

Form 3160-5
(June 2019)UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENTFORM APPROVED
OMB No. 1004-0137
Expires: October 31, 2021**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. **NMSF078764**

6. If Indian, Allottee or Tribe Name

SUBMIT IN TRIPLICATE - Other instructions on page 2

1. Type of Well

☐ Oil Well ☒ Gas Well ☐ Other2. Name of Operator **LOGOS OPERATING LLC**3a. Address **2010 AFTON PLACE, FARMINGTON, NM 87401** 3b. Phone No. (include area code)
(505) 278-87204. Location of Well (Footage, Sec., T., R., M., or Survey Description)
SEC 19/T31N/R5W/NMP7. If Unit of CA/Agreement, Name and/or No.
ROSA UNIT- MANCOS PA/NMNM78407E8. Well Name and No. **ROSA UNIT/645H**9. API Well No. **3003931415**10. Field and Pool or Exploratory Area
BASIN MANCOS/BASIN MANCOS11. Country or Parish, State
RIO ARRIBA/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 recompleate 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 recompleation 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 detennined that the site is ready for final inspection.)

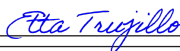
LOGOS Operating LLC, request a change in plans below:

Original surface-hole location from 960' FNL & 497' FWL to new surface-hole location 943' FNL & 424' FWL

Attached: New C102, Operation and Directional Drill plans.

14. I hereby certify that the foregoing is true and correct. Name (Printed/Typed)
ETTA TRUJILLO / Ph: (505) 324-4154Title **Regulatory Specialist**

Signature



Date

04/08/2022**THE SPACE FOR FEDERAL OR STATE OFFICE USE**

Approved by

Title

Date

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

Office

Title 18 U.S.C Section 1001 and Title 43 U.S.C Section 1212, make it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

(Instructions on page 2)

Form C-102
Revised August 1, 2011

Submit one copy to
Appropriate District Office

☒ AMENDED REPORT

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

¹⁷ OPERATOR CERTIFICATION

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

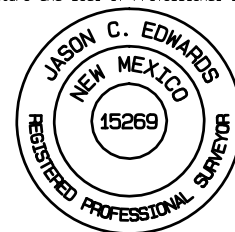
Printed Name Etta Trujillo
etrujillo@logosresourcesllc.com

¹⁸ SURVEYOR CERTIFICATION

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

Date Revised: APRIL 7, 2022
Survey Date: JANUARY 2, 2015

Signature and Seal of Professional Surveyor



JASON C. EDWARDS
Certificate Number 15269

UL or lot no.	Section	Township	Range	Lot Idn	Feet from the	North/South line	Feet from the	East/West line	County
C	19	31N	5W	1	943	NORTH	424	WEST	RIO ARRIBA

¹¹ Bottom Hole Location If Different From Surface

UL or lot no.	Section	Township	Range	Lot Idn	Feet from the	North/South line	Feet from the	East/West line	County
C	21	31N	5W		52	NORTH	2320	WEST	RIO ARriba
¹² Dedicated Acres 872.01	N/2 - Sections 19, 20, 21, T31N, R5W					¹³ Joint or Infill	¹⁴ Consolidation Code	¹⁵ Order No. R-13457	

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

SURFACE LOCATION
943' FNL 424' FWL
SECTION 19, T31N, R5W
LAT: 36.889734 °N
LONG: 107.405726 °W
DATUM: NAD1927

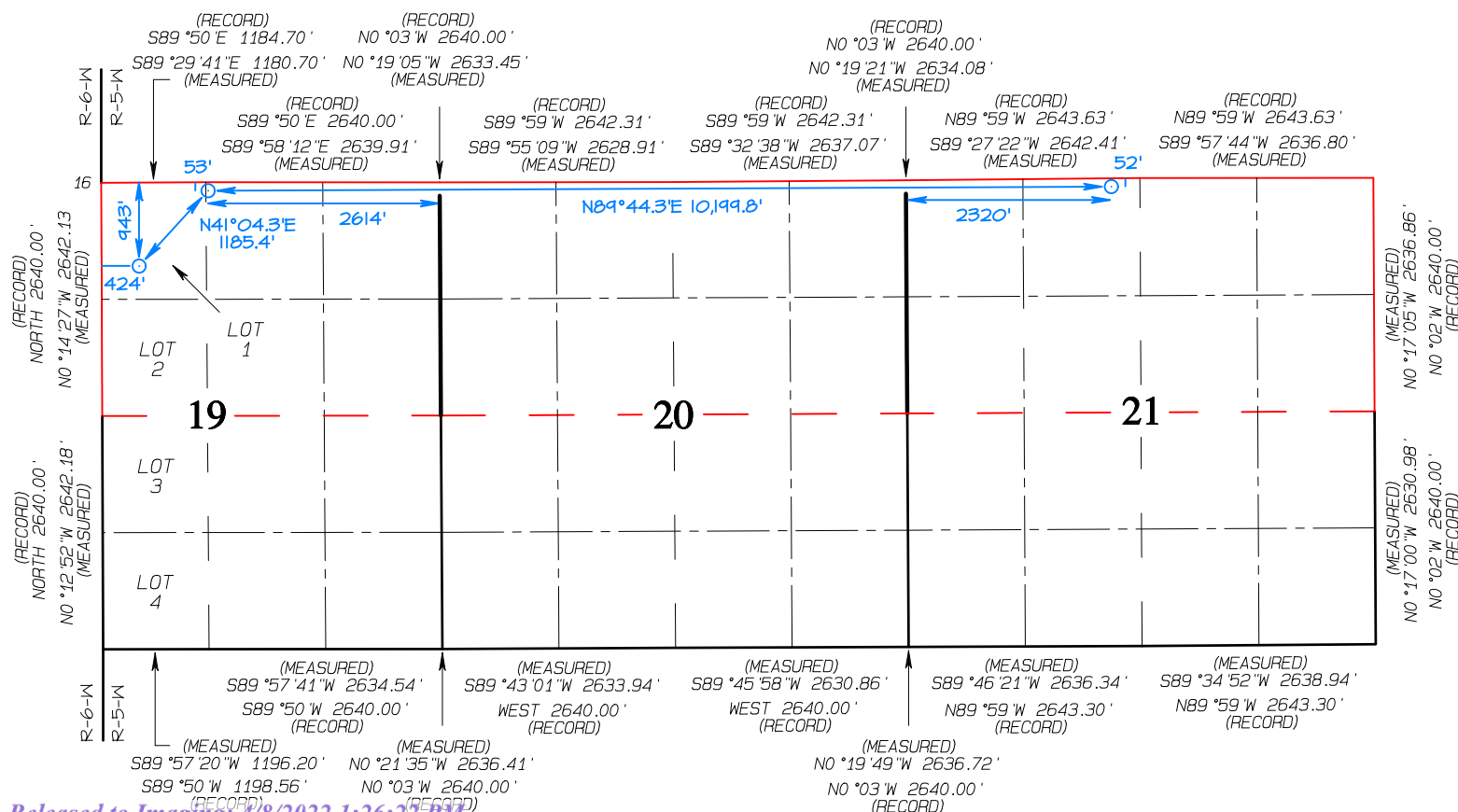
LAT: 36.889740 °N
LONG: 107.406329 °W
DATUM: NAD1983

FIRST TAKE POINT
53' FNL 2614' FEL
SECTION 19, T31N, R5W
LAT: 36.892179 °N
LONG: 107.403049 °W
DATUM: NAD1927

LAT: 36.892185 °N
LONG: 107.403652 °W
DATUM: NAD1983

LAST TAKE POINT
52' FNL 2320' FWL
SECTION 21, T31N, R5W
LAT: 36.892175 °N
LONG: 107.368170 °W
DATUM: NAD1927

LAT: 36.892181 °N
LONG: 107.368772 °W
DATUM: NAD1983





Logos Operating LLC

Rio Arriba, NM NAD83

Rosa Unit 27

Rosa Unit 645H

OH

Plan #4

Anticollision Report

07 April, 2022





Lonestar Consulting, LLC

Anticollision Report



Company:	Logos Operating LLC	Local Co-ordinate Reference:	Well Rosa Unit 645H - Slot B8
Project:	Rio Arriba, NM NAD83	TVD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Reference Site:	Rosa Unit 27	MD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Site Error:	0.00 ft	North Reference:	True
Reference Well:	Rosa Unit 645H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 ft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction
Reference Design:	Plan #4	Offset TVD Reference:	Offset Datum

Reference	Plan #4		
Filter type:	NO GLOBAL FILTER: Using user defined selection & filtering criteria		
Interpolation Method:	MD Interval 100.00ft	Error Model:	ISCWSA
Depth Range:	Unlimited	Scan Method:	Closest Approach 3D
Results Limited by:	Maximum centre distance of 10,000.00ft	Error Surface:	Pedal Curve
Warning Levels Evaluated at:	2.00 Sigma	Casing Method:	Not applied

Survey Tool Program		Date	4/7/2022		
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
0.00	17,588.54	Plan #4 (OH)	MWD+HDGM	OWSG MWD + HDGM	

Summary						
Site Name	Reference Measured Depth (ft)	Offset Measured Depth (ft)	Distance Between Centres (ft)	Distance Between Ellipses (ft)	Separation Factor	Warning
Offset Well - Wellbore - Design						
Rosa Unit 27						
Rosa Unit 640H - OH - OH	6,872.11	6,891.86	83.16	41.49	1.996	CC, ES, SF
Rosa Unit 641H - OH - OH	0.00	0.51	105.00			
Rosa Unit 641H - OH - OH	400.00	400.07	105.18	103.03	49.096	ES
Rosa Unit 641H - OH - OH	6,914.96	6,858.68	569.51	529.45	14.219	SF
Rosa Unit 642H - OH - OH	0.00	0.00	105.38			
Rosa Unit 642H - OH - OH	7,000.01	6,889.97	1,175.97	1,136.06	29.464	SF
Rosa Unit 643H - OH - OH	367.81	368.36	88.25	86.26	44.219	CC
Rosa Unit 643H - OH - OH	400.00	400.16	88.31	86.18	41.341	ES
Rosa Unit 643H - OH - OH	800.00	786.70	120.98	116.84	29.260	SF
Rosa Unit 644H - OH - Plan #1	400.00	400.50	75.47	72.91	29.507	CC
Rosa Unit 644H - OH - Plan #1	500.00	500.00	75.79	72.53	23.221	ES
Rosa Unit 644H - OH - Plan #1	700.00	695.06	85.59	80.95	18.448	SF
Rosa Unit 647H - OH - Plan #4	400.00	400.00	8.99	6.29	3.338	CC
Rosa Unit 647H - OH - Plan #4	500.00	500.00	9.42	6.01	2.764	ES, SF
Rosa Unit 648H - OH - OH	0.00	0.51	17.49			
Rosa Unit 648H - OH - OH	300.00	300.46	17.69	16.05	10.750	ES
Rosa Unit 648H - OH - OH	17,400.04	18,294.04	2,027.49	1,444.07	3.475	SF
Rosa Unit 649H - OH - Plan #4	400.00	400.00	60.61	57.91	22.513	CC
Rosa Unit 649H - OH - Plan #4	500.00	499.51	60.89	57.49	17.917	ES
Rosa Unit 649H - OH - Plan #4	17,589.48	17,531.98	1,333.55	682.30	2.048	SF

Offset Design:	Rosa Unit 27 - Rosa Unit 640H - OH - OH												Offset Site Error:	0.00 ft
Survey Program:	25-NS-GYRO-MS, 389-SDI MWD, 6481-SDI MWD, 7631-SDI MWD								Rule Assigned:		Offset Well Error:			0.00 ft
Reference	Offset		Semi Major Axis		Offset Wellbore Centre		Distance						Warning	
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)	Highside Toolface (°)	+N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Minimum Separation (ft)	Separation Factor		
0.00	0.00	0.51	0.51	0.00	0.00	102.80	-19.94	87.76	90.00					
100.00	100.00	99.81	99.81	0.27	0.16	103.01	-20.32	87.98	90.30	89.87	0.43	209.671		
200.00	200.00	199.58	199.57	0.63	0.42	103.47	-21.28	88.87	91.38	90.34	1.05	87.240		
300.00	300.00	299.79	299.77	0.99	0.67	104.04	-22.37	89.47	92.23	90.58	1.65	55.769		
400.00	400.00	399.51	399.48	1.35	0.80	104.54	-23.40	90.21	93.20	91.06	2.14	43.501		
500.00	500.00	499.43	499.39	1.70	0.86	93.99	-22.96	91.49	94.36	91.80	2.56	36.798		



Lonestar Consulting, LLC

Anticollision Report



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Project:	Rio Arriba, NM NAD83	TVD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Reference Site:	Rosa Unit 27	MD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Site Error:	0.00 ft	North Reference:	True
Reference Well:	Rosa Unit 645H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 ft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction
Reference Design:	Plan #4	Offset TVD Reference:	Offset Datum

Offset Design: Rosa Unit 27 - Rosa Unit 640H - OH - OH													Offset Site Error:	0.00 ft
Survey Program: 25-NS-GYRO-MS, 389-SDI MWD, 6481-SDI MWD, 7631-SDI MWD													Offset Well Error:	0.00 ft
Reference	Offset	Semi Major Axis	Reference	Offset	Highside	Rule Assigned:								Warning
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)	Toolface (°)	+N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Minimum Separation (ft)	Separation Factor		
600.00	599.93	599.51	599.38	2.06	0.97	93.60	-19.30	93.65	95.79	92.76	3.03	31.608		
700.00	699.68	699.42	699.03	2.43	1.13	93.50	-12.70	96.42	97.33	93.78	3.55	27.451		
800.00	799.13	799.38	798.55	2.79	1.32	94.17	-4.05	99.84	99.22	95.11	4.11	24.156		
900.00	898.20	899.07	897.58	3.16	1.56	95.36	6.67	103.89	101.47	96.76	4.72	21.514		
1,000.00	997.18	997.96	995.41	3.54	1.84	95.19	19.98	109.35	104.48	99.10	5.37	19.441		
1,100.00	1,096.17	1,097.70	1,093.82	3.92	2.15	94.13	34.86	115.84	108.04	101.97	6.07	17.795		
1,200.00	1,195.16	1,196.80	1,191.41	4.31	2.49	92.61	50.52	123.01	112.16	105.37	6.79	16.515		
1,300.00	1,294.14	1,296.31	1,289.15	4.71	2.85	90.55	67.41	131.03	116.93	109.41	7.53	15.536		
1,400.00	1,393.13	1,396.25	1,387.27	5.10	3.19	88.54	84.59	139.07	121.80	113.55	8.25	14.770		
1,500.00	1,492.12	1,496.72	1,485.98	5.49	3.53	86.82	101.55	146.99	126.68	117.72	8.96	14.143		
1,600.00	1,591.10	1,596.40	1,583.98	5.89	3.88	85.33	118.27	154.20	131.01	121.33	9.68	13.529		
1,700.00	1,690.09	1,696.20	1,681.88	6.29	4.25	83.46	136.06	162.04	135.99	125.57	10.42	13.052		
1,800.00	1,789.08	1,796.17	1,780.01	6.69	4.63	81.86	153.56	169.55	140.78	129.62	11.16	12.617		
1,900.00	1,888.06	1,896.14	1,878.05	7.09	5.01	80.15	171.59	177.04	145.64	133.75	11.89	12.246		
2,000.00	1,987.05	1,996.66	1,976.63	7.49	5.39	78.48	189.89	184.26	150.31	137.68	12.63	11.902		
2,100.00	2,086.04	2,096.12	2,074.20	7.89	5.77	76.97	207.89	191.24	154.94	141.59	13.35	11.602		
2,200.00	2,185.02	2,194.85	2,171.12	8.29	6.14	75.81	225.09	198.78	160.23	146.16	14.07	11.390		
2,300.00	2,284.01	2,295.02	2,269.46	8.69	6.52	74.70	242.56	206.52	165.68	150.89	14.80	11.198		
2,400.00	2,383.00	2,394.58	2,367.17	9.09	6.91	73.64	260.04	214.18	171.17	155.65	15.52	11.029		
2,500.01	2,481.98	2,493.87	2,464.65	9.49	7.29	72.73	277.20	222.09	176.94	160.71	16.24	10.898		
2,600.01	2,580.97	2,593.28	2,562.19	9.90	7.68	71.84	294.55	230.25	183.02	166.07	16.96	10.793		
2,700.01	2,679.96	2,693.01	2,659.96	10.30	8.08	70.87	312.41	238.49	189.27	171.59	17.68	10.707		
2,800.01	2,778.95	2,793.39	2,758.36	10.70	8.48	69.91	330.51	246.62	195.43	177.03	18.40	10.624		
2,900.01	2,877.93	2,894.84	2,857.87	11.10	8.87	69.02	348.68	254.28	201.07	181.96	19.11	10.520		
3,000.01	2,976.92	2,995.10	2,956.44	11.51	9.23	68.44	365.59	261.43	206.15	186.33	19.82	10.403		
3,100.01	3,075.91	3,092.81	3,052.53	11.91	9.60	68.06	381.61	268.95	211.69	191.18	20.51	10.321		
3,200.01	3,174.89	3,191.50	3,149.51	12.31	9.98	67.69	397.96	277.19	217.92	196.70	21.22	10.271		
3,300.01	3,273.88	3,287.87	3,244.07	12.71	10.35	67.36	414.08	286.34	225.32	203.42	21.91	10.286		
3,400.01	3,372.87	3,387.52	3,341.73	13.12	10.75	67.04	430.95	296.76	233.71	211.09	22.62	10.331		
3,500.01	3,471.85	3,490.98	3,443.13	13.52	11.16	66.46	449.28	306.03	240.83	217.47	23.36	10.311		
3,600.01	3,570.84	3,593.09	3,543.33	13.93	11.55	65.93	467.16	314.23	247.02	222.95	24.07	10.263		
3,700.01	3,669.83	3,694.76	3,643.37	14.33	11.92	65.65	483.74	321.59	252.15	227.36	24.78	10.174		
3,800.01	3,768.81	3,793.14	3,740.18	14.73	12.29	65.40	499.71	328.65	257.21	231.73	25.48	10.095		
3,900.01	3,867.80	3,890.98	3,836.33	15.14	12.66	65.09	516.13	336.36	263.09	236.92	26.17	10.051		
4,000.01	3,966.79	3,987.33	3,930.82	15.54	13.05	64.67	533.04	344.70	269.94	243.09	26.86	10.052		
4,100.01	4,065.77	4,087.14	4,028.66	15.94	13.44	64.36	550.31	354.16	277.54	249.98	27.56	10.070		
4,200.01	4,164.76	4,184.60	4,124.23	16.35	13.83	64.16	566.85	363.79	285.44	257.19	28.25	10.104		
4,300.01	4,263.75	4,283.73	4,221.23	16.75	14.24	63.80	584.57	373.90	293.91	264.95	28.95	10.151		
4,400.01	4,362.73	4,382.62	4,322.99	17.16	14.65	63.45	603.01	383.88	301.78	272.10	29.69	10.166		
4,500.01	4,461.72	4,488.44	4,422.13	17.56	15.03	63.38	619.15	392.49	308.12	277.72	30.40	10.135		
4,600.01	4,560.71	4,583.40	4,515.35	17.96	15.40	63.37	634.51	402.02	315.95	284.87	31.08	10.167		
4,700.01	4,659.69	4,685.36	4,615.29	18.37	15.80	63.18	652.00	412.16	323.98	292.18	31.80	10.187		
4,800.01	4,758.68	4,785.12	4,713.17	18.77	16.19	62.99	668.96	421.36	331.28	298.77	32.51	10.190		
4,900.01	4,857.67	4,883.46	4,809.52	19.18	16.59	62.74	686.22	430.79	339.09	305.88	33.20	10.212		
5,000.01	4,956.65	4,987.86	4,911.88	19.58	17.01	62.52	704.24	440.50	346.56	312.62	33.94	10.210		
5,100.01	5,055.64	5,086.84	5,009.14	19.98	17.38	62.41	720.57	449.04	353.14	318.50	34.64	10.194		
5,200.01	5,154.63	5,183.01	5,103.34	20.39	17.78	62.16	737.64	458.11	360.86	325.54	35.32	10.216		
5,300.01	5,253.61	5,280.51	5,198.59	20.79	18.19	61.76	756.10	467.77	369.43	333.43	36.00	10.263		
5,400.01	5,352.60	5,382.18	5,298.01	21.20	18.60	61.39	775.00	477.50	377.59	340.89	36.70	10.288		
5,500.01	5,451.59	5,484.13	5,397.83	21.60	19.01	61.09	793.53	486.80	385.20	347.79	37.41	10.296		



