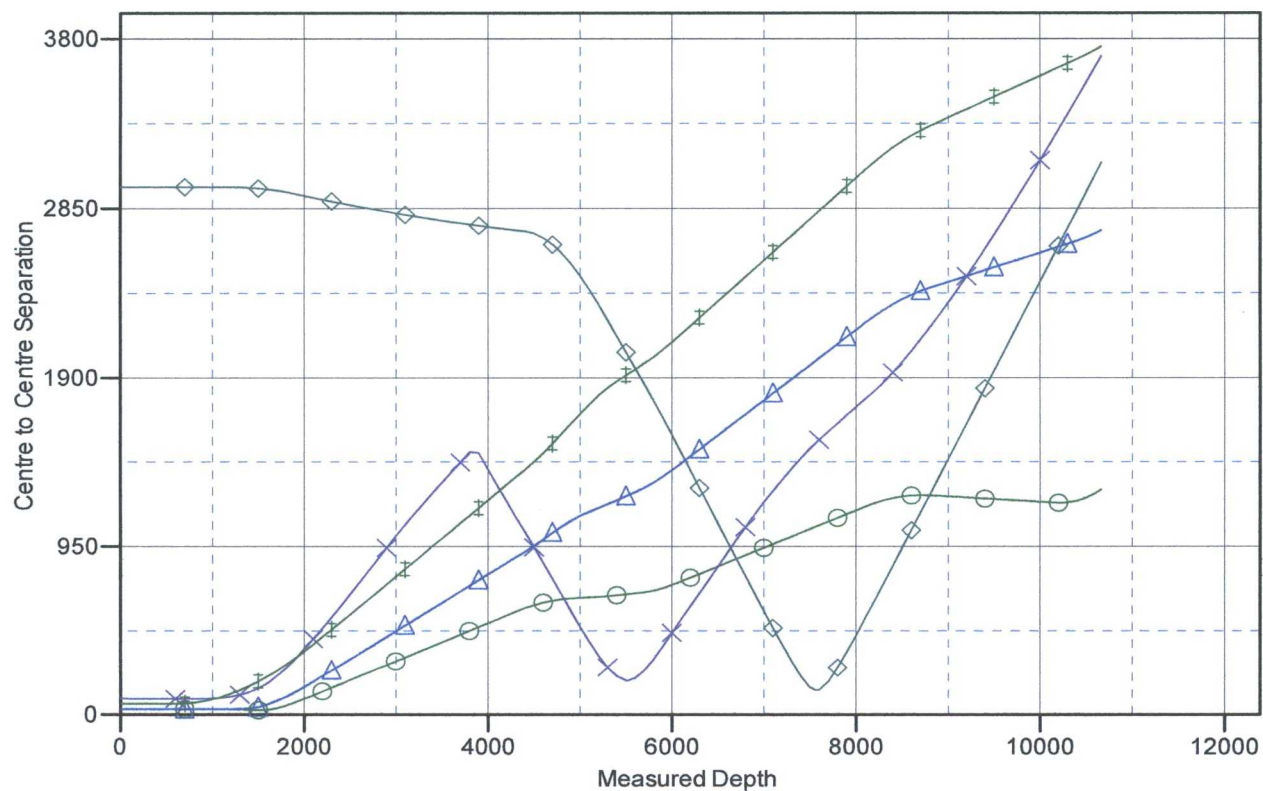
Company: Logos Operating LLC
Project: San Juan, NM NAD83
Reference Site: Heros 2308-09L
Site Error: 0.00 usft
Reference Well: Heros 2308-09L 4H
Well Error: 0.00 usft
Reference Wellbore: OH
Reference Design: Plan #6

Local Co-ordinate Reference: Well Heros 2308-09L 4H - Slot 4H
TVD Reference: GL 6913' & RKB 25' @ 6938.00usft (Aztec 1000)
MD Reference: GL 6913' & RKB 25' @ 6938.00usft (Aztec 1000)
North Reference: True
Survey Calculation Method: Minimum Curvature
Output errors are at 2.00 sigma
Database: Grand Junction District
Offset TVD Reference: Offset Datum

Reference Depths are relative to GL 6913' & RKB 25' @ 6938.00usft (A)
Offset Depths are relative to Offset Datum
Central Meridian is -107.8333334

Coordinates are relative to: Heros 2308-09L 4H - Slot 4H
Coordinate System is US State Plane 1983, New Mexico Western Zone
Grid Convergence at Surface is: 0.08°

Ladder Plot



LEGEND

—○— Heros 2308-09L 5H, OH, Plan #2 V0
 —×— Heros 2308-09L 1H, OH, OH V0
 —+— Heros 2308-09L 2H, OH, Plan #6 V0
—◇— State NM 16 #21 Unit C, OH, OH V0
 —△— Heros 2308-09L 3H, OH, Plan #6 V0