Lonestar Consulting, LLC

Anticollision Report



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Offset Design: Rosa Unit 27 - Rosa Unit 640H - OH - OH												Offset Site Error:	0.00 ft
Survey Program: 25-NS-GYRO-MS, 389-SDI MWD, 6481-SDI MWD, 7631-SDI MWD												Offset Well Error:	0.00 ft
Reference	Offset	Semi Major Axis		Offset Wellbore Centre		Rule Assigned:		Distance		Minimum	Separation	Warning	
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)	Highside Toolface (°)	+N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Separation (ft)	Factor	
5,600.01	5,550.57	5,587.26	5,498.94	22.01	19.42	60.83	811.79	495.66	392.17	354.04	38.13	10.285	
5,700.01	5,649.56	5,694.25	5,603.84	22.41	19.84	60.40	831.41	503.15	397.85	358.99	38.86	10.239	
5,800.01	5,748.55	5,798.25	5,705.69	22.81	20.25	59.69	851.93	507.99	401.80	362.27	39.54	10.163	
5,900.01	5,847.53	5,911.17	5,816.45	23.22	20.68	58.92	873.60	511.48	404.20	363.98	40.23	10.048	
6,000.01	5,946.52	6,033.89	5,937.54	23.62	21.07	58.35	893.41	510.38	401.74	360.90	40.84	9.836	
6,100.01	6,045.51	6,151.28	6,053.88	24.03	21.36	58.16	907.85	504.86	394.38	352.99	41.40	9.527	
6,200.01	6,144.49	6,273.37	6,175.18	24.43	21.57	58.52	917.17	494.88	382.14	340.32	41.82	9.138	
6,300.01	6,243.48	6,373.06	6,274.35	24.84	21.66	59.49	919.67	485.05	366.48	323.95	42.53	8.618	
6,400.00	6,342.45	6,478.78	6,379.67	25.24	21.72	61.13	919.45	475.82	351.18	308.01	43.16	8.136	
6,500.01	6,440.93	6,618.90	6,516.15	25.65	21.67	19.34	925.22	445.59	317.97	275.67	42.31	7.516	
6,600.01	6,536.70	6,759.12	6,646.26	26.06	21.59	-4.75	933.44	394.89	261.19	222.14	39.05	6.689	
6,700.01	6,627.42	6,836.38	6,711.61	26.46	21.55	-32.57	939.88	354.26	184.79	147.69	37.10	4.980	
6,800.01	6,710.86	6,878.91	6,745.23	26.86	21.52	-66.35	943.72	328.52	109.37	72.06	37.31	2.932	
6,872.11	6,765.34	6,891.86	6,755.12	27.17	21.52	-79.31	944.90	320.24	83.16	41.49	41.67	1.996 CC, ES, SF	
6,900.01	6,784.97	6,894.26	6,756.95	27.29	21.51	-81.03	945.12	318.69	87.69	45.03	42.65	2.056	
7,000.01	6,847.91	6,893.10	6,756.06	27.78	21.52	-73.17	945.01	319.44	152.48	111.62	40.86	3.732	
7,100.01	6,898.13	6,879.74	6,745.87	28.43	21.52	-49.66	943.79	327.99	241.30	201.45	39.84	6.056	
7,200.01	6,934.41	6,859.85	6,730.41	29.33	21.53	-28.59	941.99	340.38	332.76	292.66	40.10	8.298	
7,300.01	6,955.84	6,835.73	6,711.08	30.51	21.55	-16.25	939.82	354.64	422.09	381.18	40.91	10.317	
7,400.01	6,962.01	6,806.87	6,687.21	31.95	21.56	-9.73	937.32	370.65	507.30	465.41	41.89	12.111	
7,500.02	6,962.07	6,784.01	6,667.82	33.61	21.58	-8.74	935.42	382.60	592.11	549.09	43.02	13.765	
7,600.02	6,962.12	6,753.01	6,640.92	35.45	21.60	-7.58	932.95	397.80	678.92	635.39	43.53	15.597	
7,700.02	6,962.18	6,734.98	6,624.90	37.46	21.61	-7.01	931.67	406.00	767.69	723.42	44.27	17.340	
7,800.02	6,962.24	6,723.01	6,614.10	39.61	21.62	-6.68	930.94	411.08	858.13	813.16	44.97	19.083	
7,900.02	6,962.30	6,704.84	6,597.45	41.87	21.63	-6.22	929.95	418.31	949.81	904.44	45.37	20.933	
8,000.02	6,962.36	6,692.01	6,585.56	44.22	21.64	-5.93	929.29	423.07	1,042.52	996.73	45.79	22.769	
8,100.02	6,962.42	6,679.87	6,574.21	46.65	21.64	-5.67	928.67	427.33	1,136.07	1,089.94	46.13	24.630	
8,200.02	6,962.48	6,662.01	6,557.35	49.15	21.65	-5.30	927.76	433.13	1,230.39	1,184.07	46.33	26.559	
8,300.02	6,962.54	6,662.01	6,557.35	51.70	21.65	-5.30	927.76	433.13	1,325.19	1,278.48	46.71	28.372	
8,400.02	6,962.60	6,646.65	6,542.73	54.31	21.66	-5.01	926.93	437.77	1,420.48	1,373.62	46.86	30.314	
8,500.02	6,962.65	6,632.01	6,528.73	56.95	21.67	-4.73	926.06	441.97	1,516.18	1,469.18	47.00	32.262	
8,600.02	6,962.71	6,621.65	6,518.79	59.64	21.67	-4.54	925.40	444.83	1,612.17	1,565.01	47.15	34.190	
8,700.02	6,962.77	6,602.01	6,499.92	62.35	21.68	-4.19	924.08	450.11	1,708.41	1,661.19	47.21	36.185	
8,800.02	6,962.83	6,593.39	6,491.63	65.09	21.68	-4.05	923.48	452.37	1,804.82	1,757.47	47.35	38.113	
8,900.02	6,962.89	6,579.90	6,478.61	67.86	21.68	-3.83	922.58	455.83	1,901.43	1,853.98	47.44	40.077	
9,000.02	6,962.95	6,572.01	6,471.00	70.65	21.68	-3.71	922.06	457.81	1,998.22	1,950.65	47.57	42.010	
9,100.02	6,963.01	6,559.54	6,458.93	73.45	21.69	-3.54	921.32	460.86	2,095.18	2,047.53	47.65	43.972	
9,200.02	6,963.07	6,551.19	6,450.82	76.28	21.69	-3.44	920.90	462.84	2,192.32	2,144.57	47.75	45.912	
9,300.02	6,963.12	6,541.01	6,440.93	79.12	21.70	-3.33	920.47	465.17	2,289.64	2,241.80	47.84	47.865	
9,400.02	6,963.18	6,541.01	6,440.93	81.97	21.70	-3.33	920.47	465.17	2,387.11	2,339.14	47.96	49.769	
9,500.02	6,963.24	6,541.01	6,440.93	84.83	21.70	-3.33	920.47	465.17	2,484.78	2,436.70	48.08	51.679	
9,600.02	6,963.30	6,541.01	6,440.93	87.71	21.70	-3.33	920.47	465.17	2,582.63	2,534.44	48.19	53.593	
9,700.02	6,963.36	6,525.69	6,425.96	90.59	21.70	-3.18	919.98	468.42	2,680.41	2,632.17	48.24	55.567	
9,800.02	6,963.42	6,511.01	6,411.55	93.49	21.71	-3.07	919.70	471.19	2,778.56	2,730.27	48.29	57.541	
9,900.02	6,963.48	6,511.01	6,411.55	96.39	21.71	-3.07	919.70	471.19	2,876.64	2,828.26	48.38	59.454	
10,000.02	6,963.54	6,511.01	6,411.55	99.30	21.71	-3.07	919.70	471.19	2,974.85	2,926.37	48.47	61.370	
10,100.02	6,963.60	6,511.01	6,411.55	102.22	21.71	-3.07	919.70	471.19	3,073.17	3,024.61	48.56	63.287	
10,200.02	6,963.65	6,511.01	6,411.55	105.14	21.71	-3.07	919.70	471.19	3,171.60	3,122.95	48.64	65.205	
10,300.02	6,963.71	6,511.01	6,411.55	108.07	21.71	-3.07	919.70	471.19	3,270.12	3,221.40	48.72	67.123	
10,400.02	6,963.77	6,511.01	6,411.55	111.00	21.71	-3.07	919.70	471.19	3,368.73	3,319.93	48.79	69.041	



Lonestar Consulting, LLC

Anticollision Report



Company:	Logos Operating LLC	Local Co-ordinate Reference:	Well Rosa Unit 645H - Slot B8
Project:	Rio Arriba, NM NAD83	TVD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Reference Site:	Rosa Unit 27	MD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Site Error:	0.00 ft	North Reference:	True
Reference Well:	Rosa Unit 645H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 ft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction
Reference Design:	Plan #4	Offset TVD Reference:	Offset Datum

Offset Design: Rosa Unit 27 - Rosa Unit 640H - OH - OH													Offset Site Error:	0.00 ft
Survey Program: 25-NS-GYRO-MS, 389-SDI MWD, 6481-SDI MWD, 7631-SDI MWD													Offset Well Error:	0.00 ft
Reference	Offset	Semi Major Axis	Reference	Offset	Highside	Rule Assigned:				Distance	Minimum	Separation	Warning	
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)	Tooface (")	+N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Separation (ft)	Factor		
10,500.02	6,963.83	6,511.01	6,411.55	113.94	21.71	-3.07	919.70	471.19	3,467.42	3,418.55	48.87	70.959		
10,600.02	6,963.89	6,511.01	6,411.55	116.88	21.71	-3.07	919.70	471.19	3,566.18	3,517.24	48.94	72.876		
10,700.02	6,963.95	6,511.01	6,411.55	119.83	21.71	-3.07	919.70	471.19	3,665.01	3,616.01	49.00	74.791		
10,800.02	6,964.01	6,511.01	6,411.55	122.78	21.71	-3.07	919.70	471.19	3,763.90	3,714.83	49.07	76.705		
10,900.02	6,964.07	6,496.46	6,397.19	125.73	21.72	-2.98	919.55	473.55	3,862.60	3,813.49	49.12	78.644		
11,000.02	6,964.12	6,494.88	6,395.63	128.69	21.72	-2.97	919.53	473.78	3,961.55	3,912.37	49.18	80.555		
11,100.02	6,964.18	6,481.01	6,381.88	131.65	21.72	-2.89	919.45	475.57	4,060.72	4,011.49	49.23	82.490		
11,200.02	6,964.24	6,481.01	6,381.88	134.62	21.72	-2.89	919.45	475.57	4,159.71	4,110.42	49.29	84.391		
11,300.02	6,964.30	6,481.01	6,381.88	137.58	21.72	-2.89	919.45	475.57	4,258.75	4,209.40	49.35	86.290		
11,400.02	6,964.36	6,481.01	6,381.88	140.55	21.72	-2.89	919.45	475.57	4,357.84	4,308.42	49.42	88.185		
11,500.02	6,964.42	6,481.01	6,381.88	143.52	21.72	-2.89	919.45	475.57	4,456.97	4,407.49	49.48	90.078		
11,600.02	6,964.48	6,481.01	6,381.88	146.50	21.72	-2.89	919.45	475.57	4,556.13	4,506.59	49.54	91.968		
11,700.02	6,964.54	6,481.01	6,381.88	149.47	21.72	-2.89	919.45	475.57	4,655.33	4,605.73	49.60	93.855		
11,800.02	6,964.60	6,481.01	6,381.88	152.45	21.72	-2.89	919.45	475.57	4,754.57	4,704.90	49.66	95.738		
11,900.02	6,964.65	6,481.01	6,381.88	155.43	21.72	-2.89	919.45	475.57	4,853.83	4,804.11	49.72	97.618		
12,000.02	6,964.71	6,481.01	6,381.88	158.41	21.72	-2.89	919.45	475.57	4,953.13	4,903.34	49.78	99.494		
12,100.02	6,964.77	6,481.01	6,381.88	161.39	21.72	-2.89	919.45	475.57	5,052.45	5,002.61	49.84	101.366		
12,200.02	6,964.83	6,481.01	6,381.88	164.38	21.72	-2.89	919.45	475.57	5,151.80	5,101.90	49.90	103.235		
12,300.02	6,964.89	6,481.01	6,381.88	167.36	21.72	-2.89	919.45	475.57	5,251.17	5,201.21	49.96	105.099		
12,400.03	6,964.95	6,481.01	6,381.88	170.35	21.72	-2.89	919.45	475.57	5,350.57	5,300.55	50.02	106.959		
12,500.03	6,965.01	6,481.01	6,381.88	173.34	21.72	-2.89	919.45	475.57	5,449.99	5,399.90	50.08	108.815		
12,600.03	6,965.07	6,481.01	6,381.88	176.33	21.72	-2.89	919.45	475.57	5,549.43	5,499.28	50.15	110.667		
12,700.03	6,965.12	6,481.01	6,381.88	179.32	21.72	-2.89	919.45	475.57	5,648.89	5,598.68	50.21	112.514		
12,800.03	6,965.18	6,481.01	6,381.88	182.31	21.72	-2.89	919.45	475.57	5,748.37	5,698.10	50.27	114.356		
12,900.03	6,965.24	6,481.01	6,381.88	185.31	21.72	-2.89	919.45	475.57	5,847.86	5,797.54	50.33	116.194		
13,000.03	6,965.30	6,481.01	6,381.88	188.30	21.72	-2.89	919.45	475.57	5,947.38	5,896.99	50.39	118.027		
13,100.03	6,965.36	6,481.01	6,381.88	191.30	21.72	-2.89	919.45	475.57	6,046.91	5,996.46	50.45	119.855		
13,200.03	6,965.42	6,481.01	6,381.88	194.29	21.72	-2.89	919.45	475.57	6,146.45	6,095.94	50.51	121.678		
13,300.03	6,965.48	6,467.19	6,368.13	197.29	21.72	-2.82	919.44	477.02	6,245.86	6,195.30	50.57	123.514		
13,400.03	6,965.54	6,466.22	6,367.17	200.29	21.72	-2.82	919.44	477.12	6,345.42	6,294.78	50.63	125.328		
13,500.03	6,965.60	6,465.29	6,366.24	203.29	21.72	-2.81	919.44	477.20	6,444.98	6,394.29	50.69	127.136		
13,600.03	6,965.65	6,451.01	6,352.02	206.29	21.72	-2.75	919.52	478.39	6,544.69	6,493.94	50.75	128.958		
13,700.03	6,965.71	6,451.01	6,352.02	209.29	21.72	-2.75	919.52	478.39	6,644.26	6,593.45	50.82	130.753		
13,800.03	6,965.77	6,451.01	6,352.02	212.29	21.72	-2.75	919.52	478.39	6,743.85	6,692.97	50.88	132.544		
13,900.03	6,965.83	6,451.01	6,352.02	215.29	21.72	-2.75	919.52	478.39	6,843.44	6,792.50	50.95	134.329		
14,000.03	6,965.89	6,451.01	6,352.02	218.29	21.72	-2.75	919.52	478.39	6,943.05	6,892.04	51.01	136.108		
14,100.03	6,965.95	6,451.01	6,352.02	221.30	21.72	-2.75	919.52	478.39	7,042.67	6,991.59	51.08	137.883		
14,200.03	6,966.01	6,451.01	6,352.02	224.30	21.72	-2.75	919.52	478.39	7,142.29	7,091.15	51.14	139.651		
14,300.03	6,966.07	6,451.01	6,352.02	227.30	21.72	-2.75	919.52	478.39	7,241.93	7,190.72	51.21	141.414		
14,400.03	6,966.12	6,451.01	6,352.02	230.31	21.72	-2.75	919.52	478.39	7,341.58	7,290.30	51.28	143.171		
14,500.03	6,966.18	6,451.01	6,352.02	233.32	21.72	-2.75	919.52	478.39	7,441.24	7,389.89	51.35	144.923		
14,600.03	6,966.24	6,451.01	6,352.02	236.32	21.72	-2.75	919.52	478.39	7,540.91	7,489.49	51.41	146.669		
14,700.03	6,966.30	6,278.53	6,180.31	239.33	21.57	-1.99	917.38	494.35	7,640.43	7,589.13	51.30	148.939		
14,800.03	6,966.36	6,277.01	6,178.80	242.33	21.57	-1.98	917.32	494.51	7,739.91	7,688.54	51.37	150.674		
14,900.03	6,966.42	6,277.01	6,178.80	245.34	21.57	-1.98	917.32	494.51	7,839.40	7,787.96	51.44	152.398		
15,000.03	6,966.48	6,277.01	6,178.80	248.35	21.57	-1.98	917.32	494.51	7,938.91	7,887.39	51.51	154.115		
15,100.03	6,966.54	6,277.01	6,178.80	251.36	21.57	-1.98	917.32	494.51	8,038.42	7,986.84	51.59	155.827		
15,200.03	6,966.60	6,277.01	6,178.80	254.37	21.57	-1.98	917.32	494.51	8,137.95	8,086.29	51.66	157.533		
15,300.03	6,966.65	6,277.01	6,178.80	257.38	21.57	-1.98	917.32	494.51	8,237.49	8,185.76	51.73	159.233		
15,400.03	6,966.71	6,277.01	6,178.80	260.39	21.57	-1.98	917.32	494.51	8,337.05	8,285.24	51.81	160.928		



Lonestar Consulting, LLC

Anticollision Report



Company:	Logos Operating LLC	Local Co-ordinate Reference:	Well Rosa Unit 645H - Slot B8
Project:	Rio Arriba, NM NAD83	TVD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Reference Site:	Rosa Unit 27	MD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Site Error:	0.00 ft	North Reference:	True
Reference Well:	Rosa Unit 645H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 ft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction
Reference Design:	Plan #4	Offset TVD Reference:	Offset Datum

Offset Design: Rosa Unit 27 - Rosa Unit 640H - OH - OH													Offset Site Error:	0.00 ft
Survey Program: 25-NS-GYRO-MS, 389-SDI MWD, 6481-SDI MWD, 7631-SDI MWD													Offset Well Error:	0.00 ft
Reference		Offset		Semi Major Axis		Highside Toolface (°)	Offset Wellbore Centre		Distance		Minimum Separation (ft)	Separation Factor	Warning	
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)		+N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)				
15,500.03	6,966.77	6,277.01	6,178.80	263.40	21.57	-1.98	917.32	494.51	8,436.61	8,384.73	51.88	162.616		
15,600.03	6,966.83	6,277.01	6,178.80	266.41	21.57	-1.98	917.32	494.51	8,536.18	8,484.23	51.96	164.298		
15,700.03	6,966.89	6,277.01	6,178.80	269.42	21.57	-1.98	917.32	494.51	8,635.76	8,583.73	52.03	165.975		
15,800.03	6,966.95	6,277.01	6,178.80	272.43	21.57	-1.98	917.32	494.51	8,735.35	8,683.25	52.11	167.645		
15,900.03	6,967.01	6,277.01	6,178.80	275.44	21.57	-1.98	917.32	494.51	8,834.96	8,782.77	52.18	169.309		
16,000.03	6,967.07	6,277.01	6,178.80	278.45	21.57	-1.98	917.32	494.51	8,934.57	8,882.31	52.26	170.967		
16,100.03	6,967.12	6,240.95	6,142.96	281.46	21.52	-1.77	915.52	498.00	9,033.90	8,981.63	52.27	172.822		
16,200.03	6,967.18	6,238.68	6,140.70	284.47	21.51	-1.76	915.38	498.21	9,133.49	9,081.15	52.35	174.481		
16,300.03	6,967.24	6,236.44	6,138.47	287.49	21.51	-1.74	915.24	498.41	9,233.09	9,180.67	52.42	176.134		
16,400.03	6,967.30	6,234.24	6,136.29	290.50	21.51	-1.73	915.09	498.60	9,332.69	9,280.20	52.50	177.781		
16,500.03	6,967.36	6,232.08	6,134.14	293.51	21.50	-1.71	914.95	498.79	9,432.30	9,379.73	52.57	179.421		
16,600.03	6,967.42	6,229.95	6,132.02	296.52	21.50	-1.70	914.81	498.98	9,531.92	9,479.27	52.65	181.055		
16,700.03	6,967.48	6,227.86	6,129.94	299.54	21.50	-1.69	914.67	499.16	9,631.54	9,578.82	52.72	182.683		
16,800.03	6,967.54	6,225.80	6,127.89	302.55	21.49	-1.67	914.53	499.34	9,731.17	9,678.37	52.80	184.304		
16,900.03	6,967.60	6,223.77	6,125.88	305.57	21.49	-1.66	914.38	499.51	9,830.81	9,777.93	52.88	185.919		
17,000.03	6,967.65	6,221.77	6,123.89	308.58	21.49	-1.64	914.24	499.68	9,930.45	9,877.49	52.95	187.528		



Lonestar Consulting, LLC

Anticollision Report



Company:	Logos Operating LLC	Local Co-ordinate Reference:	Well Rosa Unit 645H - Slot B8
Project:	Rio Arriba, NM NAD83	TVD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Reference Site:	Rosa Unit 27	MD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Site Error:	0.00 ft	North Reference:	True
Reference Well:	Rosa Unit 645H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 ft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction
Reference Design:	Plan #4	Offset TVD Reference:	Offset Datum

Offset Design: Rosa Unit 27 - Rosa Unit 641H - OH - OH												Offset Site Error:	0.00 ft
Survey Program: 25-NS-GYRO-MS, 365-SDI MWD, 6367-SDI MWD, 7619-SDI MWD												Offset Well Error:	0.00 ft
Reference	Offset	Semi Major Axis	Offset	Highside	Offset Wellbore Centre	Distance	Rule Assigned:	Minimum	Separation	Warning			
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)	Toolface (°)	+N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Separation (ft)	Factor	
0.00	0.00	0.51	0.51	0.00	0.00	102.80	-23.27	102.39	105.00				
100.00	100.00	100.36	100.36	0.27	0.19	102.74	-23.17	102.46	105.05	104.59	0.46	226.235	
200.00	200.00	200.55	200.55	0.63	0.44	102.57	-22.88	102.63	105.15	104.08	1.07	98.001	
300.00	300.00	300.60	300.60	0.99	0.69	102.48	-22.70	102.59	105.07	103.39	1.68	62.593	
327.40	327.40	327.91	327.91	1.09	0.73	102.45	-22.65	102.59	105.06	103.24	1.82	57.799	
400.00	400.00	400.07	400.07	1.35	0.80	102.20	-22.22	102.80	105.18	103.03	2.14	49.096 ES	
500.00	500.00	498.19	498.16	1.70	0.87	91.13	-20.77	104.19	106.27	103.70	2.57	41.322	
600.00	599.93	595.81	595.65	2.06	0.99	90.87	-17.72	108.19	109.73	106.68	3.05	35.962	
700.00	699.68	694.96	694.50	2.43	1.15	91.22	-12.75	114.12	114.73	111.16	3.57	32.138	
800.00	799.13	794.71	793.91	2.79	1.35	92.95	-7.32	120.33	120.02	115.90	4.12	29.108	
900.00	898.20	894.38	893.22	3.16	1.55	95.94	-1.71	126.57	125.71	121.02	4.69	26.794	
1,000.00	997.18	994.05	992.53	3.54	1.77	98.95	3.97	132.78	131.76	126.48	5.28	24.955	
1,100.00	1,096.17	1,093.57	1,091.72	3.92	1.99	101.78	9.45	138.87	138.11	132.23	5.88	23.477	
1,200.00	1,195.16	1,192.74	1,190.55	4.31	2.21	104.39	14.71	145.07	144.97	138.47	6.49	22.323	
1,300.00	1,294.14	1,292.14	1,289.61	4.71	2.45	106.79	19.86	151.41	152.27	145.16	7.11	21.403	
1,400.00	1,393.13	1,391.93	1,389.04	5.10	2.69	108.85	25.31	157.96	159.85	152.10	7.74	20.639	
1,500.00	1,492.12	1,492.39	1,489.14	5.49	2.93	110.71	31.09	164.27	167.21	158.83	8.38	19.952	
1,600.00	1,591.10	1,592.16	1,588.55	5.89	3.18	112.40	37.04	170.15	174.30	165.28	9.01	19.335	
1,700.00	1,690.09	1,691.80	1,687.86	6.29	3.42	114.01	42.78	176.03	181.65	172.00	9.65	18.829	
1,800.00	1,789.08	1,792.23	1,788.02	6.69	3.65	115.78	47.98	181.24	188.89	178.62	10.27	18.384	
1,900.00	1,888.06	1,889.60	1,885.12	7.09	3.88	117.35	52.99	186.43	196.44	185.55	10.89	18.031	
2,000.00	1,987.05	1,988.63	1,983.83	7.49	4.12	118.74	57.74	192.62	205.06	193.54	11.52	17.799	
2,100.00	2,086.04	2,086.89	2,081.77	7.89	4.36	119.97	62.38	199.11	214.10	201.95	12.15	17.626	
2,200.00	2,185.02	2,186.47	2,180.99	8.29	4.62	120.99	67.22	206.18	223.51	210.72	12.79	17.477	
2,300.00	2,284.01	2,286.61	2,280.76	8.69	4.87	121.96	72.16	213.14	232.83	219.40	13.43	17.338	
2,400.00	2,383.00	2,387.16	2,380.96	9.09	5.12	122.89	77.24	219.72	241.83	227.76	14.07	17.191	
2,500.01	2,481.98	2,486.52	2,479.98	9.49	5.37	123.73	82.55	226.08	250.59	235.88	14.71	17.039	
2,600.01	2,580.97	2,585.22	2,578.14	9.90	5.64	124.07	88.89	234.10	259.84	244.48	15.36	16.915	
2,700.01	2,679.96	2,685.13	2,677.45	10.30	5.92	124.24	95.82	242.65	269.05	253.02	16.03	16.784	
2,800.01	2,778.95	2,785.65	2,777.37	10.70	6.20	124.42	102.85	251.09	278.12	261.42	16.70	16.655	
2,900.01	2,877.93	2,885.99	2,877.10	11.10	6.48	124.58	110.17	259.26	286.79	269.42	17.37	16.509	
3,000.01	2,976.92	2,986.81	2,977.32	11.51	6.76	124.75	117.68	267.25	295.20	277.15	18.05	16.358	
3,100.01	3,075.91	3,086.99	3,076.95	11.91	7.03	124.96	125.15	274.71	303.28	284.57	18.71	16.208	
3,200.01	3,174.89	3,184.53	3,174.02	12.31	7.29	125.28	131.78	281.68	311.62	292.27	19.35	16.101	
3,300.01	3,273.88	3,280.64	3,269.57	12.71	7.55	125.44	138.18	289.77	320.95	300.95	20.00	16.051	
3,400.01	3,372.87	3,380.51	3,368.77	13.12	7.83	125.47	145.03	298.99	330.70	310.03	20.67	15.999	
3,500.01	3,471.85	3,479.86	3,467.46	13.52	8.12	125.48	151.98	308.15	340.35	319.01	21.34	15.947	
3,600.01	3,570.84	3,578.73	3,565.72	13.93	8.39	125.59	158.28	317.04	350.28	328.28	22.00	15.919	
3,700.01	3,669.83	3,679.46	3,665.97	14.33	8.66	125.89	164.00	325.12	360.05	337.39	22.66	15.887	
3,800.01	3,768.81	3,780.80	3,766.90	14.73	8.92	126.31	169.42	332.31	369.44	346.12	23.32	15.845	
3,900.01	3,867.80	3,881.38	3,867.24	15.14	9.16	126.99	173.89	337.77	378.39	354.44	23.94	15.803	
4,000.01	3,966.79	3,981.68	3,967.34	15.54	9.40	127.76	177.94	342.50	387.21	362.65	24.56	15.765	
4,100.01	4,065.77	4,082.43	4,067.87	15.94	9.63	128.46	182.38	347.24	395.83	370.65	25.18	15.719	
4,200.01	4,164.76	4,180.25	4,165.52	16.35	9.86	129.17	186.42	351.59	404.54	378.76	25.78	15.692	
4,300.01	4,263.75	4,278.15	4,263.18	16.75	10.09	129.72	190.72	356.92	413.73	387.35	26.39	15.679	
4,400.01	4,362.73	4,378.19	4,362.95	17.16	10.33	130.21	195.21	362.71	423.12	396.10	27.01	15.663	
4,500.01	4,461.72	4,479.50	4,463.91	17.56	10.59	130.55	200.69	369.10	432.14	404.48	27.66	15.626	
4,600.01	4,560.71	4,579.21	4,563.32	17.96	10.84	130.96	205.76	374.86	441.10	412.81	28.29	15.594	
4,700.01	4,659.69	4,681.08	4,664.81	18.37	11.10	131.24	211.76	381.26	449.75	420.82	28.93	15.544	
4,800.01	4,758.68	4,779.20	4,762.60	18.77	11.34	131.56	217.50	386.87	458.11	428.55	29.56	15.497	



Lonestar Consulting, LLC

Anticollision Report



Company:	Logos Operating LLC	Local Co-ordinate Reference:	Well Rosa Unit 645H - Slot B8
Project:	Rio Arriba, NM NAD83	TVD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Reference Site:	Rosa Unit 27	MD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Site Error:	0.00 ft	North Reference:	True
Reference Well:	Rosa Unit 645H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 ft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction
Reference Design:	Plan #4	Offset TVD Reference:	Offset Datum

Offset Design: Rosa Unit 27 - Rosa Unit 641H - OH - OH													Offset Site Error:	0.00 ft
Survey Program: 25-NS-GYRO-MS, 365-SDI MWD, 6367-SDI MWD, 7619-SDI MWD													Offset Well Error:	0.00 ft
Reference	Offset	Semi Major Axis	Reference	Offset	Highside	Offset Wellbore Centre		Distance		Minimum	Separation	Warning		
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)	Tooface (")	+N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Separation (ft)	Factor		
4,900.01	4,857.67	4,875.81	4,858.84	19.18	11.59	131.78	222.95	393.36	467.24	437.06	30.18	15.481		
5,000.01	4,956.65	4,974.68	4,957.35	19.58	11.84	132.03	228.12	400.02	476.73	445.91	30.82	15.470		
5,100.01	5,055.64	5,075.32	5,057.58	19.98	12.10	132.21	233.74	407.19	486.17	454.71	31.46	15.452		
5,200.01	5,154.63	5,177.00	5,158.86	20.39	12.37	132.42	239.50	413.95	495.27	463.15	32.12	15.421		
5,300.01	5,253.61	5,277.20	5,258.52	20.79	12.64	132.43	246.43	421.79	504.09	471.30	32.78	15.377		
5,400.01	5,352.60	5,377.69	5,358.49	21.20	12.91	132.47	253.32	429.32	512.75	479.30	33.44	15.331		
5,500.01	5,451.59	5,476.40	5,456.75	21.60	13.18	132.58	259.73	436.19	521.37	487.29	34.09	15.295		
5,600.01	5,550.57	5,573.16	5,553.21	22.01	13.42	132.85	264.76	441.98	530.46	495.76	34.71	15.285		
5,700.01	5,649.56	5,672.02	5,651.72	22.41	13.67	133.07	269.92	448.39	539.85	504.51	35.33	15.278		
5,800.01	5,748.55	5,770.27	5,749.59	22.81	13.92	133.24	275.20	455.21	549.37	513.41	35.96	15.275		
5,900.01	5,847.53	5,871.26	5,850.23	23.22	14.17	133.46	280.15	461.89	559.10	522.50	36.60	15.274		
6,000.01	5,946.52	5,971.88	5,950.57	23.62	14.42	133.75	285.07	467.60	568.29	531.06	37.23	15.263		
6,100.01	6,045.51	6,073.05	6,051.51	24.03	14.66	134.10	289.64	472.79	577.50	539.64	37.86	15.254		
6,200.01	6,144.49	6,167.16	6,145.44	24.43	14.88	134.49	293.40	477.04	586.80	548.37	38.43	15.268		
6,300.01	6,243.48	6,264.09	6,242.33	24.84	15.07	135.18	294.76	479.34	597.05	558.07	38.98	15.317		
6,400.00	6,342.45	6,362.31	6,360.51	25.24	15.16	136.49	294.82	476.93	606.14	566.68	39.45	15.363		
6,500.01	6,440.93	6,491.17	6,469.11	25.65	15.13	97.82	295.44	469.55	608.78	569.04	39.75	15.316		
6,600.01	6,536.70	6,589.03	6,566.66	26.06	15.10	85.72	295.95	461.89	604.20	564.20	40.00	15.105		
6,700.01	6,627.42	6,711.59	6,687.41	26.46	15.02	86.44	297.45	441.48	591.40	551.33	40.07	14.760		
6,800.01	6,710.86	6,798.34	6,770.67	26.86	14.93	90.56	298.60	417.31	577.21	537.16	40.05	14.412		
6,900.01	6,784.97	6,852.67	6,821.48	27.29	14.86	93.94	299.60	398.10	569.65	529.60	40.05	14.225		
6,914.96	6,795.13	6,858.68	6,827.04	27.36	14.86	94.28	299.72	395.84	569.51	529.45	40.05	14.219 SF		
7,000.01	6,847.91	6,880.80	6,847.43	27.78	14.83	94.86	300.19	387.25	574.73	534.74	39.98	14.374		
7,100.01	6,898.13	6,891.01	6,856.78	28.43	14.82	93.19	300.38	383.14	594.71	554.88	39.84	14.929		
7,200.01	6,934.41	6,887.38	6,853.46	29.33	14.82	89.08	300.31	384.62	628.56	588.88	39.68	15.841		
7,300.01	6,955.84	6,873.06	6,840.31	30.51	14.84	83.02	300.03	390.30	673.22	633.61	39.61	16.996		
7,400.01	6,962.01	6,848.67	6,817.77	31.95	14.87	76.25	299.51	399.59	724.93	685.28	39.65	18.283		
7,500.02	6,962.07	6,821.33	6,792.29	33.61	14.90	73.96	298.99	409.47	783.22	743.45	39.76	19.696		
7,600.02	6,962.12	6,800.01	6,772.25	35.45	14.93	72.19	298.63	416.75	848.29	808.32	39.97	21.224		
7,700.02	6,962.18	6,779.85	6,753.16	37.46	14.95	70.54	298.33	423.21	918.90	878.72	40.18	22.870		
7,800.02	6,962.24	6,769.01	6,742.83	39.61	14.96	69.66	298.20	426.49	994.06	953.58	40.48	24.559		
7,900.02	6,962.30	6,750.67	6,725.24	41.87	14.98	68.18	297.97	431.71	1,072.84	1,032.17	40.66	26.383		
8,000.02	6,962.36	6,739.01	6,714.01	44.22	15.00	67.26	297.83	434.82	1,154.63	1,113.74	40.89	28.234		
8,100.02	6,962.42	6,727.78	6,703.14	46.65	15.01	66.37	297.68	437.66	1,238.86	1,197.75	41.11	30.135		
8,200.02	6,962.48	6,709.01	6,684.91	49.15	15.02	64.92	297.41	442.06	1,325.17	1,283.93	41.24	32.132		
8,300.02	6,962.54	6,709.01	6,684.91	51.70	15.02	64.92	297.41	442.06	1,412.98	1,371.49	41.49	34.053		
8,400.02	6,962.60	6,698.62	6,674.77	54.31	15.03	64.13	297.26	444.35	1,502.25	1,460.60	41.65	36.072		
8,500.02	6,962.65	6,689.19	6,665.55	56.95	15.04	63.42	297.11	446.34	1,592.65	1,550.87	41.79	38.114		
8,600.02	6,962.71	6,678.01	6,654.61	59.64	15.05	62.58	296.93	448.61	1,684.04	1,642.13	41.90	40.188		
8,700.02	6,962.77	6,678.01	6,654.61	62.35	15.05	62.58	296.93	448.61	1,776.27	1,734.20	42.07	42.224		
8,800.02	6,962.83	6,666.41	6,643.22	65.09	15.06	61.73	296.74	450.84	1,869.19	1,827.03	42.16	44.335		
8,900.02	6,962.89	6,660.30	6,637.21	67.86	15.06	61.29	296.65	451.95	1,962.77	1,920.50	42.27	46.435		
9,000.02	6,962.95	6,647.01	6,624.13	70.65	15.07	60.33	296.46	454.23	2,056.95	2,014.61	42.34	48.581		
9,100.02	6,963.01	6,647.01	6,624.13	73.45	15.07	60.33	296.46	454.23	2,151.53	2,109.07	42.46	50.674		
9,200.02	6,963.07	6,647.01	6,624.13	76.28	15.07	60.33	296.46	454.23	2,246.58	2,204.01	42.57	52.778		
9,300.02	6,963.12	6,647.01	6,624.13	79.12	15.07	60.33	296.46	454.23	2,342.04	2,299.37	42.67	54.893		
9,400.02	6,963.18	6,634.79	6,612.06	81.97	15.08	59.47	296.30	456.16	2,437.76	2,395.04	42.72	57.062		
9,500.02	6,963.24	6,630.50	6,607.82	84.83	15.08	59.17	296.26	456.80	2,533.82	2,491.02	42.80	59.204		
9,600.02	6,963.30	6,617.01	6,594.46	87.71	15.09	58.23	296.13	458.69	2,630.21	2,587.37	42.84	61.389		
9,700.02	6,963.36	6,617.01	6,594.46	90.59	15.09	58.23	296.13	458.69	2,726.75	2,683.82	42.93	63.521		



Lonestar Consulting, LLC

Anticollision Report



Company:	Logos Operating LLC	Local Co-ordinate Reference:	Well Rosa Unit 645H - Slot B8
Project:	Rio Arriba, NM NAD83	TVD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Reference Site:	Rosa Unit 27	MD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Site Error:	0.00 ft	North Reference:	True
Reference Well:	Rosa Unit 645H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 ft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction
Reference Design:	Plan #4	Offset TVD Reference:	Offset Datum

Offset Design: Rosa Unit 27 - Rosa Unit 641H - OH - OH													Offset Site Error:	0.00 ft
Survey Program: 25-NS-GYRO-MS, 365-SDI MWD, 6367-SDI MWD, 7619-SDI MWD													Offset Well Error:	0.00 ft
Reference	Offset	Semi Major Axis		Offset Wellbore Centre		Rule Assigned:		Distance		Minimum	Separation	Warning		
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)	Highside Toolface (°)	+N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Separation (ft)	Factor		
9,800.02	6,963.42	6,617.01	6,594.46	93.49	15.09	58.23	296.13	458.69	2,823.53	2,780.52	43.00	65.656		
9,900.02	6,963.48	6,617.01	6,594.46	96.39	15.09	58.23	296.13	458.69	2,920.52	2,877.44	43.08	67.795		
10,000.02	6,963.54	6,617.01	6,594.46	99.30	15.09	58.23	296.13	458.69	3,017.71	2,974.56	43.15	69.936		
10,100.02	6,963.60	6,617.01	6,594.46	102.22	15.09	58.23	296.13	458.69	3,115.08	3,071.86	43.22	72.079		
10,200.02	6,963.65	6,617.01	6,594.46	105.14	15.09	58.23	296.13	458.69	3,212.61	3,169.33	43.28	74.223		
10,300.02	6,963.71	6,617.01	6,594.46	108.07	15.09	58.23	296.13	458.69	3,310.29	3,266.94	43.35	76.368		
10,400.02	6,963.77	6,603.69	6,581.25	111.00	15.09	57.32	296.03	460.34	3,407.96	3,364.58	43.39	78.550		
10,500.02	6,963.83	6,601.61	6,579.18	113.94	15.09	57.18	296.01	460.58	3,505.85	3,462.41	43.44	80.698		
10,600.02	6,963.89	6,599.62	6,577.20	116.88	15.10	57.05	296.00	460.80	3,603.85	3,560.35	43.50	82.845		
10,700.02	6,963.95	6,586.01	6,563.66	119.83	15.10	56.14	295.93	462.18	3,702.06	3,658.52	43.54	85.027		
10,800.02	6,964.01	6,586.01	6,563.66	122.78	15.10	56.14	295.93	462.18	3,800.22	3,756.62	43.60	87.163		
10,900.02	6,964.07	6,586.01	6,563.66	125.73	15.10	56.14	295.93	462.18	3,898.48	3,854.82	43.66	89.297		
11,000.02	6,964.12	6,586.01	6,563.66	128.69	15.10	56.14	295.93	462.18	3,996.82	3,953.11	43.72	91.429		
11,100.02	6,964.18	6,586.01	6,563.66	131.65	15.10	56.14	295.93	462.18	4,095.25	4,051.47	43.77	93.558		
11,200.02	6,964.24	6,586.01	6,563.66	134.62	15.10	56.14	295.93	462.18	4,193.74	4,149.92	43.83	95.685		
11,300.02	6,964.30	6,586.01	6,563.66	137.58	15.10	56.14	295.93	462.18	4,292.31	4,248.43	43.88	97.809		
11,400.02	6,964.36	6,586.01	6,563.66	140.55	15.10	56.14	295.93	462.18	4,390.94	4,347.00	43.94	99.930		
11,500.02	6,964.42	6,586.01	6,563.66	143.52	15.10	56.14	295.93	462.18	4,489.64	4,445.64	44.00	102.047		
11,600.02	6,964.48	6,586.01	6,563.66	146.50	15.10	56.14	295.93	462.18	4,588.39	4,544.34	44.05	104.161		
11,700.02	6,964.54	6,586.01	6,563.66	149.47	15.10	56.14	295.93	462.18	4,687.19	4,643.08	44.11	106.270		
11,800.02	6,964.60	6,586.01	6,563.66	152.45	15.10	56.14	295.93	462.18	4,786.04	4,741.88	44.16	108.376		
11,900.02	6,964.65	6,586.01	6,563.66	155.43	15.10	56.14	295.93	462.18	4,884.94	4,840.72	44.22	110.478		
12,000.02	6,964.71	6,586.01	6,563.66	158.41	15.10	56.14	295.93	462.18	4,983.88	4,939.61	44.27	112.575		
12,100.02	6,964.77	6,573.15	6,550.85	161.39	15.11	55.30	295.88	463.30	5,082.79	5,038.48	44.32	114.692		
12,200.02	6,964.83	6,571.43	6,549.13	164.38	15.11	55.19	295.88	463.44	5,181.79	5,137.42	44.37	116.783		
12,300.02	6,964.89	6,569.76	6,547.47	167.36	15.11	55.08	295.87	463.57	5,280.83	5,236.40	44.43	118.868		
12,400.03	6,964.95	6,568.14	6,545.85	170.35	15.11	54.98	295.86	463.70	5,379.90	5,335.42	44.48	120.948		
12,500.03	6,965.01	6,556.01	6,533.76	173.34	15.11	54.21	295.82	464.61	5,479.05	5,434.52	44.53	123.043		
12,600.03	6,965.07	6,556.01	6,533.76	176.33	15.11	54.21	295.82	464.61	5,578.17	5,533.58	44.59	125.108		
12,700.03	6,965.12	6,556.01	6,533.76	179.32	15.11	54.21	295.82	464.61	5,677.32	5,632.68	44.64	127.169		
12,800.03	6,965.18	6,556.01	6,533.76	182.31	15.11	54.21	295.82	464.61	5,776.50	5,731.80	44.70	129.223		
12,900.03	6,965.24	6,556.01	6,533.76	185.31	15.11	54.21	295.82	464.61	5,875.70	5,830.95	44.76	131.273		
13,000.03	6,965.30	6,551.39	6,529.15	188.30	15.11	53.92	295.80	464.95	5,974.94	5,930.12	44.82	133.323		
13,100.03	6,965.36	6,544.06	6,521.84	191.30	15.12	53.46	295.76	465.49	6,074.18	6,029.31	44.87	135.371		
13,200.03	6,965.42	6,515.30	6,493.16	194.29	15.12	51.72	295.60	467.68	6,173.42	6,128.51	44.92	137.439		
13,300.03	6,965.48	6,508.36	6,486.25	197.29	15.13	51.32	295.55	468.22	6,272.68	6,227.70	44.98	139.470		
13,400.03	6,965.54	6,501.45	6,479.35	200.29	15.13	50.92	295.51	468.75	6,371.94	6,326.91	45.03	141.494		
13,500.03	6,965.60	6,494.55	6,472.48	203.29	15.13	50.52	295.46	469.28	6,471.23	6,426.13	45.09	143.510		
13,600.03	6,965.65	6,487.68	6,465.63	206.29	15.13	50.13	295.42	469.81	6,570.52	6,525.37	45.15	145.520		
13,700.03	6,965.71	6,480.83	6,458.80	209.29	15.14	49.75	295.37	470.34	6,669.83	6,624.62	45.21	147.522		
13,800.03	6,965.77	6,474.00	6,451.99	212.29	15.14	49.37	295.33	470.87	6,769.15	6,723.88	45.27	149.518		
13,900.03	6,965.83	6,467.19	6,445.20	215.29	15.14	49.00	295.28	471.39	6,868.48	6,823.15	45.33	151.505		
14,000.03	6,965.89	6,460.40	6,438.43	218.29	15.14	48.63	295.24	471.91	6,967.83	6,922.43	45.40	153.486		
14,100.03	6,965.95	6,453.63	6,431.68	221.30	15.14	48.27	295.19	472.43	7,067.19	7,021.73	45.46	155.459		
14,200.03	6,966.01	6,449.01	6,427.08	224.30	15.15	48.03	295.16	472.78	7,166.55	7,121.03	45.52	157.423		
14,300.03	6,966.07	6,449.01	6,427.08	227.30	15.15	48.03	295.16	472.78	7,265.94	7,220.35	45.59	159.379		
14,400.03	6,966.12	6,449.01	6,427.08	230.31	15.15	48.03	295.16	472.78	7,365.34	7,319.68	45.65	161.328		
14,500.03	6,966.18	6,449.01	6,427.08	233.32	15.15	48.03	295.16	472.78	7,464.75	7,419.03	45.72	163.270		
14,600.03	6,966.24	6,449.01	6,427.08	236.32	15.15	48.03	295.16	472.78	7,564.18	7,518.40	45.79	165.205		
14,700.03	6,966.30	6,449.01	6,427.08	239.33	15.15	48.03	295.16	472.78	7,663.63	7,617.78	45.85	167.134		



Lonestar Consulting, LLC

Anticollision Report



Company:	Logos Operating LLC	Local Co-ordinate Reference:	Well Rosa Unit 645H - Slot B8
Project:	Rio Arriba, NM NAD83	TVD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Reference Site:	Rosa Unit 27	MD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Site Error:	0.00 ft	North Reference:	True
Reference Well:	Rosa Unit 645H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 ft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction
Reference Design:	Plan #4	Offset TVD Reference:	Offset Datum

Offset Design: Rosa Unit 27 - Rosa Unit 641H - OH - OH													Offset Site Error:	0.00 ft
Survey Program: 25-NS-GYRO-MS, 365-SDI MWD, 6367-SDI MWD, 7619-SDI MWD													Offset Well Error:	0.00 ft
Reference													Rule Assigned:	
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference	Semi Major Axis Offset (ft)	Highside Toolface (°)	Offset Wellbore Centre		Distance Between Centres (ft)		Between Ellipses (ft)	Minimum Separation (ft)	Separation Factor	Warning
14,800.03	6,966.36	6,449.01	6,427.08	242.33	15.15	48.03	295.16	472.78	7,763.09	7,717.17	45.92	169.055		
14,900.03	6,966.42	6,449.01	6,427.08	245.34	15.15	48.03	295.16	472.78	7,862.57	7,816.58	45.99	170.970		
15,000.03	6,966.48	6,449.01	6,427.08	248.35	15.15	48.03	295.16	472.78	7,962.05	7,916.00	46.06	172.878		
15,100.03	6,966.54	6,449.01	6,427.08	251.36	15.15	48.03	295.16	472.78	8,061.55	8,015.43	46.12	174.778		
15,200.03	6,966.60	6,449.01	6,427.08	254.37	15.15	48.03	295.16	472.78	8,161.06	8,114.87	46.19	176.672		
15,300.03	6,966.65	6,449.01	6,427.08	257.38	15.15	48.03	295.16	472.78	8,260.59	8,214.33	46.26	178.558		
15,400.03	6,966.71	6,449.01	6,427.08	260.39	15.15	48.03	295.16	472.78	8,360.12	8,313.79	46.33	180.438		
15,500.03	6,966.77	6,449.01	6,427.08	263.40	15.15	48.03	295.16	472.78	8,459.67	8,413.27	46.40	182.310		
15,600.03	6,966.83	6,449.01	6,427.08	266.41	15.15	48.03	295.16	472.78	8,559.23	8,512.75	46.47	184.174		
15,700.03	6,966.89	6,449.01	6,427.08	269.42	15.15	48.03	295.16	472.78	8,658.79	8,612.25	46.54	186.032		
15,800.03	6,966.95	6,449.01	6,427.08	272.43	15.15	48.03	295.16	472.78	8,758.37	8,711.75	46.62	187.882		
15,900.03	6,967.01	6,449.01	6,427.08	275.44	15.15	48.03	295.16	472.78	8,857.96	8,811.27	46.69	189.724		
16,000.03	6,967.07	6,449.01	6,427.08	278.45	15.15	48.03	295.16	472.78	8,957.55	8,910.79	46.76	191.560		
16,100.03	6,967.12	6,449.01	6,427.08	281.46	15.15	48.03	295.16	472.78	9,057.16	9,010.32	46.83	193.388		
16,200.03	6,967.18	6,449.01	6,427.08	284.47	15.15	48.03	295.16	472.78	9,156.77	9,109.86	46.91	195.208		
16,300.03	6,967.24	6,416.13	6,394.28	287.49	15.15	46.34	294.97	475.07	9,256.11	9,209.12	46.99	196.995		
16,400.03	6,967.30	6,414.88	6,393.03	290.50	15.15	46.27	294.96	475.14	9,355.71	9,308.65	47.06	198.798		
16,500.03	6,967.36	6,413.66	6,391.81	293.51	15.15	46.21	294.95	475.22	9,455.33	9,408.19	47.14	200.593		
16,600.03	6,967.42	6,412.45	6,390.61	296.52	15.15	46.15	294.95	475.29	9,554.95	9,507.74	47.21	202.381		
16,700.03	6,967.48	6,411.27	6,389.42	299.54	15.16	46.09	294.94	475.36	9,654.58	9,607.29	47.29	204.161		
16,800.03	6,967.54	6,410.10	6,388.26	302.55	15.16	46.04	294.94	475.43	9,754.22	9,706.85	47.37	205.933		
16,900.03	6,967.60	6,408.96	6,387.12	305.57	15.16	45.98	294.93	475.50	9,853.86	9,806.42	47.44	207.698		
17,000.03	6,967.65	6,407.83	6,385.99	308.58	15.16	45.92	294.93	475.57	9,953.51	9,905.99	47.52	209.455		



Lonestar Consulting, LLC

Anticollision Report



Company:	Logos Operating LLC	Local Co-ordinate Reference:	Well Rosa Unit 645H - Slot B8
Project:	Rio Arriba, NM NAD83	TVD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Reference Site:	Rosa Unit 27	MD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Site Error:	0.00 ft	North Reference:	True
Reference Well:	Rosa Unit 645H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 ft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction
Reference Design:	Plan #4	Offset TVD Reference:	Offset Datum