Scientific Drilling, Intl

Anticollision Report

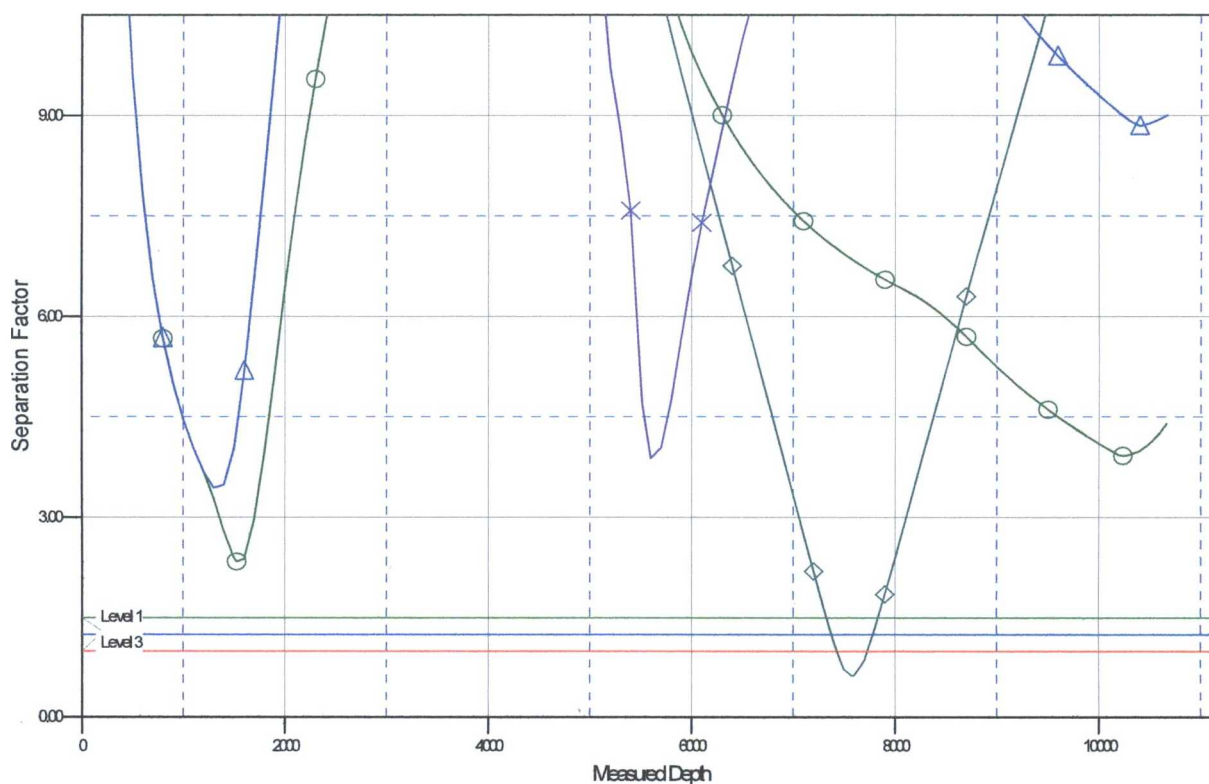


Company:	Logos Operating LLC	Local Co-ordinate Reference:	Well Heros 2308-09L 4H - Slot 4H
Project:	San Juan, NM NAD83	TVD Reference:	GL 6913' & RKB 25' @ 6938.00usft (Aztec 1000)
Reference Site:	Heros 2308-09L	MD Reference:	GL 6913' & RKB 25' @ 6938.00usft (Aztec 1000)
Site Error:	0.00 usft	North Reference:	True
Reference Well:	Heros 2308-09L 4H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 usft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction District
Reference Design:	Plan #6	Offset TVD Reference:	Offset Datum

Reference Depths are relative to GL 6913' & RKB 25' @ 6938.00usft (A)
Offset Depths are relative to Offset Datum
Central Meridian is -107.8333334

Coordinates are relative to: Heros 2308-09L 4H - Slot 4H
Coordinate System is US State Plane 1983, New Mexico Western Zone
Grid Convergence at Surface is: 0.08°

Separation Factor Plot



LEGEND

- Heros 2308-09L 5H, OH, Plan #2 V0
- Heros 2308-09L 1H, OH, OH V0
- Heros 2308-09L 2H, OH, Plan #6 V0
- State NM 16#21 Unit C, OH, OH V0
- Heros 2308-09L 3H, OH, Plan #6 V0