Offset Design: Rosa Unit 27 - Rosa Unit 642H - OH - OH													Offset Site Error:	0.00 ft
Survey Program: 125-NS-GYRO-MS, 389-SDI MWD, 6382-SDI MWD, 7376-SDI MWD													Offset Well Error:	0.00 ft
Reference	Offset	Semi Major Axis	Reference	Offset	Highside	Rule Assigned:								Warning
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)	Toolface (°)	+N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Minimum Separation (ft)	Separation Factor		
0.00	0.00	0.00	0.00	0.00	0.00	107.70	-32.04	100.39	105.38					
100.00	100.00	99.65	99.65	0.27	0.11	107.83	-32.39	100.70	105.79	105.41	0.38	280.478		
200.00	200.00	199.20	199.19	0.63	0.33	108.17	-33.33	101.53	106.87	105.91	0.96	111.372		
300.00	300.00	299.53	299.51	0.99	0.60	108.62	-34.49	102.37	108.03	106.45	1.58	68.254		
400.00	400.00	399.37	399.34	1.35	0.73	109.05	-35.56	102.96	108.93	106.86	2.08	52.446		
500.00	500.00	497.17	497.11	1.70	0.80	99.63	-37.55	104.36	111.04	108.54	2.50	44.391		
600.00	599.93	593.91	593.73	2.06	0.91	102.34	-41.17	107.42	116.02	113.05	2.98	38.989		
700.00	699.68	691.12	690.69	2.43	1.07	106.32	-45.93	112.67	124.73	121.24	3.49	35.764		
800.00	799.13	789.42	788.65	2.79	1.27	111.23	-51.38	118.55	136.09	132.07	4.02	33.872		
900.00	898.20	887.93	886.83	3.16	1.47	116.48	-56.77	124.47	149.74	145.18	4.56	32.862		
1,000.00	997.18	984.94	983.52	3.54	1.69	120.90	-61.76	130.66	164.84	159.73	5.11	32.278		
1,100.00	1,096.17	1,084.22	1,082.45	3.92	1.92	124.58	-66.81	137.26	180.90	175.23	5.67	31.911		
1,200.00	1,195.16	1,182.94	1,180.87	4.31	2.13	127.60	-71.33	143.53	197.00	190.77	6.23	31.620		
1,300.00	1,294.14	1,281.15	1,278.79	4.71	2.36	130.17	-75.79	149.65	213.45	206.65	6.80	31.381		
1,400.00	1,393.13	1,379.55	1,376.90	5.10	2.59	132.38	-80.21	155.74	230.20	222.82	7.38	31.197		
1,500.00	1,492.12	1,478.00	1,475.06	5.49	2.82	134.29	-84.64	161.80	247.22	239.26	7.96	31.055		
1,600.00	1,591.10	1,577.57	1,574.36	5.89	3.06	135.94	-88.77	167.87	264.15	255.61	8.55	30.899		
1,700.00	1,690.09	1,675.52	1,672.05	6.29	3.29	137.24	-92.15	174.18	280.87	271.73	9.14	30.744		
1,800.00	1,789.08	1,772.18	1,768.39	6.69	3.53	138.28	-95.79	181.14	298.36	288.64	9.72	30.683		
1,900.00	1,888.06	1,869.52	1,865.39	7.09	3.78	139.21	-99.69	188.35	316.24	305.92	10.32	30.649		
2,000.00	1,987.05	1,967.56	1,963.05	7.49	4.03	140.02	-103.79	195.82	334.45	323.53	10.92	30.635		
2,100.00	2,086.04	2,067.77	2,062.89	7.89	4.28	140.76	-107.72	203.41	352.48	340.96	11.52	30.592		
2,200.00	2,185.02	2,166.17	2,160.98	8.29	4.52	141.47	-111.42	210.32	370.14	358.03	12.12	30.544		
2,300.00	2,284.01	2,264.54	2,259.05	8.69	4.76	142.15	-115.24	217.08	387.92	375.20	12.72	30.508		
2,400.00	2,383.00	2,362.23	2,356.45	9.09	5.00	142.81	-119.25	223.51	405.80	392.49	13.31	30.492		
2,500.01	2,481.98	2,460.84	2,454.75	9.49	5.24	143.41	-123.29	230.08	423.75	409.85	13.91	30.468		
2,600.01	2,580.97	2,558.28	2,551.88	9.90	5.49	143.94	-127.23	236.69	441.76	427.26	14.50	30.460		
2,700.01	2,679.96	2,657.00	2,646.29	10.30	5.73	144.48	-131.77	242.90	460.37	445.29	15.08	30.521		
2,800.01	2,778.95	2,750.39	2,743.33	10.70	5.97	145.00	-136.90	249.39	479.50	463.83	15.68	30.585		
2,900.01	2,877.93	2,852.86	2,845.45	11.10	6.23	145.52	-142.05	256.03	498.38	482.08	16.29	30.588		
3,000.01	2,976.92	2,957.72	2,950.05	11.51	6.47	146.01	-146.08	262.20	515.97	499.06	16.92	30.504		
3,100.01	3,075.91	3,055.52	3,047.65	11.91	6.70	146.45	-149.26	267.65	532.94	515.44	17.50	30.445		
3,200.01	3,174.89	3,147.91	3,139.82	12.31	6.92	146.85	-152.90	273.02	550.67	532.60	18.07	30.470		
3,300.01	3,273.88	3,241.95	3,233.54	12.71	7.16	147.18	-157.37	279.27	569.46	550.81	18.65	30.533		
3,400.01	3,372.87	3,336.71	3,327.94	13.12	7.41	147.48	-162.33	285.82	588.82	569.59	19.24	30.612		
3,500.01	3,471.85	3,433.55	3,424.38	13.52	7.66	147.76	-167.73	292.86	608.63	588.80	19.83	30.692		
3,600.01	3,570.84	3,531.56	3,521.97	13.93	7.91	148.04	-173.31	299.82	628.50	608.07	20.43	30.768		
3,700.01	3,669.83	3,630.83	3,620.85	14.33	8.16	148.32	-178.92	306.69	648.28	627.25	21.03	30.829		
3,800.01	3,768.81	3,734.25	3,723.91	14.73	8.42	148.61	-184.32	313.42	667.54	645.89	21.65	30.832		
3,900.01	3,867.80	3,832.15	3,821.49	15.14	8.66	148.86	-189.04	319.77	686.44	664.19	22.25	30.855		
4,000.01	3,966.79	3,932.45	3,921.41	15.54	8.92	149.04	-193.74	327.01	705.47	682.61	22.86	30.858		
4,100.01	4,065.77	4,034.13	4,022.82	15.94	9.17	149.27	-197.63	333.39	723.38	699.90	23.48	30.809		
4,200.01	4,164.76	4,121.00	4,109.37	16.35	9.39	149.43	-201.83	339.48	742.48	718.46	24.02	30.910		
4,300.01	4,263.75	4,219.69	4,207.61	16.75	9.66	149.54	-207.10	347.38	762.40	737.77	24.63	30.952		
4,400.01	4,362.73	4,320.52	4,308.04	17.16	9.92	149.67	-211.88	354.98	781.60	756.35	25.25	30.952		
4,500.01	4,461.72	4,422.95	4,410.05	17.56	10.18	149.79	-216.79	362.72	800.88	775.00	25.88	30.947		
4,600.01	4,560.71	4,524.33	4,511.10	17.96	10.44	149.93	-220.91	369.85	819.31	792.81	26.50	30.920		
4,700.01	4,659.69	4,624.57	4,611.02	18.37	10.68	150.06	-224.87	376.83	837.60	810.49	27.11	30.897		
4,800.01	4,758.68	4,712.41	4,698.55	18.77	10.91	150.17	-228.65	383.03	856.28	828.62	27.66	30.961		
4,900.01	4,857.67	4,809.84	4,795.60	19.18	11.15	150.31	-233.73	389.90	875.80	847.54	28.25	30.997		



Lonestar Consulting, LLC

Anticollision Report



Company:	Logos Operating LLC	Local Co-ordinate Reference:	Well Rosa Unit 645H - Slot B8
Project:	Rio Arriba, NM NAD83	TVD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Reference Site:	Rosa Unit 27	MD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Site Error:	0.00 ft	North Reference:	True
Reference Well:	Rosa Unit 645H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 ft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction
Reference Design:	Plan #4	Offset TVD Reference:	Offset Datum

Offset Design: Rosa Unit 27 - Rosa Unit 642H - OH - OH												Offset Site Error:	0.00 ft
Survey Program: 125-NS-GYRO-MS, 389-SDI MWD, 6382-SDI MWD, 7376-SDI MWD												Offset Well Error:	0.00 ft
Reference	Offset	Semi Major Axis	Reference	Offset	Highside	Offset Wellbore Centre		Distance		Minimum	Separation	Warning	
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)	Tooface (")	+N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Separation (ft)	Factor	
5,000.01	4,956.65	4,907.28	4,892.68	19.58	11.40	150.44	-238.79	396.69	895.27	866.41	28.85	31.029	
5,100.01	5,055.64	5,008.33	4,993.35	19.98	11.66	150.57	-243.92	403.79	914.64	885.17	29.47	31.037	
5,200.01	5,154.63	5,110.84	5,095.54	20.39	11.91	150.74	-248.84	410.09	933.50	903.41	30.09	31.024	
5,300.01	5,253.61	5,200.58	5,184.97	20.79	12.14	150.86	-253.20	416.11	952.60	921.95	30.64	31.085	
5,400.01	5,352.60	5,283.82	5,267.80	21.20	12.37	150.92	-258.10	422.80	973.05	941.88	31.17	31.221	
5,500.01	5,451.59	5,384.40	5,367.83	21.60	12.64	150.97	-264.42	431.27	994.01	962.22	31.79	31.266	
5,600.01	5,550.57	5,486.04	5,468.91	22.01	12.92	151.02	-270.56	439.85	1,014.75	982.33	32.42	31.298	
5,700.01	5,649.56	5,596.35	5,578.70	22.41	13.21	151.06	-276.31	448.95	1,034.66	1,001.56	33.10	31.258	
5,800.01	5,748.55	5,695.03	5,676.99	22.81	13.47	151.11	-280.71	456.50	1,053.68	1,019.97	33.71	31.257	
5,900.01	5,847.53	5,796.96	5,778.53	23.22	13.73	151.19	-285.63	463.99	1,072.95	1,038.62	34.34	31.249	
6,000.01	5,946.52	5,894.27	5,875.50	23.62	13.97	151.28	-289.98	470.72	1,091.76	1,056.83	34.93	31.253	
6,100.01	6,045.51	6,009.90	5,990.85	24.03	14.25	151.47	-295.24	476.77	1,110.17	1,074.56	35.61	31.174	
6,200.01	6,144.49	6,148.59	6,129.46	24.43	14.52	151.95	-299.45	478.33	1,125.94	1,089.59	36.35	30.978	
6,300.01	6,243.48	6,271.90	6,252.76	24.84	14.73	152.43	-299.93	477.20	1,138.58	1,101.60	36.99	30.785	
6,400.00	6,342.45	6,370.61	6,351.43	25.24	14.87	152.88	-299.83	474.58	1,150.36	1,112.84	37.52	30.661	
6,500.01	6,440.93	6,501.01	6,481.36	25.65	14.83	112.89	-300.67	464.85	1,159.86	1,121.95	37.91	30.597	
6,600.01	6,536.70	6,631.67	6,608.25	26.06	14.69	100.12	-300.98	434.22	1,161.28	1,123.06	38.22	30.381	
6,604.46	6,540.86	6,634.86	6,611.29	26.08	14.69	99.80	-301.00	433.26	1,161.29	1,123.05	38.24	30.367	
6,700.01	6,627.42	6,793.11	6,757.47	26.46	14.46	99.35	-301.39	373.35	1,161.71	1,123.27	38.45	30.217	
6,800.01	6,710.86	6,848.11	6,804.80	26.86	14.38	98.36	-299.45	345.45	1,160.14	1,121.23	38.91	29.815	
6,804.46	6,714.38	6,850.14	6,806.50	26.88	14.37	98.33	-299.38	344.34	1,160.20	1,121.26	38.93	29.799	
6,900.01	6,784.97	6,885.33	6,835.21	27.29	14.32	97.65	-298.05	324.04	1,164.45	1,125.05	39.40	29.553	
7,000.01	6,847.91	6,889.97	6,838.88	27.78	14.31	95.51	-297.85	321.21	1,175.97	1,136.06	39.91	29.464 SF	
7,100.01	6,898.13	6,877.37	6,828.84	28.43	14.33	92.35	-298.38	328.81	1,194.54	1,154.09	40.46	29.526	
7,200.01	6,934.41	6,860.01	6,814.69	29.33	14.36	88.75	-299.04	338.84	1,219.05	1,177.95	41.10	29.662	
7,300.01	6,955.84	6,829.01	6,788.65	30.51	14.41	84.39	-300.09	355.62	1,248.05	1,206.20	41.85	29.823	
7,400.01	6,962.01	6,809.04	6,771.43	31.95	14.44	80.90	-300.78	365.71	1,280.04	1,237.28	42.76	29.935	
7,500.02	6,962.07	6,778.27	6,744.32	33.61	14.49	79.64	-301.91	380.21	1,316.39	1,272.69	43.71	30.119	
7,600.02	6,962.12	6,732.96	6,703.35	35.45	14.56	77.75	-302.72	399.54	1,357.89	1,313.29	44.60	30.448	
7,700.02	6,962.18	6,700.31	6,673.08	37.46	14.60	76.37	-302.22	411.75	1,404.08	1,358.60	45.48	30.873	
7,800.02	6,962.24	6,677.01	6,651.23	39.61	14.63	75.37	-301.66	419.80	1,455.07	1,408.73	46.35	31.396	
7,900.02	6,962.30	6,664.18	6,639.12	41.87	14.65	74.82	-301.38	424.05	1,510.56	1,463.37	47.19	32.009	
8,000.02	6,962.36	6,646.01	6,621.90	44.22	14.67	74.05	-301.11	429.84	1,570.18	1,522.24	47.94	32.751	
8,100.02	6,962.42	6,636.80	6,613.14	46.65	14.69	73.66	-301.02	432.67	1,633.46	1,584.80	48.66	33.570	
8,200.02	6,962.48	6,616.01	6,593.29	49.15	14.71	72.79	-300.90	438.83	1,700.08	1,650.82	49.26	34.515	
8,300.02	6,962.54	6,616.01	6,593.29	51.70	14.71	72.79	-300.90	438.83	1,769.58	1,719.71	49.86	35.487	
8,400.02	6,962.60	6,601.22	6,579.09	54.31	14.73	72.16	-300.88	442.99	1,841.72	1,791.36	50.36	36.573	
8,500.02	6,962.65	6,586.01	6,564.43	56.95	14.75	71.53	-300.91	447.03	1,916.26	1,865.46	50.80	37.725	
8,600.02	6,962.71	6,586.01	6,564.43	59.64	14.75	71.53	-300.91	447.03	1,992.87	1,941.64	51.23	38.903	
8,700.02	6,962.77	6,572.24	6,551.10	62.35	14.77	70.95	-300.94	450.49	2,071.36	2,019.78	51.57	40.163	
8,800.02	6,962.83	6,555.01	6,534.36	65.09	14.79	70.24	-300.96	454.55	2,151.58	2,099.71	51.87	41.479	
8,900.02	6,962.89	6,555.01	6,534.36	67.86	14.79	70.24	-300.96	454.55	2,233.22	2,181.04	52.18	42.798	
9,000.02	6,962.95	6,555.01	6,534.36	70.65	14.79	70.24	-300.96	454.55	2,316.30	2,263.85	52.46	44.157	
9,100.02	6,963.01	6,542.55	6,522.19	73.45	14.80	69.72	-300.94	457.28	2,400.56	2,347.89	52.67	45.575	
9,200.02	6,963.07	6,537.03	6,516.79	76.28	14.80	69.49	-300.92	458.42	2,485.96	2,433.08	52.88	47.010	
9,300.02	6,963.12	6,525.01	6,505.01	79.12	14.82	68.99	-300.85	460.75	2,572.41	2,519.36	53.06	48.485	
9,400.02	6,963.18	6,525.01	6,505.01	81.97	14.82	68.99	-300.85	460.75	2,659.71	2,606.47	53.24	49.960	
9,500.02	6,963.24	6,525.01	6,505.01	84.83	14.82	68.99	-300.85	460.75	2,747.87	2,694.47	53.40	51.457	
9,600.02	6,963.30	6,525.01	6,505.01	87.71	14.82	68.99	-300.85	460.75	2,836.82	2,783.27	53.55	52.975	
9,700.02	6,963.36	6,525.01	6,505.01	90.59	14.82	68.99	-300.85	460.75	2,926.48	2,872.80	53.68	54.512	



Lonestar Consulting, LLC

Anticollision Report



Company:	Logos Operating LLC	Local Co-ordinate Reference:	Well Rosa Unit 645H - Slot B8
Project:	Rio Arriba, NM NAD83	TVD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Reference Site:	Rosa Unit 27	MD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Site Error:	0.00 ft	North Reference:	True
Reference Well:	Rosa Unit 645H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 ft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction
Reference Design:	Plan #4	Offset TVD Reference:	Offset Datum

Offset Design: Rosa Unit 27 - Rosa Unit 642H - OH - OH													Offset Site Error:	0.00 ft
Survey Program: 125-NS-GYRO-MS, 389-SDI MWD, 6382-SDI MWD, 7376-SDI MWD													Offset Well Error:	0.00 ft
Reference	Vertical	Offset	Vertical	Reference	Semi Major Axis	Offset	Highside	Offset Wellbore Centre		Distance		Minimum	Separation	Warning
Measured	Depth	Depth	Depth	Reference	Offset	Offset	Toolface	+N/-S	+E/-W	Between	Between	Separation	Factor	
Depth	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(°)	(ft)	(ft)	Centres	Ellipses	(ft)		
(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(°)	(ft)	(ft)	(ft)	(ft)	(ft)		
9,800.02	6,963.42	6,510.46	6,490.68	93.49	14.83	68.39	-300.74	463.32	3,016.64	2,962.85	53.78	56.089		
9,900.02	6,963.48	6,506.85	6,487.12	96.39	14.83	68.25	-300.71	463.92	3,107.46	3,053.56	53.89	57.662		
10,000.02	6,963.54	6,495.01	6,475.43	99.30	14.84	67.76	-300.62	465.76	3,198.86	3,144.88	53.98	59.264		
10,100.02	6,963.60	6,495.01	6,475.43	102.22	14.84	67.76	-300.62	465.76	3,290.66	3,236.58	54.08	60.853		
10,200.02	6,963.65	6,495.01	6,475.43	105.14	14.84	67.76	-300.62	465.76	3,382.93	3,328.76	54.17	62.454		
10,300.02	6,963.71	6,495.01	6,475.43	108.07	14.84	67.76	-300.62	465.76	3,475.62	3,421.37	54.25	64.065		
10,400.02	6,963.77	6,495.01	6,475.43	111.00	14.84	67.76	-300.62	465.76	3,568.71	3,514.38	54.33	65.685		
10,500.02	6,963.83	6,495.01	6,475.43	113.94	14.84	67.76	-300.62	465.76	3,662.16	3,607.76	54.40	67.313		
10,600.02	6,963.89	6,495.01	6,475.43	116.88	14.84	67.76	-300.62	465.76	3,755.96	3,701.48	54.47	68.949		
10,700.02	6,963.95	6,495.01	6,475.43	119.83	14.84	67.76	-300.62	465.76	3,850.06	3,795.52	54.54	70.591		
10,800.02	6,964.01	6,495.01	6,475.43	122.78	14.84	67.76	-300.62	465.76	3,944.45	3,889.85	54.60	72.239		
10,900.02	6,964.07	6,480.57	6,461.13	125.73	14.85	67.17	-300.51	467.75	4,038.95	3,984.30	54.65	73.911		
11,000.02	6,964.12	6,478.63	6,459.20	128.69	14.85	67.09	-300.49	468.00	4,133.82	4,079.12	54.70	75.570		
11,100.02	6,964.18	6,464.01	6,444.68	131.65	14.86	66.50	-300.37	469.68	4,229.05	4,174.31	54.74	77.257		
11,200.02	6,964.24	6,464.01	6,444.68	134.62	14.86	66.50	-300.37	469.68	4,324.33	4,269.53	54.79	78.920		
11,300.02	6,964.30	6,464.01	6,444.68	137.58	14.86	66.50	-300.37	469.68	4,419.82	4,364.97	54.85	80.586		
11,400.02	6,964.36	6,464.01	6,444.68	140.55	14.86	66.50	-300.37	469.68	4,515.50	4,460.60	54.90	82.255		
11,500.02	6,964.42	6,464.01	6,444.68	143.52	14.86	66.50	-300.37	469.68	4,611.37	4,556.42	54.95	83.926		
11,600.02	6,964.48	6,464.01	6,444.68	146.50	14.86	66.50	-300.37	469.68	4,707.41	4,652.42	54.99	85.600		
11,700.02	6,964.54	6,464.01	6,444.68	149.47	14.86	66.50	-300.37	469.68	4,803.61	4,748.57	55.04	87.276		
11,800.02	6,964.60	6,464.01	6,444.68	152.45	14.86	66.50	-300.37	469.68	4,899.96	4,844.88	55.09	88.953		
11,900.02	6,964.65	6,464.01	6,444.68	155.43	14.86	66.50	-300.37	469.68	4,996.46	4,941.33	55.13	90.631		
12,000.02	6,964.71	6,464.01	6,444.68	158.41	14.86	66.50	-300.37	469.68	5,093.09	5,037.92	55.17	92.310		
12,100.02	6,964.77	6,464.01	6,444.68	161.39	14.86	66.50	-300.37	469.68	5,189.85	5,134.63	55.22	93.990		
12,200.02	6,964.83	6,464.01	6,444.68	164.38	14.86	66.50	-300.37	469.68	5,286.73	5,231.47	55.26	95.670		
12,300.02	6,964.89	6,464.01	6,444.68	167.36	14.86	66.50	-300.37	469.68	5,383.73	5,328.42	55.30	97.351		
12,400.03	6,964.95	6,464.01	6,444.68	170.35	14.86	66.50	-300.37	469.68	5,480.83	5,425.48	55.34	99.031		
12,500.03	6,965.01	6,464.01	6,444.68	173.34	14.86	66.50	-300.37	469.68	5,578.03	5,522.65	55.39	100.711		
12,600.03	6,965.07	6,464.01	6,444.68	176.33	14.86	66.50	-300.37	469.68	5,675.34	5,619.91	55.43	102.391		
12,700.03	6,965.12	6,464.01	6,444.68	179.32	14.86	66.50	-300.37	469.68	5,772.73	5,717.26	55.47	104.071		
12,800.03	6,965.18	6,464.01	6,444.68	182.31	14.86	66.50	-300.37	469.68	5,870.21	5,814.70	55.51	105.749		
12,900.03	6,965.24	6,464.01	6,444.68	185.31	14.86	66.50	-300.37	469.68	5,967.78	5,912.22	55.55	107.427		
13,000.03	6,965.30	6,464.01	6,444.68	188.30	14.86	66.50	-300.37	469.68	6,065.42	6,009.83	55.59	109.103		
13,100.03	6,965.36	6,464.01	6,444.68	191.30	14.86	66.50	-300.37	469.68	6,163.14	6,107.51	55.63	110.778		
13,200.03	6,965.42	6,464.01	6,444.68	194.29	14.86	66.50	-300.37	469.68	6,260.93	6,205.26	55.68	112.452		
13,300.03	6,965.48	6,464.01	6,444.68	197.29	14.86	66.50	-300.37	469.68	6,358.79	6,303.08	55.72	114.124		
13,400.03	6,965.54	6,464.01	6,444.68	200.29	14.86	66.50	-300.37	469.68	6,456.72	6,400.96	55.76	115.795		
13,500.03	6,965.60	6,450.13	6,430.87	203.29	14.86	65.94	-300.25	470.97	6,554.53	6,498.74	55.80	117.474		
13,600.03	6,965.65	6,449.46	6,430.19	206.29	14.86	65.91	-300.24	471.03	6,652.57	6,596.73	55.84	119.141		
13,700.03	6,965.71	6,448.81	6,429.54	209.29	14.86	65.89	-300.24	471.08	6,750.65	6,694.77	55.88	120.806		
13,800.03	6,965.77	6,448.17	6,428.91	212.29	14.86	65.86	-300.23	471.13	6,848.80	6,792.88	55.92	122.469		
13,900.03	6,965.83	6,434.01	6,414.78	215.29	14.87	65.30	-300.13	472.07	6,947.16	6,891.20	55.96	124.146		
14,000.03	6,965.89	6,434.01	6,414.78	218.29	14.87	65.30	-300.13	472.07	7,045.39	6,989.39	56.00	125.803		
14,100.03	6,965.95	6,434.01	6,414.78	221.30	14.87	65.30	-300.13	472.07	7,143.67	7,087.62	56.05	127.458		
14,200.03	6,966.01	6,434.01	6,414.78	224.30	14.87	65.30	-300.13	472.07	7,242.00	7,185.90	56.09	129.110		
14,300.03	6,966.07	6,434.01	6,414.78	227.30	14.87	65.30	-300.13	472.07	7,340.37	7,284.23	56.14	130.760		
14,400.03	6,966.12	6,434.01	6,414.78	230.31	14.87	65.30	-300.13	472.07	7,438.78	7,382.60	56.18	132.407		
14,500.03	6,966.18	6,434.01	6,414.78	233.32	14.87	65.30	-300.13	472.07	7,537.24	7,481.02	56.23	134.052		
14,600.03	6,966.24	6,434.01	6,414.78	236.32	14.87	65.30	-300.13	472.07	7,635.74	7,579.47	56.27	135.693		
14,700.03	6,966.30	6,434.01	6,414.78	239.33	14.87	65.30	-300.13	472.07	7,734.28	7,677.96	56.32	137.332		



Lonestar Consulting, LLC

Anticollision Report



Company:	Logos Operating LLC	Local Co-ordinate Reference:	Well Rosa Unit 645H - Slot B8
Project:	Rio Arriba, NM NAD83	TVD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Reference Site:	Rosa Unit 27	MD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Site Error:	0.00 ft	North Reference:	True
Reference Well:	Rosa Unit 645H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 ft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction
Reference Design:	Plan #4	Offset TVD Reference:	Offset Datum

Offset Design: Rosa Unit 27 - Rosa Unit 642H - OH - OH													Offset Site Error:	0.00 ft
Survey Program: 125-NS-GYRO-MS, 389-SDI MWD, 6382-SDI MWD, 7376-SDI MWD							Rule Assigned:						Offset Well Error:	0.00 ft
Reference				Offset		Semi Major Axis		Offset Wellbore Centre		Distance				Warning
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)	Highside Toolface (°)	+N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Minimum Separation (ft)	Separation Factor		
14,800.03	6,966.36	6,434.01	6,414.78	242.33	14.87	65.30	-300.13	472.07	7,832.85	7,776.48	56.36	138.968		
14,900.03	6,966.42	6,434.01	6,414.78	245.34	14.87	65.30	-300.13	472.07	7,931.46	7,875.05	56.41	140.600		
15,000.03	6,966.48	6,434.01	6,414.78	248.35	14.87	65.30	-300.13	472.07	8,030.10	7,973.64	56.46	142.230		
15,100.03	6,966.54	6,434.01	6,414.78	251.36	14.87	65.30	-300.13	472.07	8,128.78	8,072.27	56.51	143.856		
15,200.03	6,966.60	6,434.01	6,414.78	254.37	14.87	65.30	-300.13	472.07	8,227.49	8,170.93	56.55	145.480		
15,300.03	6,966.65	6,434.01	6,414.78	257.38	14.87	65.30	-300.13	472.07	8,326.23	8,269.62	56.60	147.100		
15,400.03	6,966.71	6,434.01	6,414.78	260.39	14.87	65.30	-300.13	472.07	8,424.99	8,368.34	56.65	148.716		
15,500.03	6,966.77	6,434.01	6,414.78	263.40	14.87	65.30	-300.13	472.07	8,523.79	8,467.09	56.70	150.330		
15,600.03	6,966.83	6,434.01	6,414.78	266.41	14.87	65.30	-300.13	472.07	8,622.62	8,565.87	56.75	151.940		
15,700.03	6,966.89	6,434.01	6,414.78	269.42	14.87	65.30	-300.13	472.07	8,721.47	8,664.67	56.80	153.546		
15,800.03	6,966.95	6,434.01	6,414.78	272.43	14.87	65.30	-300.13	472.07	8,820.35	8,763.50	56.85	155.149		
15,900.03	6,967.01	6,434.01	6,414.78	275.44	14.87	65.30	-300.13	472.07	8,919.25	8,862.35	56.90	156.748		
16,000.03	6,967.07	6,434.01	6,414.78	278.45	14.87	65.30	-300.13	472.07	9,018.18	8,961.23	56.95	158.343		
16,100.03	6,967.12	6,434.01	6,414.78	281.46	14.87	65.30	-300.13	472.07	9,117.13	9,060.12	57.01	159.935		
16,200.03	6,967.18	6,434.01	6,414.78	284.47	14.87	65.30	-300.13	472.07	9,216.10	9,159.05	57.06	161.523		
16,300.03	6,967.24	6,434.01	6,414.78	287.49	14.87	65.30	-300.13	472.07	9,315.10	9,257.99	57.11	163.107		
16,400.03	6,967.30	6,434.01	6,414.78	290.50	14.87	65.30	-300.13	472.07	9,414.11	9,356.95	57.16	164.688		
16,500.03	6,967.36	6,434.01	6,414.78	293.51	14.87	65.30	-300.13	472.07	9,513.15	9,455.93	57.22	166.264		
16,600.03	6,967.42	6,434.01	6,414.78	296.52	14.87	65.30	-300.13	472.07	9,612.21	9,554.94	57.27	167.837		
16,700.03	6,967.48	6,434.01	6,414.78	299.54	14.87	65.30	-300.13	472.07	9,711.29	9,653.96	57.33	169.405		
16,800.03	6,967.54	6,434.01	6,414.78	302.55	14.87	65.30	-300.13	472.07	9,810.38	9,753.00	57.38	170.970		
16,900.03	6,967.60	6,434.01	6,414.78	305.57	14.87	65.30	-300.13	472.07	9,909.49	9,852.06	57.44	172.531		



Lonestar Consulting, LLC

Anticollision Report



Company:	Logos Operating LLC	Local Co-ordinate Reference:	Well Rosa Unit 645H - Slot B8
Project:	Rio Arriba, NM NAD83	TVD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Reference Site:	Rosa Unit 27	MD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Site Error:	0.00 ft	North Reference:	True
Reference Well:	Rosa Unit 645H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 ft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction
Reference Design:	Plan #4	Offset TVD Reference:	Offset Datum

Offset Design: Rosa Unit 27 - Rosa Unit 643H - OH - OH													Offset Site Error:	0.00 ft
Survey Program: 25-NS-GYRO-MS, 379-SDI MWD, 6560-SDI MWD, 7715-SDI MWD													Offset Well Error:	0.00 ft
Reference	Vertical	Offset	Semi Major Axis	Offset	Highside	Rule Assigned:				Distance	Minimum	Separation	Warning	
Measured Depth (ft)	Depth (ft)	Depth (ft)	Depth (ft)	Reference (ft)	Offset (ft)	Tooface (")	+N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Separation (ft)	Factor		
0.00	0.00	0.51	0.51	0.00	0.00	108.51	-28.72	85.77	90.45					
100.00	100.00	101.38	101.38	0.27	0.18	108.64	-28.79	85.35	90.08	89.63	0.45	200.764		
200.00	200.00	201.33	201.32	0.63	0.44	109.22	-29.34	84.15	89.12	88.06	1.07	83.655		
300.00	300.00	300.98	300.96	0.99	0.67	110.24	-30.59	82.96	88.42	86.76	1.66	53.210		
367.81	367.81	368.36	368.32	1.23	0.77	110.86	-31.43	82.47	88.25	86.26	2.00	44.219 CC		
400.00	400.00	400.16	400.12	1.35	0.79	111.16	-31.87	82.36	88.31	86.18	2.14	41.341 ES		
500.00	500.00	497.74	497.65	1.70	0.86	102.79	-34.96	82.74	89.97	87.39	2.57	34.988		
600.00	599.93	594.38	594.07	2.06	0.99	107.25	-40.79	85.33	95.90	92.83	3.06	31.310		
700.00	699.68	691.67	690.95	2.43	1.17	113.38	-48.79	89.49	106.25	102.66	3.59	29.627		
800.00	799.13	786.70	785.39	2.79	1.39	119.93	-58.11	94.24	120.98	116.84	4.13	29.260 SF		
900.00	898.20	881.18	878.98	3.16	1.65	126.19	-69.36	100.54	141.56	136.87	4.69	30.182		
1,000.00	997.18	976.58	973.36	3.54	1.94	131.15	-81.35	107.63	164.86	159.62	5.24	31.455		
1,100.00	1,096.17	1,072.56	1,068.27	3.92	2.24	135.00	-93.87	114.70	189.43	183.64	5.79	32.713		
1,200.00	1,195.16	1,163.42	1,157.93	4.31	2.54	137.88	-106.72	121.75	215.75	209.41	6.34	34.050		
1,300.00	1,294.14	1,255.85	1,248.81	4.71	2.88	140.07	-121.22	130.34	244.53	237.64	6.90	35.449		
1,400.00	1,393.13	1,348.11	1,339.33	5.10	3.25	141.75	-136.46	139.55	274.62	267.15	7.47	36.773		
1,500.00	1,492.12	1,440.95	1,430.27	5.49	3.64	143.10	-152.51	149.24	305.74	297.70	8.05	37.997		
1,600.00	1,591.10	1,537.63	1,524.93	5.89	4.00	144.23	-169.22	159.50	337.07	328.44	8.63	39.045		
1,700.00	1,690.09	1,631.31	1,616.70	6.29	4.36	145.10	-185.19	169.51	368.31	359.10	9.21	39.996		
1,800.00	1,789.08	1,733.66	1,717.14	6.69	4.74	145.92	-201.80	180.03	398.72	388.89	9.83	40.559		
1,900.00	1,888.06	1,825.90	1,807.70	7.09	5.08	146.51	-216.42	189.64	428.91	418.51	10.40	41.227		
2,000.00	1,987.05	1,926.33	1,906.40	7.49	5.45	147.22	-232.47	198.91	458.82	447.80	11.02	41.636		
2,100.00	2,086.04	2,027.10	2,005.67	7.89	5.77	147.97	-247.92	206.81	487.73	476.10	11.62	41.960		
2,200.00	2,185.02	2,124.77	2,102.03	8.29	6.10	148.61	-262.03	214.23	515.79	503.57	12.22	42.219		
2,300.00	2,284.01	2,219.49	2,195.43	8.69	6.43	149.13	-275.84	221.75	544.15	531.35	12.80	42.497		
2,400.00	2,383.00	2,315.49	2,290.13	9.09	6.76	149.61	-289.69	229.36	572.40	559.00	13.40	42.716		
2,500.01	2,481.98	2,412.86	2,386.14	9.49	7.10	150.03	-303.79	237.24	600.79	586.79	14.01	42.895		
2,600.01	2,580.97	2,503.00	2,475.05	9.90	7.42	150.33	-316.46	245.11	629.03	614.46	14.58	43.156		
2,700.01	2,679.96	2,590.66	2,561.26	10.30	7.76	150.62	-330.23	252.93	658.84	643.70	15.14	43.526		
2,800.01	2,778.95	2,680.18	2,649.19	10.70	8.12	150.88	-344.84	261.23	689.35	673.64	15.71	43.870		
2,900.01	2,877.93	2,773.44	2,740.64	11.10	8.49	151.14	-360.89	269.94	720.70	704.39	16.31	44.188		
3,000.01	2,976.92	2,871.02	2,836.41	11.51	8.86	151.41	-377.42	278.75	751.73	734.80	16.93	44.409		
3,100.01	3,075.91	2,982.84	2,946.27	11.91	9.27	151.60	-395.06	289.83	782.01	764.38	17.63	44.369		
3,200.01	3,174.89	3,077.00	3,039.03	12.31	9.61	151.75	-408.60	298.67	810.80	792.58	18.22	44.498		
3,300.01	3,273.88	3,178.51	3,139.02	12.71	9.98	151.89	-423.22	308.25	839.63	820.77	18.86	44.520		
3,400.01	3,372.87	3,269.01	3,228.24	13.12	10.29	152.04	-436.12	316.25	868.15	848.72	19.43	44.684		
3,500.01	3,471.85	3,361.01	3,318.86	13.52	10.63	152.23	-449.95	324.03	897.30	877.29	20.01	44.833		
3,600.01	3,570.84	3,460.85	3,417.15	13.93	11.00	152.37	-464.93	333.13	926.62	905.97	20.65	44.879		
3,700.01	3,669.83	3,559.91	3,514.75	14.33	11.34	152.51	-479.35	341.99	955.46	934.19	21.27	44.926		
3,800.01	3,768.81	3,658.87	3,612.37	14.73	11.68	152.69	-493.47	349.94	983.79	961.91	21.88	44.955		
3,900.01	3,867.80	3,751.88	3,704.09	15.14	12.01	152.86	-507.14	357.26	1,012.48	990.01	22.47	45.056		
4,000.01	3,966.79	3,861.06	3,811.85	15.54	12.38	153.02	-522.25	366.04	1,040.43	1,017.28	23.14	44.953		
4,100.01	4,065.77	3,972.43	3,922.05	15.94	12.73	153.28	-536.85	372.96	1,067.22	1,043.41	23.81	44.814		
4,200.01	4,164.76	4,060.69	4,009.47	16.35	13.01	153.50	-547.94	377.82	1,093.35	1,068.99	24.37	44.870		
4,300.01	4,263.75	4,157.10	4,104.83	16.75	13.32	153.69	-560.77	383.87	1,120.38	1,095.41	24.96	44.879		
4,400.01	4,362.73	4,246.40	4,193.18	17.16	13.62	153.88	-572.59	389.25	1,147.29	1,121.76	25.53	44.946		
4,500.01	4,461.72	4,347.11	4,292.72	17.56	13.95	154.02	-586.10	396.54	1,174.67	1,148.52	26.15	44.921		
4,600.01	4,560.71	4,432.01	4,376.62	17.96	14.24	154.12	-597.29	403.09	1,201.99	1,175.30	26.69	45.031		
4,700.01	4,659.69	4,516.43	4,459.86	18.37	14.54	154.17	-609.16	410.58	1,230.40	1,203.16	27.24	45.173		
4,800.01	4,758.68	4,600.65	4,542.78	18.77	14.86	154.22	-621.68	418.28	1,259.64	1,231.85	27.78	45.337		



Lonestar Consulting, LLC

Anticollision Report



Company:	Logos Operating LLC	Local Co-ordinate Reference:	Well Rosa Unit 645H - Slot B8
Project:	Rio Arriba, NM NAD83	TVD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Reference Site:	Rosa Unit 27	MD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Site Error:	0.00 ft	North Reference:	True
Reference Well:	Rosa Unit 645H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 ft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction
Reference Design:	Plan #4	Offset TVD Reference:	Offset Datum

Offset Design: Rosa Unit 27 - Rosa Unit 643H - OH - OH												Offset Site Error:	0.00 ft
Survey Program: 25-NS-GYRO-MS, 379-SDI MWD, 6560-SDI MWD, 7715-SDI MWD												Offset Well Error:	0.00 ft
Reference	Offset	Semi Major Axis	Reference	Offset	Highside	Offset Wellbore Centre		Distance		Minimum	Separation	Warning	
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)	Toothface (")	+N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Separation (ft)	Factor	
4,900.01	4,857.67	4,689.60	4,630.23	19.18	15.21	154.26	-635.56	426.80	1,289.66	1,261.31	28.36	45.477	
5,000.01	4,956.65	4,771.39	4,710.59	19.58	15.53	154.31	-648.78	434.31	1,320.16	1,291.27	28.89	45.698	
5,100.01	5,055.64	4,851.64	4,789.23	19.98	15.85	154.36	-662.89	441.92	1,352.00	1,322.59	29.41	45.974	
5,200.01	5,154.63	4,954.16	4,889.65	20.39	16.26	154.44	-681.25	451.37	1,384.12	1,354.05	30.07	46.029	
5,300.01	5,253.61	5,081.83	5,015.06	20.79	16.74	154.53	-702.20	462.77	1,414.79	1,383.92	30.87	45.824	
5,400.01	5,352.60	5,163.56	5,095.51	21.20	17.04	154.60	-714.98	469.54	1,444.56	1,413.16	31.40	46.005	
5,500.01	5,451.59	5,244.92	5,175.42	21.60	17.36	154.68	-728.66	476.28	1,475.42	1,443.49	31.93	46.212	
5,600.01	5,550.57	5,338.84	5,267.57	22.01	17.73	154.75	-744.94	484.35	1,506.84	1,474.31	32.53	46.319	
5,700.01	5,649.56	5,427.91	5,354.97	22.41	18.08	154.84	-760.44	491.72	1,538.26	1,505.15	33.11	46.465	
5,800.01	5,748.55	5,549.98	5,474.80	22.81	18.56	154.93	-781.29	502.13	1,569.52	1,535.64	33.88	46.324	
5,900.01	5,847.53	5,648.34	5,571.55	23.22	18.92	154.99	-796.85	510.46	1,599.51	1,565.00	34.50	46.356	
6,000.01	5,946.52	5,747.75	5,669.39	23.62	19.28	155.04	-812.25	519.04	1,629.22	1,594.09	35.13	46.371	
6,100.01	6,045.51	5,847.53	5,767.61	24.03	19.64	155.11	-827.78	527.22	1,658.92	1,623.15	35.77	46.383	
6,200.01	6,144.49	5,970.63	5,889.06	24.43	20.06	155.21	-845.63	536.43	1,687.40	1,650.88	36.52	46.205	
6,300.01	6,243.48	6,076.53	5,993.73	24.84	20.41	155.29	-859.95	543.90	1,714.88	1,677.71	37.17	46.135	
6,400.00	6,342.45	6,217.90	6,133.79	25.24	20.84	155.51	-877.84	550.45	1,741.05	1,703.07	37.98	45.843	
6,500.01	6,440.93	6,346.81	6,261.90	25.65	21.18	113.64	-892.03	552.22	1,763.14	1,724.43	38.71	45.542	
6,600.01	6,536.70	6,476.78	6,391.29	26.06	21.49	97.73	-904.11	553.19	1,779.73	1,740.24	39.49	45.073	
6,700.01	6,627.42	6,592.34	6,506.45	26.46	21.66	91.70	-912.78	550.43	1,790.53	1,750.38	40.15	44.598	
6,800.01	6,710.86	6,787.28	6,697.13	26.86	21.60	92.00	-924.64	513.30	1,795.39	1,754.65	40.74	44.071	
6,900.01	6,784.97	6,833.01	6,740.42	27.29	21.57	90.78	-926.95	498.76	1,799.67	1,758.31	41.37	43.506	
7,000.01	6,847.91	6,855.18	6,761.12	27.78	21.55	89.57	-928.22	490.94	1,805.91	1,763.79	42.12	42.874	
7,100.01	6,898.13	6,864.01	6,769.33	28.43	21.54	88.22	-928.76	487.71	1,814.63	1,771.58	43.05	42.150	
7,200.01	6,934.41	6,864.01	6,769.33	29.33	21.54	86.70	-928.76	487.71	1,825.87	1,781.68	44.19	41.315	
7,300.01	6,955.84	6,854.74	6,760.72	30.51	21.55	84.93	-928.20	491.10	1,839.30	1,793.75	45.55	40.382	
7,400.01	6,962.01	6,833.01	6,740.42	31.95	21.57	83.04	-926.95	498.76	1,854.35	1,807.28	47.07	39.397	
7,500.02	6,962.07	6,818.50	6,726.77	33.61	21.58	82.61	-926.17	503.63	1,872.79	1,824.06	48.72	38.436	
7,600.02	6,962.12	6,803.01	6,712.12	35.45	21.59	82.15	-925.39	508.57	1,896.04	1,845.58	50.45	37.581	
7,700.02	6,962.18	6,787.61	6,697.45	37.46	21.60	81.70	-924.66	513.20	1,923.96	1,871.76	52.21	36.853	
7,800.02	6,962.24	6,772.01	6,682.49	39.61	21.61	81.23	-923.95	517.58	1,956.40	1,902.45	53.95	36.262	
7,900.02	6,962.30	6,761.80	6,672.65	41.87	21.62	80.92	-923.49	520.28	1,993.16	1,937.49	55.67	35.804	
8,000.02	6,962.36	6,742.01	6,653.50	44.22	21.63	80.33	-922.63	525.16	2,034.05	1,976.74	57.30	35.497	
8,100.02	6,962.42	6,742.01	6,653.50	46.65	21.63	80.33	-922.63	525.16	2,078.75	2,019.84	58.91	35.289	
8,200.02	6,962.48	6,726.29	6,638.21	49.15	21.64	79.86	-921.94	528.75	2,127.11	2,066.73	60.38	35.226	
8,300.02	6,962.54	6,712.01	6,624.27	51.70	21.65	79.43	-921.28	531.80	2,178.88	2,117.11	61.77	35.273	
8,400.02	6,962.60	6,702.02	6,614.50	54.31	21.65	79.13	-920.80	533.83	2,233.81	2,170.74	63.07	35.416	
8,500.02	6,962.65	6,689.24	6,601.98	56.95	21.66	78.74	-920.14	536.31	2,291.68	2,227.41	64.27	35.656	
8,600.02	6,962.71	6,675.50	6,588.50	59.64	21.66	78.33	-919.37	538.83	2,352.27	2,286.90	65.37	35.983	
8,700.02	6,962.77	6,660.24	6,573.50	62.35	21.67	77.87	-918.39	541.47	2,415.38	2,349.00	66.38	36.390	
8,800.02	6,962.83	6,651.01	6,564.42	65.09	21.67	77.59	-917.73	542.98	2,480.82	2,413.51	67.31	36.855	
8,900.02	6,962.89	6,640.26	6,553.83	67.86	21.67	77.26	-916.90	544.63	2,548.44	2,480.28	68.16	37.389	
9,000.02	6,962.95	6,633.06	6,546.73	70.65	21.67	77.04	-916.31	545.68	2,618.09	2,549.15	68.95	37.972	
9,100.02	6,963.01	6,621.01	6,534.84	73.45	21.66	76.68	-915.28	547.31	2,689.64	2,619.99	69.64	38.619	
9,200.02	6,963.07	6,621.01	6,534.84	76.28	21.66	76.68	-915.28	547.31	2,762.90	2,692.57	70.33	39.287	
9,300.02	6,963.12	6,621.01	6,534.84	79.12	21.66	76.68	-915.28	547.31	2,837.79	2,766.84	70.95	39.997	
9,400.02	6,963.18	6,621.01	6,534.84	81.97	21.66	76.68	-915.28	547.31	2,914.19	2,842.67	71.52	40.747	
9,500.02	6,963.24	6,621.01	6,534.84	84.83	21.66	76.68	-915.28	547.31	2,991.98	2,919.94	72.04	41.533	
9,600.02	6,963.30	6,621.01	6,534.84	87.71	21.66	76.68	-915.28	547.31	3,071.06	2,998.54	72.51	42.352	
9,700.02	6,963.36	6,607.56	6,521.53	90.59	21.66	76.27	-914.10	548.92	3,151.18	3,078.29	72.89	43.229	
9,800.02	6,963.42	6,605.35	6,519.35	93.49	21.66	76.20	-913.91	549.16	3,232.50	3,159.22	73.28	44.109	



Lonestar Consulting, LLC

Anticollision Report



Company:	Logos Operating LLC	Local Co-ordinate Reference:	Well Rosa Unit 645H - Slot B8
Project:	Rio Arriba, NM NAD83	TVD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Reference Site:	Rosa Unit 27	MD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Site Error:	0.00 ft	North Reference:	True
Reference Well:	Rosa Unit 645H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 ft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction
Reference Design:	Plan #4	Offset TVD Reference:	Offset Datum

Offset Design: Rosa Unit 27 - Rosa Unit 643H - OH - OH													Offset Site Error:	0.00 ft
Survey Program: 25-NS-GYRO-MS, 379-SDI MWD, 6560-SDI MWD, 7715-SDI MWD													Offset Well Error:	0.00 ft
Reference	Vertical	Offset	Vertical	Semi Major Axis	Offset	Highside	Offset Wellbore Centre		Distance		Minimum	Separation	Warning	
Measured Depth (ft)	Depth (ft)	Depth (ft)	Depth (ft)	Reference (ft)	Offset (ft)	Toolface (°)	+N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Separation (ft)	Factor		
9,900.02	6,963.48	6,603.27	6,517.29	96.39	21.66	76.14	-913.73	549.38	3,314.83	3,241.19	73.64	45.013		
10,000.02	6,963.54	6,591.01	6,505.13	99.30	21.66	75.77	-912.67	550.55	3,398.19	3,324.26	73.93	45.966		
10,100.02	6,963.60	6,591.01	6,505.13	102.22	21.66	75.77	-912.67	550.55	3,482.31	3,408.07	74.24	46.909		
10,200.02	6,963.65	6,591.01	6,505.13	105.14	21.66	75.77	-912.67	550.55	3,567.25	3,492.73	74.52	47.870		
10,300.02	6,963.71	6,591.01	6,505.13	108.07	21.66	75.77	-912.67	550.55	3,652.96	3,578.18	74.78	48.849		
10,400.02	6,963.77	6,591.01	6,505.13	111.00	21.66	75.77	-912.67	550.55	3,739.37	3,664.35	75.02	49.845		
10,500.02	6,963.83	6,591.01	6,505.13	113.94	21.66	75.77	-912.67	550.55	3,826.45	3,751.20	75.24	50.855		
10,600.02	6,963.89	6,591.01	6,505.13	116.88	21.66	75.77	-912.67	550.55	3,914.14	3,838.69	75.45	51.880		
10,700.02	6,963.95	6,591.01	6,505.13	119.83	21.66	75.77	-912.67	550.55	4,002.41	3,926.78	75.64	52.917		
10,800.02	6,964.01	6,591.01	6,505.13	122.78	21.66	75.77	-912.67	550.55	4,091.22	4,015.41	75.81	53.966		
10,900.02	6,964.07	6,591.01	6,505.13	125.73	21.66	75.77	-912.67	550.55	4,180.54	4,104.56	75.97	55.026		
11,000.02	6,964.12	6,591.01	6,505.13	128.69	21.66	75.77	-912.67	550.55	4,270.33	4,194.20	76.12	56.096		
11,100.02	6,964.18	6,591.01	6,505.13	131.65	21.66	75.77	-912.67	550.55	4,360.56	4,284.30	76.27	57.176		
11,200.02	6,964.24	6,591.01	6,505.13	134.62	21.66	75.77	-912.67	550.55	4,451.21	4,374.82	76.40	58.264		
11,300.02	6,964.30	6,591.01	6,505.13	137.58	21.66	75.77	-912.67	550.55	4,542.26	4,465.74	76.52	59.361		
11,400.02	6,964.36	6,591.01	6,505.13	140.55	21.66	75.77	-912.67	550.55	4,633.67	4,557.04	76.63	60.465		
11,500.02	6,964.42	6,591.01	6,505.13	143.52	21.66	75.77	-912.67	550.55	4,725.43	4,648.69	76.74	61.576		
11,600.02	6,964.48	6,591.01	6,505.13	146.50	21.66	75.77	-912.67	550.55	4,817.52	4,740.68	76.84	62.694		
11,700.02	6,964.54	6,591.01	6,505.13	149.47	21.66	75.77	-912.67	550.55	4,909.92	4,832.98	76.94	63.817		
11,800.02	6,964.60	6,591.01	6,505.13	152.45	21.66	75.77	-912.67	550.55	5,002.61	4,925.58	77.03	64.947		
11,900.02	6,964.65	6,591.01	6,505.13	155.43	21.66	75.77	-912.67	550.55	5,095.58	5,018.47	77.11	66.081		
12,000.02	6,964.71	6,591.01	6,505.13	158.41	21.66	75.77	-912.67	550.55	5,188.81	5,111.62	77.19	67.221		
12,100.02	6,964.77	6,576.86	6,491.07	161.39	21.65	75.34	-911.52	551.64	5,282.11	5,204.89	77.22	68.404		
12,200.02	6,964.83	6,576.13	6,490.34	164.38	21.65	75.30	-911.46	551.69	5,375.81	5,298.52	77.29	69.554		
12,300.02	6,964.89	6,575.43	6,489.65	167.36	21.65	75.30	-911.41	551.74	5,469.72	5,392.37	77.36	70.708		
12,400.03	6,964.95	6,574.75	6,488.97	170.35	21.65	75.28	-911.35	551.78	5,563.85	5,486.43	77.42	71.866		
12,500.03	6,965.01	6,574.09	6,488.31	173.34	21.65	75.26	-911.30	551.82	5,658.18	5,580.70	77.48	73.027		
12,600.03	6,965.07	6,560.01	6,474.29	176.33	21.64	74.83	-910.28	552.57	5,752.85	5,675.36	77.50	74.234		
12,700.03	6,965.12	6,560.01	6,474.29	179.32	21.64	74.83	-910.28	552.57	5,847.54	5,769.98	77.55	75.400		
12,800.03	6,965.18	6,560.01	6,474.29	182.31	21.64	74.83	-910.28	552.57	5,942.40	5,864.79	77.61	76.568		
12,900.03	6,965.24	6,560.01	6,474.29	185.31	21.64	74.83	-910.28	552.57	6,037.43	5,959.76	77.66	77.738		
13,000.03	6,965.30	6,560.01	6,474.29	188.30	21.64	74.83	-910.28	552.57	6,132.61	6,054.89	77.72	78.911		
13,100.03	6,965.36	6,560.01	6,474.29	191.30	21.64	74.83	-910.28	552.57	6,227.95	6,150.18	77.77	80.086		
13,200.03	6,965.42	6,560.01	6,474.29	194.29	21.64	74.83	-910.28	552.57	6,323.43	6,245.61	77.81	81.263		
13,300.03	6,965.48	6,560.01	6,474.29	197.29	21.64	74.83	-910.28	552.57	6,419.04	6,341.18	77.86	82.442		
13,400.03	6,965.54	6,560.01	6,474.29	200.29	21.64	74.83	-910.28	552.57	6,514.79	6,436.88	77.91	83.622		
13,500.03	6,965.60	6,560.01	6,474.29	203.29	21.64	74.83	-910.28	552.57	6,610.67	6,532.71	77.95	84.804		
13,600.03	6,965.65	6,560.01	6,474.29	206.29	21.64	74.83	-910.28	552.57	6,706.66	6,628.67	78.00	85.987		
13,700.03	6,965.71	6,560.01	6,474.29	209.29	21.64	74.83	-910.28	552.57	6,802.77	6,724.73	78.04	87.171		
13,800.03	6,965.77	6,560.01	6,474.29	212.29	21.64	74.83	-910.28	552.57	6,899.00	6,820.91	78.08	88.356		
13,900.03	6,965.83	6,560.01	6,474.29	215.29	21.64	74.83	-910.28	552.57	6,995.32	6,917.20	78.12	89.543		
14,000.03	6,965.89	6,560.01	6,474.29	218.29	21.64	74.83	-910.28	552.57	7,091.75	7,013.59	78.16	90.730		
14,100.03	6,965.95	6,560.01	6,474.29	221.30	21.64	74.83	-910.28	552.57	7,188.28	7,110.08	78.20	91.918		
14,200.03	6,966.01	6,560.01	6,474.29	224.30	21.64	74.83	-910.28	552.57	7,284.90	7,206.66	78.24	93.106		
14,300.03	6,966.07	6,560.01	6,474.29	227.30	21.64	74.83	-910.28	552.57	7,381.61	7,303.33	78.28	94.295		
14,400.03	6,966.12	6,560.01	6,474.29	230.31	21.64	74.83	-910.28	552.57	7,478.41	7,400.09	78.32	95.485		
14,500.03	6,966.18	6,560.01	6,474.29	233.32	21.64	74.83	-910.28	552.57	7,575.29	7,496.93	78.36	96.674		
14,600.03	6,966.24	6,560.01	6,474.29	236.32	21.64	74.83	-910.28	552.57	7,672.25	7,593.85	78.40	97.864		
14,700.03	6,966.30	6,560.01	6,474.29	239.33	21.64	74.83	-910.28	552.57	7,769.28	7,690.85	78.43	99.054		
14,800.03	6,966.36	6,560.01	6,474.29	242.33	21.64	74.83	-910.28	552.57	7,866.40	7,787.92	78.47	100.245		



Lonestar Consulting, LLC

Anticollision Report



Company:	Logos Operating LLC	Local Co-ordinate Reference:	Well Rosa Unit 645H - Slot B8
Project:	Rio Arriba, NM NAD83	TVD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Reference Site:	Rosa Unit 27	MD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Site Error:	0.00 ft	North Reference:	True
Reference Well:	Rosa Unit 645H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 ft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction
Reference Design:	Plan #4	Offset TVD Reference:	Offset Datum

Offset Design: Rosa Unit 27 - Rosa Unit 643H - OH - OH													Offset Site Error:	0.00 ft
Survey Program: 25-NS-GYRO-MS, 379-SDI MWD, 6560-SDI MWD, 7715-SDI MWD							Rule Assigned:						Offset Well Error:	0.00 ft
Reference		Offset		Semi Major Axis		Highside Toolface (°)	Offset Wellbore Centre		Distance		Minimum Separation (ft)	Separation Factor	Warning	
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)		+N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)				
14,900.03	6,966.42	6,560.01	6,474.29	245.34	21.64	74.83	-910.28	552.57	7,963.58	7,885.07	78.51	101.435		
15,000.03	6,966.48	6,560.01	6,474.29	248.35	21.64	74.83	-910.28	552.57	8,060.83	7,982.28	78.55	102.625		
15,100.03	6,966.54	6,560.01	6,474.29	251.36	21.64	74.83	-910.28	552.57	8,158.15	8,079.57	78.58	103.815		
15,200.03	6,966.60	6,560.01	6,474.29	254.37	21.64	74.83	-910.28	552.57	8,255.53	8,176.91	78.62	105.005		
15,300.03	6,966.65	6,560.01	6,474.29	257.38	21.64	74.83	-910.28	552.57	8,352.98	8,274.32	78.66	106.194		
15,400.03	6,966.71	6,560.01	6,474.29	260.39	21.64	74.83	-910.28	552.57	8,450.48	8,371.79	78.69	107.383		
15,500.03	6,966.77	6,560.01	6,474.29	263.40	21.64	74.83	-910.28	552.57	8,548.04	8,469.31	78.73	108.572		
15,600.03	6,966.83	6,560.01	6,474.29	266.41	21.64	74.83	-910.28	552.57	8,645.66	8,566.89	78.77	109.760		
15,700.03	6,966.89	6,560.01	6,474.29	269.42	21.64	74.83	-910.28	552.57	8,743.33	8,664.52	78.81	110.948		
15,800.03	6,966.95	6,560.01	6,474.29	272.43	21.64	74.83	-910.28	552.57	8,841.05	8,762.21	78.84	112.135		
15,900.03	6,967.01	6,560.01	6,474.29	275.44	21.64	74.83	-910.28	552.57	8,938.83	8,859.95	78.88	113.322		
16,000.03	6,967.07	6,560.01	6,474.29	278.45	21.64	74.83	-910.28	552.57	9,036.65	8,957.73	78.92	114.508		
16,100.03	6,967.12	6,560.01	6,474.29	281.46	21.64	74.83	-910.28	552.57	9,134.52	9,055.56	78.96	115.693		
16,200.03	6,967.18	6,560.01	6,474.29	284.47	21.64	74.83	-910.28	552.57	9,232.43	9,153.44	78.99	116.877		
16,300.03	6,967.24	6,560.01	6,474.29	287.49	21.64	74.83	-910.28	552.57	9,330.39	9,251.36	79.03	118.061		
16,400.03	6,967.30	6,560.01	6,474.29	290.50	21.64	74.83	-910.28	552.57	9,428.40	9,349.33	79.07	119.243		
16,500.03	6,967.36	6,560.01	6,474.29	293.51	21.64	74.83	-910.28	552.57	9,526.44	9,447.33	79.11	120.425		
16,600.03	6,967.42	6,560.01	6,474.29	296.52	21.64	74.83	-910.28	552.57	9,624.52	9,545.38	79.15	121.606		
16,700.03	6,967.48	6,560.01	6,474.29	299.54	21.64	74.83	-910.28	552.57	9,722.65	9,643.46	79.18	122.786		
16,800.03	6,967.54	6,560.01	6,474.29	302.55	21.64	74.83	-910.28	552.57	9,820.81	9,741.59	79.22	123.964		
16,900.03	6,967.60	6,560.01	6,474.29	305.57	21.64	74.83	-910.28	552.57	9,919.01	9,839.74	79.26	125.142		



Lonestar Consulting, LLC

Anticollision Report



Company:	Logos Operating LLC	Local Co-ordinate Reference:	Well Rosa Unit 645H - Slot B8
Project:	Rio Arriba, NM NAD83	TVD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Reference Site:	Rosa Unit 27	MD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Site Error:	0.00 ft	North Reference:	True
Reference Well:	Rosa Unit 645H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 ft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction
Reference Design:	Plan #4	Offset TVD Reference:	Offset Datum

Offset Design: Rosa Unit 27 - Rosa Unit 644H - OH - Plan #1													Offset Site Error:	0.00 ft
Survey Program: 0-MWD+HDGM													Offset Well Error:	0.00 ft
Reference	Offset	Semi Major Axis		Offset Wellbore Centre		Rule Assigned:		Distance		Minimum	Separation	Warning		
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)	Highside Toolface (°)	+N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Separation (ft)	Factor		
0.00	0.00	0.50	0.50	0.00	0.00	109.64	-25.37	71.08	75.47					
100.00	100.00	100.50	100.50	0.27	0.14	109.64	-25.37	71.08	75.47	75.06	0.41	185.488		
200.00	200.00	200.50	200.50	0.63	0.49	109.64	-25.37	71.08	75.47	74.35	1.12	67.155		
300.00	300.00	300.50	300.50	0.99	0.85	109.64	-25.37	71.08	75.47	73.63	1.84	40.999		
400.00	400.00	400.50	400.50	1.35	1.21	109.64	-25.37	71.08	75.47	72.91	2.56	29.507 CC		
500.00	500.00	500.00	500.00	1.70	1.56	99.88	-25.79	71.19	75.79	72.53	3.26	23.221 ES		
600.00	599.93	597.90	597.83	2.06	1.89	104.30	-29.06	72.07	78.63	74.68	3.95	19.921		
700.00	699.68	695.06	694.76	2.43	2.22	112.03	-35.48	73.80	85.59	80.95	4.64	18.448 SF		
800.00	799.13	790.58	789.78	2.79	2.56	121.13	-44.90	76.33	98.46	93.13	5.34	18.456		
900.00	898.20	883.97	882.31	3.16	2.90	129.76	-57.05	79.60	118.35	112.32	6.03	19.642		
1,000.00	997.18	975.50	972.56	3.54	3.26	136.48	-71.78	83.56	143.71	137.01	6.69	21.473		
1,100.00	1,096.17	1,065.18	1,060.47	3.92	3.63	141.36	-88.91	88.16	173.44	166.10	7.34	23.623		
1,200.00	1,195.16	1,152.90	1,145.87	4.31	4.00	144.93	-108.23	93.36	206.98	199.00	7.98	25.943		
1,300.00	1,294.14	1,240.50	1,230.53	4.71	4.40	147.61	-129.93	99.19	243.80	235.20	8.61	28.328		
1,400.00	1,393.13	1,332.58	1,319.34	5.10	4.83	149.72	-153.41	105.51	281.75	272.46	9.29	30.313		
1,500.00	1,492.12	1,424.66	1,408.16	5.49	5.27	151.33	-176.90	111.82	319.95	309.97	9.99	32.038		
1,600.00	1,591.10	1,516.75	1,496.97	5.89	5.72	152.60	-200.39	118.14	358.33	347.64	10.68	33.543		
1,700.00	1,690.09	1,608.83	1,585.79	6.29	6.18	153.63	-223.87	124.45	396.82	385.44	11.38	34.865		
1,800.00	1,789.08	1,700.91	1,674.60	6.69	6.64	154.47	-247.36	130.77	435.40	423.32	12.08	36.033		
1,900.00	1,888.06	1,793.00	1,763.41	7.09	7.10	155.18	-270.85	137.08	474.05	461.26	12.79	37.070		
2,000.00	1,987.05	1,885.08	1,852.23	7.49	7.57	155.78	-294.33	143.40	512.76	499.26	13.49	37.997		
2,100.00	2,086.04	1,977.16	1,941.04	7.89	8.04	156.30	-317.82	149.71	551.50	537.30	14.20	38.830		
2,200.00	2,185.02	2,069.25	2,029.85	8.29	8.51	156.74	-341.31	156.03	590.28	575.36	14.91	39.582		
2,300.00	2,284.01	2,161.33	2,118.67	8.69	8.98	157.14	-364.79	162.34	629.08	613.46	15.62	40.263		
2,400.00	2,383.00	2,253.41	2,207.48	9.09	9.45	157.49	-388.28	168.66	667.91	651.57	16.34	40.884		
2,500.01	2,481.98	2,345.50	2,296.29	9.49	9.93	157.79	-411.77	174.97	706.75	689.70	17.05	41.451		
2,600.01	2,580.97	2,437.58	2,385.11	9.90	10.41	158.07	-435.25	181.29	745.61	727.85	17.76	41.971		
2,700.01	2,679.96	2,529.66	2,473.92	10.30	10.88	158.32	-458.74	187.60	784.49	766.01	18.48	42.450		
2,800.01	2,778.95	2,621.75	2,562.73	10.70	11.36	158.55	-482.23	193.92	823.38	804.18	19.20	42.892		
2,900.01	2,877.93	2,713.83	2,651.55	11.10	11.84	158.75	-505.71	200.23	862.27	842.36	19.91	43.302		
3,000.01	2,976.92	2,805.91	2,740.36	11.51	12.32	158.94	-529.20	206.55	901.18	880.54	20.63	43.681		
3,100.01	3,075.91	2,898.00	2,829.17	11.91	12.80	159.12	-552.69	212.86	940.09	918.74	21.35	44.035		
3,200.01	3,174.89	2,990.08	2,917.99	12.31	13.28	159.27	-576.17	219.18	979.01	956.94	22.07	44.365		
3,300.01	3,273.88	3,082.16	3,006.80	12.71	13.76	159.42	-599.66	225.49	1,017.93	995.14	22.79	44.673		
3,400.01	3,372.87	3,174.25	3,095.62	13.12	14.24	159.56	-623.15	231.81	1,056.86	1,033.36	23.51	44.962		
3,500.01	3,471.85	3,266.33	3,184.43	13.52	14.72	159.68	-646.64	238.12	1,095.80	1,071.57	24.23	45.232		
3,600.01	3,570.84	3,358.41	3,273.24	13.93	15.21	159.80	-670.12	244.44	1,134.73	1,109.79	24.95	45.487		
3,700.01	3,669.83	3,450.50	3,362.06	14.33	15.69	159.91	-693.61	250.75	1,173.68	1,148.01	25.67	45.727		
3,800.01	3,768.81	3,542.58	3,450.87	14.73	16.17	160.01	-717.10	257.07	1,212.62	1,186.24	26.39	45.953		
3,900.01	3,867.80	3,634.66	3,539.68	15.14	16.65	160.11	-740.58	263.38	1,251.57	1,224.46	27.11	46.167		
4,000.01	3,966.79	3,726.75	3,628.50	15.54	17.14	160.20	-764.07	269.70	1,290.52	1,262.69	27.83	46.369		
4,100.01	4,065.77	3,818.83	3,717.31	15.94	17.62	160.29	-787.56	276.01	1,329.48	1,300.93	28.55	46.561		
4,200.01	4,164.76	3,910.91	3,806.12	16.35	18.10	160.37	-811.04	282.33	1,368.44	1,339.16	29.28	46.742		
4,300.01	4,263.75	4,003.00	3,894.94	16.75	18.59	160.44	-834.53	288.64	1,407.40	1,377.40	30.00	46.915		
4,400.01	4,362.73	4,095.08	3,983.75	17.16	19.07	160.51	-858.02	294.96	1,446.36	1,415.63	30.72	47.079		
4,500.01	4,461.72	4,187.16	4,072.56	17.56	19.55	160.58	-881.50	301.27	1,485.32	1,453.87	31.45	47.235		
4,600.01	4,560.71	4,279.25	4,161.38	17.96	20.04	160.65	-904.99	307.59	1,524.28	1,492.11	32.17	47.384		
4,700.01	4,659.69	4,371.33	4,250.19	18.37	20.52	160.71	-928.48	313.90	1,563.25	1,530.36	32.89	47.526		
4,800.01	4,758.68	4,463.42	4,339.00	18.77	21.01	160.77	-951.96	320.22	1,602.22	1,568.60	33.62	47.661		
4,900.01	4,857.67	4,555.50	4,427.82	19.18	21.49	160.82	-975.45	326.53	1,641.19	1,606.85	34.34	47.790		



Lonestar Consulting, LLC

Anticollision Report



Company:	Logos Operating LLC	Local Co-ordinate Reference:	Well Rosa Unit 645H - Slot B8
Project:	Rio Arriba, NM NAD83	TVD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Reference Site:	Rosa Unit 27	MD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Site Error:	0.00 ft	North Reference:	True
Reference Well:	Rosa Unit 645H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 ft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction
Reference Design:	Plan #4	Offset TVD Reference:	Offset Datum

Offset Design: Rosa Unit 27 - Rosa Unit 644H - OH - Plan #1													Offset Site Error:	0.00 ft
Survey Program: 0-MWD+HDGM													Offset Well Error:	0.00 ft
Reference	Offset	Semi Major Axis		Offset Wellbore Centre		Rule Assigned:		Distance		Minimum	Separation	Warning		
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)	Highside Toolface (°)	+N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Separation (ft)			
5,000.01	4,956.65	4,647.58	4,516.63	19.58	21.98	160.88	-998.94	332.85	1,680.16	1,645.09	35.07	47.914		
5,100.01	5,055.64	4,739.67	4,605.45	19.98	22.46	160.93	-1,022.42	339.16	1,719.13	1,683.34	35.79	48.033		
5,200.01	5,154.63	4,831.75	4,694.26	20.39	22.94	160.97	-1,045.91	345.48	1,758.10	1,721.58	36.52	48.146		
5,300.01	5,253.61	4,923.83	4,783.07	20.79	23.43	161.02	-1,069.40	351.79	1,797.07	1,759.83	37.24	48.255		
5,400.01	5,352.60	5,015.92	4,871.89	21.20	23.91	161.07	-1,092.88	358.11	1,836.05	1,798.08	37.97	48.359		
5,500.01	5,451.59	5,108.00	4,960.70	21.60	24.40	161.11	-1,116.37	364.42	1,875.02	1,836.33	38.69	48.459		
5,600.01	5,550.57	5,200.08	5,049.51	22.01	24.88	161.15	-1,139.86	370.74	1,914.00	1,874.58	39.42	48.555		
5,700.01	5,649.56	5,292.17	5,138.33	22.41	25.37	161.19	-1,163.34	377.05	1,952.98	1,912.83	40.15	48.648		
5,800.01	5,748.55	5,384.25	5,227.14	22.81	25.85	161.23	-1,186.83	383.37	1,991.95	1,951.08	40.87	48.737		
5,900.01	5,847.53	5,476.33	5,315.95	23.22	26.34	161.26	-1,210.32	389.68	2,030.93	1,989.33	41.60	48.822		
6,000.01	5,946.52	5,568.42	5,404.77	23.62	26.83	161.30	-1,233.81	396.00	2,069.91	2,027.59	42.33	48.904		
6,100.01	6,045.51	5,660.50	5,493.58	24.03	27.31	161.33	-1,257.29	402.31	2,108.89	2,065.84	43.05	48.984		
6,200.01	6,144.49	5,752.58	5,582.39	24.43	27.80	161.36	-1,280.78	408.63	2,147.87	2,104.09	43.78	49.060		
6,300.01	6,243.48	5,844.67	5,671.21	24.84	28.28	161.39	-1,304.27	414.94	2,186.85	2,142.35	44.51	49.134		
6,400.00	6,342.45	5,936.74	5,760.01	25.24	28.77	161.42	-1,327.75	421.26	2,225.83	2,180.59	45.24	49.205		
6,500.01	6,440.93	6,028.83	5,848.83	25.65	29.25	117.60	-1,351.24	427.57	2,263.76	2,217.78	45.97	49.240		
6,600.01	6,536.70	6,119.47	5,936.25	26.06	29.73	99.21	-1,374.36	433.79	2,298.89	2,252.17	46.73	49.199		
6,700.01	6,627.42	6,206.43	6,020.13	26.46	30.19	90.47	-1,396.54	439.75	2,330.82	2,283.33	47.49	49.082		
6,800.01	6,710.86	6,287.59	6,098.40	26.86	30.62	85.46	-1,417.24	445.32	2,359.41	2,311.14	48.27	48.879		
6,900.01	6,784.97	6,360.93	6,169.14	27.29	31.00	82.31	-1,435.94	450.35	2,384.78	2,335.68	49.10	48.570		
7,000.01	6,847.91	6,424.65	6,230.60	27.78	31.34	80.20	-1,452.20	454.72	2,407.21	2,357.19	50.02	48.121		
7,100.01	6,898.13	6,477.19	6,281.27	28.43	31.62	78.71	-1,465.60	458.32	2,427.06	2,375.97	51.09	47.506		
7,200.01	6,934.41	6,514.09	6,316.87	29.33	31.81	77.47	-1,475.01	460.66	2,444.66	2,392.36	52.30	46.743		
7,300.01	6,955.84	6,531.98	6,334.16	30.51	31.90	76.27	-1,479.58	461.20	2,460.33	2,406.70	53.63	45.874		
7,400.01	6,962.01	6,536.83	6,338.85	31.95	31.93	75.27	-1,480.82	461.26	2,474.16	2,419.07	55.10	44.907		
7,500.02	6,962.07	6,537.36	6,339.36	33.61	31.93	75.28	-1,480.96	461.26	2,489.61	2,432.92	56.70	43.912		
7,600.02	6,962.12	6,537.81	6,339.79	35.45	31.93	75.29	-1,481.07	461.27	2,508.96	2,450.54	58.42	42.950		
7,700.02	6,962.18	6,550.00	6,351.58	37.46	31.99	75.58	-1,484.18	461.23	2,532.16	2,471.83	60.33	41.975		
7,800.02	6,962.24	6,550.00	6,351.58	39.61	31.99	75.58	-1,484.18	461.23	2,559.01	2,496.83	62.18	41.157		
7,900.02	6,962.30	6,550.00	6,351.58	41.87	31.99	75.58	-1,484.18	461.23	2,589.44	2,525.39	64.05	40.429		
8,000.02	6,962.36	6,550.00	6,351.58	44.22	31.99	75.58	-1,484.18	461.23	2,623.34	2,557.42	65.92	39.796		
8,100.02	6,962.42	6,550.00	6,351.58	46.65	31.99	75.58	-1,484.18	461.23	2,660.56	2,592.79	67.77	39.261		
8,200.02	6,962.48	6,550.00	6,351.58	49.15	31.99	75.58	-1,484.18	461.23	2,700.98	2,631.40	69.57	38.821		
8,300.02	6,962.54	6,550.00	6,351.58	51.70	31.99	75.58	-1,484.18	461.23	2,744.44	2,673.11	71.33	38.473		
8,400.02	6,962.60	6,550.00	6,351.58	54.31	31.99	75.58	-1,484.18	461.23	2,790.82	2,717.78	73.03	38.213		
8,500.02	6,962.65	6,550.00	6,351.58	56.95	31.99	75.58	-1,484.18	461.23	2,839.95	2,765.29	74.67	38.034		
8,600.02	6,962.71	6,550.00	6,351.58	59.64	31.99	75.58	-1,484.18	461.23	2,891.72	2,815.48	76.23	37.932		
8,700.02	6,962.77	6,550.00	6,351.58	62.35	31.99	75.58	-1,484.18	461.23	2,945.97	2,868.24	77.73	37.901		
8,800.02	6,962.83	6,550.00	6,351.58	65.09	31.99	75.58	-1,484.18	461.23	3,002.57	2,923.42	79.15	37.936		
8,900.02	6,962.89	6,550.00	6,351.58	67.86	31.99	75.58	-1,484.18	461.23	3,061.39	2,980.89	80.50	38.032		
9,000.02	6,962.95	6,550.00	6,351.58	70.65	31.99	75.58	-1,484.18	461.23	3,122.31	3,040.53	81.77	38.183		
9,100.02	6,963.01	6,550.00	6,351.58	73.45	31.99	75.58	-1,484.18	461.23	3,185.20	3,102.22	82.98	38.386		
9,200.02	6,963.07	6,550.00	6,351.58	76.28	31.99	75.58	-1,484.18	461.23	3,249.95	3,165.84	84.12	38.637		
9,300.02	6,963.12	6,550.00	6,351.58	79.12	31.99	75.58	-1,484.18	461.23	3,316.45	3,231.27	85.19	38.931		
9,400.02	6,963.18	6,550.00	6,351.58	81.97	31.99	75.58	-1,484.18	461.23	3,384.61	3,298.41	86.20	39.265		
9,500.02	6,963.24	6,550.00	6,351.58	84.83	31.99	75.58	-1,484.18	461.23	3,454.31	3,367.16	87.15	39.637		
9,600.02	6,963.30	6,550.00	6,351.58	87.71	31.99	75.58	-1,484.18	461.23	3,525.47	3,437.43	88.04	40.042		
9,700.02	6,963.36	6,550.00	6,351.58	90.59	31.99	75.58	-1,484.18	461.23	3,598.00	3,509.12	88.89	40.479		
9,800.02	6,963.42	6,550.00	6,351.58	93.49	31.99	75.58	-1,484.18	461.23	3,671.83	3,582.15	89.68	40.945		
9,900.02	6,963.48	6,550.00	6,351.58	96.39	31.99	75.58	-1,484.18	461.23	3,746.87	3,656.45	90.42	41.438		



Lonestar Consulting, LLC

Anticollision Report



Company:	Logos Operating LLC	Local Co-ordinate Reference:	Well Rosa Unit 645H - Slot B8
Project:	Rio Arriba, NM NAD83	TVD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Reference Site:	Rosa Unit 27	MD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Site Error:	0.00 ft	North Reference:	True
Reference Well:	Rosa Unit 645H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 ft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction
Reference Design:	Plan #4	Offset TVD Reference:	Offset Datum

Offset Design: Rosa Unit 27 - Rosa Unit 644H - OH - Plan #1													Offset Site Error:	0.00 ft
Survey Program: 0-MWD+HDGM													Offset Well Error:	0.00 ft
Reference	Offset	Semi Major Axis		Offset Wellbore Centre		Rule Assigned:		Warning						
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)	Highside Toolface (°)	+N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Minimum Separation (ft)	Separation Factor		
10,000.02	6,963.54	6,550.00	6,351.58	99.30	31.99	75.58	-1,484.18	461.23	3,823.05	3,731.93	91.12	41.956		
10,100.02	6,963.60	6,550.00	6,351.58	102.22	31.99	75.58	-1,484.18	461.23	3,900.31	3,808.53	91.78	42.498		
10,200.02	6,963.65	6,550.00	6,351.58	105.14	31.99	75.58	-1,484.18	461.23	3,978.58	3,886.18	92.40	43.060		
10,300.02	6,963.71	6,550.00	6,351.58	108.07	31.99	75.58	-1,484.18	461.23	4,057.81	3,964.83	92.98	43.642		
10,400.02	6,963.77	6,550.00	6,351.58	111.00	31.99	75.58	-1,484.18	461.23	4,137.93	4,044.41	93.53	44.243		
10,500.02	6,963.83	6,550.00	6,351.58	113.94	31.99	75.58	-1,484.18	461.23	4,218.91	4,124.86	94.04	44.861		
10,600.02	6,963.89	6,550.00	6,351.58	116.88	31.99	75.58	-1,484.18	461.23	4,300.68	4,206.15	94.53	45.496		
10,700.02	6,963.95	6,550.00	6,351.58	119.83	31.99	75.58	-1,484.18	461.23	4,383.21	4,288.22	94.99	46.145		
10,800.02	6,964.01	6,550.00	6,351.58	122.78	31.99	75.58	-1,484.18	461.23	4,466.46	4,371.04	95.42	46.808		
10,900.02	6,964.07	6,550.00	6,351.58	125.73	31.99	75.58	-1,484.18	461.23	4,550.38	4,454.55	95.83	47.484		
11,000.02	6,964.12	6,550.00	6,351.58	128.69	31.99	75.58	-1,484.18	461.23	4,634.94	4,538.72	96.22	48.172		
11,100.02	6,964.18	6,550.00	6,351.58	131.65	31.99	75.58	-1,484.18	461.23	4,720.10	4,623.52	96.58	48.872		
11,200.02	6,964.24	6,550.00	6,351.58	134.62	31.99	75.58	-1,484.18	461.23	4,805.83	4,708.91	96.93	49.582		
11,300.02	6,964.30	6,550.00	6,351.58	137.58	31.99	75.58	-1,484.18	461.23	4,892.11	4,794.85	97.25	50.302		
11,400.02	6,964.36	6,550.00	6,351.58	140.55	31.99	75.58	-1,484.18	461.23	4,978.90	4,881.33	97.56	51.032		
11,500.02	6,964.42	6,550.00	6,351.58	143.52	31.99	75.58	-1,484.18	461.23	5,066.17	4,968.31	97.86	51.771		
11,600.02	6,964.48	6,550.00	6,351.58	146.50	31.99	75.58	-1,484.18	461.23	5,153.91	5,055.77	98.14	52.517		
11,700.02	6,964.54	6,550.00	6,351.58	149.47	31.99	75.58	-1,484.18	461.23	5,242.09	5,143.69	98.40	53.272		
11,800.02	6,964.60	6,550.00	6,351.58	152.45	31.99	75.58	-1,484.18	461.23	5,330.68	5,232.03	98.65	54.034		
11,900.02	6,964.65	6,550.00	6,351.58	155.43	31.99	75.58	-1,484.18	461.23	5,419.67	5,320.78	98.89	54.803		
12,000.02	6,964.71	6,550.00	6,351.58	158.41	31.99	75.58	-1,484.18	461.23	5,509.04	5,409.92	99.12	55.579		
12,100.02	6,964.77	6,550.00	6,351.58	161.39	31.99	75.58	-1,484.18	461.23	5,598.77	5,499.43	99.34	56.360		
12,200.02	6,964.83	6,550.00	6,351.58	164.38	31.99	75.58	-1,484.18	461.23	5,688.85	5,589.30	99.55	57.148		
12,300.02	6,964.89	6,550.00	6,351.58	167.36	31.99	75.58	-1,484.18	461.23	5,779.24	5,679.50	99.74	57.940		
12,400.03	6,964.95	6,550.00	6,351.58	170.35	31.99	75.58	-1,484.18	461.23	5,869.95	5,770.02	99.93	58.738		
12,500.03	6,965.01	6,550.00	6,351.58	173.34	31.99	75.58	-1,484.18	461.23	5,960.96	5,860.85	100.11	59.541		
12,600.03	6,965.07	6,550.00	6,351.58	176.33	31.99	75.58	-1,484.18	461.23	6,052.25	5,951.96	100.29	60.349		
12,700.03	6,965.12	6,550.00	6,351.58	179.32	31.99	75.58	-1,484.18	461.23	6,143.81	6,043.36	100.45	61.161		
12,800.03	6,965.18	6,550.00	6,351.58	182.31	31.99	75.58	-1,484.18	461.23	6,235.63	6,135.02	100.61	61.977		
12,900.03	6,965.24	6,550.00	6,351.58	185.31	31.99	75.58	-1,484.18	461.23	6,327.70	6,226.94	100.77	62.797		
13,000.03	6,965.30	6,550.00	6,351.58	188.30	31.99	75.58	-1,484.18	461.23	6,420.01	6,319.10	100.91	63.620		
13,100.03	6,965.36	6,550.00	6,351.58	191.30	31.99	75.58	-1,484.18	461.23	6,512.54	6,411.49	101.05	64.447		
13,200.03	6,965.42	6,550.00	6,351.58	194.29	31.99	75.58	-1,484.18	461.23	6,605.29	6,504.11	101.19	65.277		
13,300.03	6,965.48	6,550.00	6,351.58	197.29	31.99	75.58	-1,484.18	461.23	6,698.25	6,596.93	101.32	66.111		
13,400.03	6,965.54	6,550.00	6,351.58	200.29	31.99	75.58	-1,484.18	461.23	6,791.41	6,689.97	101.44	66.947		
13,500.03	6,965.60	6,550.00	6,351.58	203.29	31.99	75.58	-1,484.18	461.23	6,884.76	6,783.20	101.57	67.786		
13,600.03	6,965.65	6,550.00	6,351.58	206.29	31.99	75.58	-1,484.18	461.23	6,978.30	6,876.62	101.68	68.628		
13,700.03	6,965.71	6,550.00	6,351.58	209.29	31.99	75.58	-1,484.18	461.23	7,072.01	6,970.22	101.80	69.472		
13,800.03	6,965.77	6,550.00	6,351.58	212.29	31.99	75.58	-1,484.18	461.23	7,165.90	7,063.99	101.91	70.319		
13,900.03	6,965.83	6,550.00	6,351.58	215.29	31.99	75.58	-1,484.18	461.23	7,259.94	7,157.93	102.01	71.168		
14,000.03	6,965.89	6,550.00	6,351.58	218.29	31.99	75.58	-1,484.18	461.23	7,354.15	7,252.03	102.11	72.019		
14,100.03	6,965.95	6,550.00	6,351.58	221.30	31.99	75.58	-1,484.18	461.23	7,448.50	7,346.29	102.21	72.872		
14,200.03	6,966.01	6,550.00	6,351.58	224.30	31.99	75.58	-1,484.18	461.23	7,543.00	7,440.69	102.31	73.726		
14,300.03	6,966.07	6,550.00	6,351.58	227.30	31.99	75.58	-1,484.18	461.23	7,637.64	7,535.24	102.40	74.583		
14,400.03	6,966.12	6,550.00	6,351.58	230.31	31.99	75.58	-1,484.18	461.23	7,732.41	7,629.92	102.50	75.441		
14,500.03	6,966.18	6,550.00	6,351.58	233.32	31.99	75.58	-1,484.18	461.23	7,827.32	7,724.74	102.58	76.301		
14,600.03	6,966.24	6,550.00	6,351.58	236.32	31.99	75.58	-1,484.18	461.23	7,922.35	7,819.68	102.67	77.162		
14,700.03	6,966.30	6,550.00	6,351.58	239.33	31.99	75.58	-1,484.18	461.23	8,017.50	7,914.75	102.76	78.025		
14,800.03	6,966.36	6,550.00	6,351.58	242.33	31.99	75.58	-1,484.18	461.23	8,112.77	8,009.93	102.84	78.889		
14,900.03	6,966.42	6,550.00	6,351.58	245.34	31.99	75.58	-1,484.18	461.23	8,208.15	8,105.23	102.92	79.754		



Lonestar Consulting, LLC

Anticollision Report



Company:	Logos Operating LLC	Local Co-ordinate Reference:	Well Rosa Unit 645H - Slot B8
Project:	Rio Arriba, NM NAD83	TVD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Reference Site:	Rosa Unit 27	MD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Site Error:	0.00 ft	North Reference:	True
Reference Well:	Rosa Unit 645H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 ft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction
Reference Design:	Plan #4	Offset TVD Reference:	Offset Datum

Offset Design: Rosa Unit 27 - Rosa Unit 644H - OH - Plan #1													Offset Site Error:	0.00 ft	
Survey Program:		0-MWD+HDGM		Offset		Semi Major Axis		Offset Wellbore Centre		Rule Assigned:				Offset Well Error:	0.00 ft
Measured Depth	Vertical Depth	Measured Depth	Vertical Depth	Reference	Offset	Highside Toolface	+N/-S	+E/-W	Between Centres	Between Ellipses	Minimum Separation	Separation Factor	Warning		
(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(°)	(ft)	(ft)	(ft)	(ft)	(ft)				
15,000.03	6,966.48	6,550.00	6,351.58	248.35	31.99	75.58	-1,484.18	461.23	8,303.64	8,200.64	103.00	80.620			
15,100.03	6,966.54	6,550.00	6,351.58	251.36	31.99	75.58	-1,484.18	461.23	8,399.23	8,296.16	103.07	81.488			
15,200.03	6,966.60	6,550.00	6,351.58	254.37	31.99	75.58	-1,484.18	461.23	8,494.93	8,391.78	103.15	82.356			
15,300.03	6,966.65	6,550.00	6,351.58	257.38	31.99	75.58	-1,484.18	461.23	8,590.72	8,487.50	103.22	83.226			
15,400.03	6,966.71	6,550.00	6,351.58	260.39	31.99	75.58	-1,484.18	461.23	8,686.61	8,583.32	103.29	84.096			
15,500.03	6,966.77	6,550.00	6,351.58	263.40	31.99	75.58	-1,484.18	461.23	8,782.59	8,679.23	103.36	84.967			
15,600.03	6,966.83	6,550.00	6,351.58	266.41	31.99	75.58	-1,484.18	461.23	8,878.66	8,775.23	103.43	85.839			
15,700.03	6,966.89	6,550.00	6,351.58	269.42	31.99	75.58	-1,484.18	461.23	8,974.81	8,871.31	103.50	86.711			
15,800.03	6,966.95	6,550.00	6,351.58	272.43	31.99	75.58	-1,484.18	461.23	9,071.05	8,967.48	103.57	87.584			
15,900.03	6,967.01	6,550.00	6,351.58	275.44	31.99	75.58	-1,484.18	461.23	9,167.37	9,063.74	103.64	88.458			
16,000.03	6,967.07	6,550.00	6,351.58	278.45	31.99	75.58	-1,484.18	461.23	9,263.77	9,160.07	103.70	89.332			
16,100.03	6,967.12	6,550.00	6,351.58	281.46	31.99	75.58	-1,484.18	461.23	9,360.24	9,256.48	103.76	90.207			
16,200.03	6,967.18	6,550.00	6,351.58	284.47	31.99	75.58	-1,484.18	461.23	9,456.78	9,352.96	103.83	91.082			
16,300.03	6,967.24	6,550.00	6,351.58	287.49	31.99	75.58	-1,484.18	461.23	9,553.40	9,449.51	103.89	91.958			
16,400.03	6,967.30	6,550.00	6,351.58	290.50	31.99	75.58	-1,484.18	461.23	9,650.09	9,546.14	103.95	92.834			
16,500.03	6,967.36	6,550.00	6,351.58	293.51	31.99	75.58	-1,484.18	461.23	9,746.84	9,642.83	104.01	93.710			
16,600.03	6,967.42	6,550.00	6,351.58	296.52	31.99	75.58	-1,484.18	461.23	9,843.66	9,739.59	104.07	94.586			
16,700.03	6,967.48	6,550.00	6,351.58	299.54	31.99	75.58	-1,484.18	461.23	9,940.54	9,836.41	104.13	95.463			



Lonestar Consulting, LLC

Anticollision Report



Company:	Logos Operating LLC	Local Co-ordinate Reference:	Well Rosa Unit 645H - Slot B8
Project:	Rio Arriba, NM NAD83	TVD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Reference Site:	Rosa Unit 27	MD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Site Error:	0.00 ft	North Reference:	True
Reference Well:	Rosa Unit 645H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 ft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction
Reference Design:	Plan #4	Offset TVD Reference:	Offset Datum

Offset Design: Rosa Unit 27 - Rosa Unit 647H - OH - Plan #4													Offset Site Error:	0.00 ft
Survey Program: 0-MWD+HDGM													Offset Well Error:	0.00 ft
Reference	Offset	Semi Major Axis		Offset Wellbore Centre		Rule Assigned:		Warning						
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)	Highside Toolface (°)	+N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Minimum Separation (ft)	Separation Factor		
0.00	0.00	0.00	0.00	0.00	0.00	-167.15	-8.76	-2.00	8.99					
100.00	100.00	100.00	100.00	0.27	0.27	-167.15	-8.76	-2.00	8.99	8.45	0.54	16.602		
200.00	200.00	200.00	200.00	0.63	0.63	-167.15	-8.76	-2.00	8.99	7.73	1.26	7.142		
300.00	300.00	300.00	300.00	0.99	0.99	-167.15	-8.76	-2.00	8.99	7.01	1.98	4.550		
400.00	400.00	400.00	400.00	1.35	1.35	-167.15	-8.76	-2.00	8.99	6.29	2.69	3.338 CC		
404.45	404.45	404.45	404.45	1.36	1.36	-177.50	-8.76	-2.00	8.99	6.26	2.72	3.300		
500.00	500.00	500.00	500.00	1.70	1.70	-177.61	-8.76	-2.00	9.42	6.01	3.41	2.764 ES, SF		
600.00	599.93	599.93	599.93	2.06	2.06	-178.26	-8.76	-2.00	12.91	8.78	4.13	3.128		
700.00	699.68	699.68	699.68	2.43	2.42	-178.86	-8.76	-2.00	19.88	15.04	4.85	4.101		
800.00	799.13	799.13	799.13	2.79	2.78	-179.25	-8.76	-2.00	30.33	24.77	5.57	5.448		
900.00	898.20	896.73	896.72	3.16	3.11	179.95	-10.39	-1.85	45.55	39.28	6.27	7.265		
1,000.00	997.18	993.11	992.97	3.54	3.43	178.79	-15.24	-1.42	64.57	57.63	6.94	9.307		
1,100.00	1,096.17	1,088.17	1,087.68	3.92	3.75	177.65	-23.19	-0.72	86.79	79.20	7.60	11.423		
1,200.00	1,195.16	1,181.71	1,180.59	4.31	4.07	176.62	-34.05	0.25	112.16	103.92	8.25	13.600		
1,300.00	1,294.14	1,273.60	1,271.44	4.71	4.40	175.73	-47.67	1.45	140.61	131.73	8.88	15.829		
1,400.00	1,393.13	1,363.67	1,360.04	5.10	4.74	174.95	-63.82	2.89	172.06	162.55	9.51	18.102		
1,500.00	1,492.12	1,451.83	1,446.22	5.49	5.08	174.27	-82.31	4.53	206.42	196.32	10.11	20.423		
1,600.00	1,591.10	1,537.96	1,529.82	5.89	5.43	173.68	-102.91	6.36	243.61	232.91	10.70	22.767		
1,700.00	1,690.09	1,621.98	1,610.75	6.29	5.79	173.16	-125.42	8.35	283.53	272.25	11.27	25.149		
1,800.00	1,789.08	1,710.41	1,695.38	6.69	6.20	172.69	-150.95	10.62	325.42	313.50	11.92	27.311		
1,900.00	1,888.06	1,801.14	1,782.19	7.09	6.62	172.32	-177.23	12.95	367.43	354.83	12.59	29.180		
2,000.00	1,987.05	1,891.86	1,868.99	7.49	7.05	172.02	-203.52	15.28	409.44	396.17	13.27	30.847		
2,100.00	2,086.04	1,982.59	1,955.79	7.89	7.50	171.77	-229.80	17.61	451.47	437.51	13.96	32.342		
2,200.00	2,185.02	2,073.31	2,042.60	8.29	7.95	171.57	-256.08	19.95	493.50	478.85	14.65	33.691		
2,300.00	2,284.01	2,164.04	2,129.40	8.69	8.40	171.40	-282.37	22.28	535.54	520.20	15.34	34.911		
2,400.00	2,383.00	2,254.76	2,216.20	9.09	8.87	171.26	-308.65	24.61	577.58	561.54	16.03	36.021		
2,500.01	2,481.98	2,345.49	2,303.01	9.49	9.33	171.13	-334.94	26.94	619.62	602.89	16.73	37.033		
2,600.01	2,580.97	2,436.21	2,389.81	9.90	9.80	171.02	-361.22	29.28	661.66	644.23	17.43	37.961		
2,700.01	2,679.96	2,526.94	2,476.61	10.30	10.27	170.92	-387.51	31.61	703.71	685.58	18.13	38.813		
2,800.01	2,778.95	2,617.66	2,563.41	10.70	10.75	170.84	-413.79	33.94	745.75	726.92	18.83	39.599		
2,900.01	2,877.93	2,708.39	2,650.22	11.10	11.23	170.76	-440.08	36.27	787.80	768.27	19.54	40.325		
3,000.01	2,976.92	2,799.12	2,737.02	11.51	11.71	170.69	-466.36	38.60	829.85	809.61	20.24	40.998		
3,100.01	3,075.91	2,889.84	2,823.82	11.91	12.19	170.63	-492.65	40.94	871.90	850.96	20.95	41.624		
3,200.01	3,174.89	2,980.57	2,910.63	12.31	12.67	170.57	-518.93	43.27	913.95	892.30	21.65	42.207		
3,300.01	3,273.88	3,071.29	2,997.43	12.71	13.16	170.52	-545.21	45.60	956.00	933.64	22.36	42.751		
3,400.01	3,372.87	3,162.02	3,084.23	13.12	13.64	170.47	-571.50	47.93	998.06	974.99	23.07	43.260		
3,500.01	3,471.85	3,252.74	3,171.04	13.52	14.13	170.43	-597.78	50.27	1,040.11	1,016.33	23.78	43.737		
3,600.01	3,570.84	3,343.47	3,257.84	13.93	14.62	170.39	-624.07	52.60	1,082.16	1,057.67	24.49	44.185		
3,700.01	3,669.83	3,434.19	3,344.64	14.33	15.11	170.35	-650.35	54.93	1,124.22	1,099.01	25.20	44.607		
3,800.01	3,768.81	3,524.92	3,431.45	14.73	15.60	170.32	-676.64	57.26	1,166.27	1,140.36	25.91	45.004		
3,900.01	3,867.80	3,615.65	3,518.25	15.14	16.09	170.29	-702.92	59.60	1,208.33	1,181.70	26.63	45.379		
4,000.01	3,966.79	3,706.37	3,605.05	15.54	16.58	170.26	-729.21	61.93	1,250.38	1,223.04	27.34	45.734		
4,100.01	4,065.77	3,797.10	3,691.86	15.94	17.07	170.23	-755.49	64.26	1,292.43	1,264.38	28.05	46.069		
4,200.01	4,164.76	3,887.82	3,778.66	16.35	17.57	170.20	-781.77	66.59	1,334.49	1,305.72	28.77	46.387		
4,300.01	4,263.75	3,978.55	3,865.46	16.75	18.06	170.18	-808.06	68.92	1,376.54	1,347.06	29.48	46.689		
4,400.01	4,362.73	4,069.27	3,952.27	17.16	18.55	170.16	-834.34	71.26	1,418.60	1,388.40	30.20	46.976		
4,500.01	4,461.72	4,160.00	4,039.07	17.56	19.05	170.14	-860.63	73.59	1,460.66	1,429.74	30.91	47.249		
4,600.01	4,560.71	4,250.72	4,125.87	17.96	19.54	170.11	-886.91	75.92	1,502.71	1,471.08	31.63	47.508		
4,700.01	4,659.69	4,341.45	4,212.68	18.37	20.04	170.10	-913.20	78.25	1,544.77	1,512.42	32.35	47.756		
4,800.01	4,758.68	4,432.17	4,299.48	18.77	20.53	170.08	-939.48	80.59	1,586.82	1,553.76	33.06	47.992		



Lonestar Consulting, LLC

Anticollision Report



Company:	Logos Operating LLC	Local Co-ordinate Reference:	Well Rosa Unit 645H - Slot B8
Project:	Rio Arriba, NM NAD83	TVD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Reference Site:	Rosa Unit 27	MD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Site Error:	0.00 ft	North Reference:	True
Reference Well:	Rosa Unit 645H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 ft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction
Reference Design:	Plan #4	Offset TVD Reference:	Offset Datum

Offset Design: Rosa Unit 27 - Rosa Unit 647H - OH - Plan #4													Offset Site Error:	0.00 ft
Survey Program: 0-MWD+HDGM													Offset Well Error:	0.00 ft
Reference		Offset		Semi Major Axis		Highside Toolface (°)	Offset Wellbore Centre		Distance		Minimum Separation (ft)	Separation Factor	Warning	
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)		+N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)				
4,900.01	4,857.67	4,522.90	4,386.28	19.18	21.03	170.06	-965.77	82.92	1,628.88	1,595.10	33.78	48.218		
5,000.01	4,956.65	4,613.63	4,473.09	19.58	21.53	170.04	-992.05	85.25	1,670.94	1,636.44	34.50	48.434		
5,100.01	5,055.64	4,704.35	4,559.89	19.98	22.02	170.03	-1,018.33	87.58	1,712.99	1,677.78	35.22	48.641		
5,200.01	5,154.63	4,795.08	4,646.69	20.39	22.52	170.01	-1,044.62	89.92	1,755.05	1,719.11	35.94	48.838		
5,300.01	5,253.61	4,885.80	4,733.50	20.79	23.02	170.00	-1,070.90	92.25	1,797.11	1,760.45	36.65	49.028		
5,400.01	5,352.60	4,976.53	4,820.30	21.20	23.52	169.98	-1,097.19	94.58	1,839.16	1,801.79	37.37	49.210		
5,500.01	5,451.59	5,067.25	4,907.10	21.60	24.01	169.97	-1,123.47	96.91	1,881.22	1,843.13	38.09	49.384		
5,600.01	5,550.57	5,157.98	4,993.91	22.01	24.51	169.96	-1,149.76	99.24	1,923.28	1,884.46	38.81	49.551		
5,700.01	5,649.56	5,248.70	5,080.71	22.41	25.01	169.95	-1,176.04	101.58	1,965.33	1,925.80	39.53	49.712		
5,800.01	5,748.55	5,339.43	5,167.51	22.81	25.51	169.94	-1,202.33	103.91	2,007.39	1,967.14	40.25	49.867		
5,900.01	5,847.53	5,430.16	5,254.32	23.22	26.01	169.92	-1,228.61	106.24	2,049.45	2,008.47	40.98	50.016		
6,000.01	5,946.52	5,520.88	5,341.12	23.62	26.51	169.91	-1,254.89	108.57	2,091.51	2,049.81	41.70	50.160		
6,100.01	6,045.51	5,611.61	5,427.92	24.03	27.00	169.90	-1,281.18	110.91	2,133.56	2,091.14	42.42	50.298		
6,200.01	6,144.49	5,702.33	5,514.73	24.43	27.50	169.89	-1,307.46	113.24	2,175.62	2,132.48	43.14	50.431		
6,300.01	6,243.48	5,793.06	5,601.53	24.84	28.00	169.89	-1,333.75	115.57	2,217.68	2,173.81	43.86	50.559		
6,400.00	6,342.45	5,883.77	5,688.32	25.24	28.50	169.88	-1,360.03	117.90	2,259.73	2,215.14	44.59	50.683		
6,500.01	6,440.93	5,974.21	5,774.85	25.65	29.00	125.52	-1,386.23	120.23	2,301.67	2,256.36	45.31	50.794		
6,600.01	6,536.70	6,062.57	5,859.39	26.06	29.49	106.36	-1,411.83	122.50	2,342.82	2,296.77	46.04	50.882		
6,700.01	6,627.42	6,146.68	5,939.87	26.46	29.95	96.67	-1,436.20	124.66	2,382.58	2,335.81	46.77	50.941		
6,800.01	6,710.86	6,224.48	6,014.30	26.86	30.38	90.58	-1,458.74	126.66	2,420.61	2,373.11	47.50	50.957		
6,900.01	6,784.97	6,294.05	6,080.86	27.29	30.76	86.25	-1,478.89	128.45	2,456.77	2,408.50	48.27	50.899		
7,000.01	6,847.91	6,353.68	6,137.91	27.78	31.09	82.90	-1,496.17	129.98	2,491.01	2,441.91	49.11	50.728		
7,100.01	6,898.13	6,401.89	6,184.04	28.43	31.36	80.12	-1,510.14	131.22	2,523.35	2,473.28	50.06	50.404		
7,200.01	6,934.41	6,437.51	6,218.12	29.33	31.55	77.67	-1,520.45	132.14	2,553.73	2,502.57	51.17	49.908		
7,300.01	6,955.84	6,459.65	6,239.30	30.51	31.67	75.42	-1,526.87	132.71	2,582.05	2,529.63	52.42	49.257		
7,400.01	6,962.01	6,467.85	6,247.15	31.95	31.72	73.55	-1,529.25	132.92	2,608.05	2,554.28	53.78	48.499		
7,500.02	6,962.07	6,470.48	6,249.66	33.61	31.73	73.61	-1,530.01	132.99	2,635.20	2,579.96	55.24	47.701		
7,600.02	6,962.12	7,790.62	6,957.24	35.45	40.88	89.89	-1,745.34	989.90	2,635.56	2,564.57	70.99	37.125		
7,700.02	6,962.18	7,890.62	6,957.34	37.46	42.42	89.89	-1,745.50	1,089.90	2,635.73	2,560.62	75.11	35.092		
7,800.02	6,962.24	7,990.62	6,957.45	39.61	44.16	89.90	-1,745.66	1,189.90	2,635.90	2,556.42	79.47	33.167		
7,900.02	6,962.30	8,090.62	6,957.56	41.87	46.08	89.90	-1,745.82	1,289.90	2,636.07	2,552.02	84.05	31.363		
8,000.02	6,962.36	8,190.62	6,957.67	44.22	48.14	89.90	-1,745.98	1,389.90	2,636.24	2,547.44	88.80	29.687		
8,100.02	6,962.42	8,290.62	6,957.77	46.65	50.32	89.90	-1,746.14	1,489.90	2,636.41	2,542.70	93.70	28.136		
8,200.02	6,962.48	8,390.62	6,957.88	49.15	52.61	89.90	-1,746.30	1,589.90	2,636.57	2,537.84	98.73	26.704		
8,300.02	6,962.54	8,490.62	6,957.99	51.70	54.98	89.90	-1,746.46	1,689.89	2,636.74	2,532.87	103.87	25.385		
8,400.02	6,962.60	8,590.62	6,958.10	54.31	57.42	89.90	-1,746.62	1,789.89	2,636.91	2,527.81	109.10	24.169		
8,500.02	6,962.65	8,690.62	6,958.21	56.95	59.92	89.90	-1,746.79	1,889.89	2,637.08	2,522.66	114.42	23.048		
8,600.02	6,962.71	8,790.62	6,958.31	59.64	62.48	89.90	-1,746.95	1,989.89	2,637.25	2,517.45	119.80	22.014		
8,700.02	6,962.77	8,890.62	6,958.42	62.35	65.08	89.91	-1,747.11	2,089.89	2,637.42	2,512.17	125.24	21.058		
8,800.02	6,962.83	8,990.62	6,958.53	65.09	67.72	89.91	-1,747.27	2,189.89	2,637.59	2,506.85	130.74	20.174		
8,900.02	6,962.89	9,090.62	6,958.64	67.86	70.39	89.91	-1,747.43	2,289.89	2,637.76	2,501.47	136.29	19.354		
9,000.02	6,962.95	9,190.62	6,958.75	70.65	73.10	89.91	-1,747.59	2,389.89	2,637.93	2,496.05	141.87	18.593		
9,100.02	6,963.01	9,290.62	6,958.85	73.45	75.83	89.91	-1,747.75	2,489.89	2,638.09	2,490.60	147.50	17.886		
9,200.02	6,963.07	9,390.62	6,958.96	76.28	78.58	89.91	-1,747.91	2,589.89	2,638.26	2,485.11	153.15	17.226		
9,300.02	6,963.12	9,490.62	6,959.07	79.12	81.36	89.91	-1,748.07	2,689.89	2,638.43	2,479.59	158.84	16.611		
9,400.02	6,963.18	9,590.62	6,959.18	81.97	84.15	89.91	-1,748.23	2,789.89	2,638.60	2,474.05	164.55	16.035		
9,500.02	6,963.24	9,690.62	6,959.28	84.83	86.96	89.91	-1,748.39	2,889.89	2,638.77	2,468.49	170.28	15.496		
9,600.02	6,963.30	9,790.62	6,959.39	87.71	89.78	89.92	-1,748.56	2,989.89	2,638.94	2,462.90	176.04	14.991		
9,700.02	6,963.36	9,890.62	6,959.50	90.59	92.62	89.92	-1,748.72	3,089.89	2,639.11	2,457.29	181.81	14.515		
9,800.02	6,963.42	9,990.62	6,959.61	93.49	95.47	89.92	-1,748.88	3,189.89	2,639.28	2,451.67	187.61	14.068		



Lonestar Consulting, LLC

Anticollision Report



Company:	Logos Operating LLC	Local Co-ordinate Reference:	Well Rosa Unit 645H - Slot B8
Project:	Rio Arriba, NM NAD83	TVD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Reference Site:	Rosa Unit 27	MD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Site Error:	0.00 ft	North Reference:	True
Reference Well:	Rosa Unit 645H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 ft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction
Reference Design:	Plan #4	Offset TVD Reference:	Offset Datum

Offset Design: Rosa Unit 27 - Rosa Unit 647H - OH - Plan #4													Offset Site Error:	0.00 ft
Survey Program: 0-MWD+HDGM													Offset Well Error:	0.00 ft
Reference	Offset	Semi Major Axis		Offset Wellbore Centre		Rule Assigned:		Distance		Minimum	Separation	Warning		
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)	Highside Toolface (°)	+N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Separation (ft)			
9,900.02	6,963.48	10,090.62	6,959.72	96.39	98.33	89.92	-1,749.04	3,289.89	2,639.45	2,446.03	193.42	13.647		
10,000.02	6,963.54	10,190.62	6,959.82	99.30	101.20	89.92	-1,749.20	3,389.89	2,639.61	2,440.38	199.24	13.249		
10,100.02	6,963.60	10,290.62	6,959.93	102.22	104.08	89.92	-1,749.36	3,489.89	2,639.78	2,434.71	205.07	12.872		
10,200.02	6,963.65	10,390.62	6,960.04	105.14	106.97	89.92	-1,749.52	3,589.89	2,639.95	2,429.03	210.92	12.516		
10,300.02	6,963.71	10,490.62	6,960.15	108.07	109.87	89.92	-1,749.68	3,689.89	2,640.12	2,423.34	216.78	12.179		
10,400.02	6,963.77	10,590.62	6,960.26	111.00	112.77	89.92	-1,749.84	3,789.89	2,640.29	2,417.64	222.65	11.858		
10,500.02	6,963.83	10,690.62	6,960.36	113.94	115.68	89.92	-1,750.00	3,889.89	2,640.46	2,411.93	228.53	11.554		
10,600.02	6,963.89	10,790.62	6,960.47	116.88	118.60	89.93	-1,750.16	3,989.89	2,640.63	2,406.21	234.42	11.265		
10,700.02	6,963.95	10,890.62	6,960.58	119.83	121.52	89.93	-1,750.32	4,089.89	2,640.80	2,400.48	240.32	10.989		
10,800.02	6,964.01	10,990.62	6,960.69	122.78	124.44	89.93	-1,750.49	4,189.89	2,640.97	2,394.75	246.22	10.726		
10,900.02	6,964.07	11,090.62	6,960.79	125.73	127.38	89.93	-1,750.65	4,289.89	2,641.13	2,389.00	252.13	10.475		
11,000.02	6,964.12	11,190.62	6,960.90	128.69	130.31	89.93	-1,750.81	4,389.89	2,641.30	2,383.26	258.05	10.236		
11,100.02	6,964.18	11,290.62	6,961.01	131.65	133.25	89.93	-1,750.97	4,489.89	2,641.47	2,377.50	263.97	10.007		
11,200.02	6,964.24	11,390.62	6,961.12	134.62	136.19	89.93	-1,751.13	4,589.89	2,641.64	2,371.74	269.90	9.787		
11,300.02	6,964.30	11,490.62	6,961.23	137.58	139.14	89.93	-1,751.29	4,689.89	2,641.81	2,365.98	275.84	9.577		
11,400.02	6,964.36	11,590.62	6,961.33	140.55	142.09	89.93	-1,751.45	4,789.89	2,641.98	2,360.20	281.77	9.376		
11,500.02	6,964.42	11,690.62	6,961.44	143.52	145.05	89.94	-1,751.61	4,889.89	2,642.15	2,354.43	287.72	9.183		
11,600.02	6,964.48	11,790.62	6,961.55	146.50	148.00	89.94	-1,751.77	4,989.89	2,642.32	2,348.65	293.67	8.998		
11,700.02	6,964.54	11,890.62	6,961.66	149.47	150.96	89.94	-1,751.93	5,089.89	2,642.49	2,342.87	299.62	8.819		
11,800.02	6,964.60	11,990.62	6,961.77	152.45	153.93	89.94	-1,752.09	5,189.89	2,642.65	2,337.08	305.58	8.648		
11,900.02	6,964.65	12,090.62	6,961.87	155.43	156.89	89.94	-1,752.26	5,289.89	2,642.82	2,331.29	311.54	8.483		
12,000.02	6,964.71	12,190.62	6,961.98	158.41	159.86	89.94	-1,752.42	5,389.89	2,642.99	2,325.49	317.50	8.324		
12,100.02	6,964.77	12,290.62	6,962.09	161.39	162.83	89.94	-1,752.58	5,489.89	2,643.16	2,319.69	323.47	8.171		
12,200.02	6,964.83	12,390.62	6,962.20	164.38	165.80	89.94	-1,752.74	5,589.89	2,643.33	2,313.89	329.44	8.024		
12,300.02	6,964.89	12,490.62	6,962.30	167.36	168.77	89.94	-1,752.90	5,689.89	2,643.50	2,308.09	335.41	7.881		
12,400.03	6,964.95	12,590.62	6,962.41	170.35	171.75	89.95	-1,753.06	5,789.89	2,643.67	2,302.28	341.39	7.744		
12,500.03	6,965.01	12,690.62	6,962.52	173.34	174.72	89.95	-1,753.22	5,889.89	2,643.84	2,296.47	347.37	7.611		
12,600.03	6,965.07	12,790.62	6,962.63	176.33	177.70	89.95	-1,753.38	5,989.89	2,644.01	2,290.66	353.35	7.483		
12,700.03	6,965.12	12,890.62	6,962.74	179.32	180.68	89.95	-1,753.54	6,089.89	2,644.18	2,284.84	359.33	7.359		
12,800.03	6,965.18	12,990.62	6,962.84	182.31	183.67	89.95	-1,753.70	6,189.89	2,644.34	2,279.03	365.32	7.239		
12,900.03	6,965.24	13,090.62	6,962.95	185.31	186.65	89.95	-1,753.86	6,289.89	2,644.51	2,273.21	371.30	7.122		
13,000.03	6,965.30	13,190.62	6,963.06	188.30	189.63	89.95	-1,754.02	6,389.89	2,644.68	2,267.39	377.29	7.010		
13,100.03	6,965.36	13,290.62	6,963.17	191.30	192.62	89.95	-1,754.19	6,489.89	2,644.85	2,261.57	383.29	6.900		
13,200.03	6,965.42	13,390.62	6,963.28	194.29	195.61	89.95	-1,754.35	6,589.89	2,645.02	2,255.74	389.28	6.795		
13,300.03	6,965.48	13,490.62	6,963.38	197.29	198.60	89.95	-1,754.51	6,689.89	2,645.19	2,249.91	395.27	6.692		
13,400.03	6,965.54	13,590.62	6,963.49	200.29	201.59	89.96	-1,754.67	6,789.89	2,645.36	2,244.09	401.27	6.592		
13,500.03	6,965.60	13,690.62	6,963.60	203.29	204.58	89.96	-1,754.83	6,889.89	2,645.53	2,238.26	407.27	6.496		
13,600.03	6,965.65	13,790.62	6,963.71	206.29	207.57	89.96	-1,754.99	6,989.89	2,645.70	2,232.42	413.27	6.402		
13,700.03	6,965.71	13,890.62	6,963.81	209.29	210.56	89.96	-1,755.15	7,089.89	2,645.86	2,226.59	419.27	6.311		
13,800.03	6,965.77	13,990.62	6,963.92	212.29	213.55	89.96	-1,755.31	7,189.89	2,646.03	2,220.76	425.28	6.222		
13,900.03	6,965.83	14,090.62	6,964.03	215.29	216.55	89.96	-1,755.47	7,289.89	2,646.20	2,214.92	431.28	6.136		
14,000.03	6,965.89	14,190.62	6,964.14	218.29	219.54	89.96	-1,755.63	7,389.89	2,646.37	2,209.09	437.29	6.052		
14,100.03	6,965.95	14,290.63	6,964.25	221.30	222.54	89.96	-1,755.79	7,489.89	2,646.54	2,203.25	443.29	5.970		
14,200.03	6,966.01	14,390.63	6,964.35	224.30	225.54	89.96	-1,755.96	7,589.89	2,646.71	2,197.41	449.30	5.891		
14,300.03	6,966.07	14,490.63	6,964.46	227.30	228.54	89.97	-1,756.12	7,689.89	2,646.88	2,191.57	455.31	5.813		
14,400.03	6,966.12	14,590.63	6,964.57	230.31	231.54	89.97	-1,756.28	7,789.89	2,647.05	2,185.73	461.32	5.738		
14,500.03	6,966.18	14,690.63	6,964.68	233.32	234.53	89.97	-1,756.44	7,889.89	2,647.22	2,179.88	467.33	5.665		
14,600.03	6,966.24	14,790.63	6,964.79	236.32	237.53	89.97	-1,756.60	7,989.89	2,647.38	2,174.04	473.35	5.593		
14,700.03	6,966.30	14,890.63	6,964.89	239.33	240.54	89.97	-1,756.76	8,089.89	2,647.55	2,168.19	479.36	5.523		
14,800.03	6,966.36	14,990.63	6,965.00	242.33	243.54	89.97	-1,756.92	8,189.89	2,647.72	2,162.35	485.37	5.455		



Lonestar Consulting, LLC

Anticollision Report



Company:	Logos Operating LLC	Local Co-ordinate Reference:	Well Rosa Unit 645H - Slot B8
Project:	Rio Arriba, NM NAD83	TVD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Reference Site:	Rosa Unit 27	MD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Site Error:	0.00 ft	North Reference:	True
Reference Well:	Rosa Unit 645H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 ft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction
Reference Design:	Plan #4	Offset TVD Reference:	Offset Datum

Offset Design: Rosa Unit 27 - Rosa Unit 647H - OH - Plan #4													Offset Site Error:	0.00 ft
Survey Program: 0-MWD+HDGM													Offset Well Error:	0.00 ft
Reference	Offset	Semi Major Axis		Offset Wellbore Centre		Distance		Rule Assigned:		Warning				
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)	Highside Toolface (°)	+N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Minimum Separation (ft)	Separation Factor		
14,900.03	6,966.42	15,090.63	6,965.11	245.34	246.54	89.97	-1,757.08	8,289.89	2,647.89	2,156.50	491.39	5.389		
15,000.03	6,966.48	15,190.63	6,965.22	248.35	249.54	89.97	-1,757.24	8,389.89	2,648.06	2,150.65	497.41	5.324		
15,100.03	6,966.54	15,290.63	6,965.32	251.36	252.54	89.97	-1,757.40	8,489.89	2,648.23	2,144.81	503.42	5.260		
15,200.03	6,966.60	15,390.63	6,965.43	254.37	255.55	89.97	-1,757.56	8,589.89	2,648.40	2,138.96	509.44	5.199		
15,300.03	6,966.65	15,490.63	6,965.54	257.38	258.55	89.98	-1,757.73	8,689.89	2,648.57	2,133.11	515.46	5.138		
15,400.03	6,966.71	15,590.63	6,965.65	260.39	261.56	89.98	-1,757.89	8,789.88	2,648.74	2,127.26	521.48	5.079		
15,500.03	6,966.77	15,690.63	6,965.76	263.40	264.56	89.98	-1,758.05	8,889.88	2,648.91	2,121.40	527.50	5.022		
15,600.03	6,966.83	15,790.63	6,965.86	266.41	267.57	89.98	-1,758.21	8,989.88	2,649.07	2,115.55	533.52	4.965		
15,700.03	6,966.89	15,890.63	6,965.97	269.42	270.57	89.98	-1,758.37	9,089.88	2,649.24	2,109.70	539.54	4.910		
15,800.03	6,966.95	15,990.63	6,966.08	272.43	273.58	89.98	-1,758.53	9,189.88	2,649.41	2,103.85	545.57	4.856		
15,900.03	6,967.01	16,090.63	6,966.19	275.44	276.59	89.98	-1,758.69	9,289.88	2,649.58	2,097.99	551.59	4.804		
16,000.03	6,967.07	16,190.63	6,966.30	278.45	279.60	89.98	-1,758.85	9,389.88	2,649.75	2,092.14	557.61	4.752		
16,100.03	6,967.12	16,290.63	6,966.40	281.46	282.60	89.98	-1,759.01	9,489.88	2,649.92	2,086.28	563.64	4.701		
16,200.03	6,967.18	16,390.63	6,966.51	284.47	285.61	89.99	-1,759.17	9,589.88	2,650.09	2,080.43	569.66	4.652		
16,300.03	6,967.24	16,490.63	6,966.62	287.49	288.62	89.99	-1,759.33	9,689.88	2,650.26	2,074.57	575.69	4.604		
16,400.03	6,967.30	16,590.63	6,966.73	290.50	291.63	89.99	-1,759.49	9,789.88	2,650.43	2,068.71	581.71	4.556		
16,500.03	6,967.36	16,690.63	6,966.83	293.51	294.64	89.99	-1,759.66	9,889.88	2,650.60	2,062.85	587.74	4.510		
16,600.03	6,967.42	16,790.63	6,966.94	296.52	297.65	89.99	-1,759.82	9,989.88	2,650.76	2,057.00	593.77	4.464		
16,700.03	6,967.48	16,890.63	6,967.05	299.54	300.66	89.99	-1,759.98	10,089.88	2,650.93	2,051.14	599.80	4.420		
16,800.03	6,967.54	16,990.63	6,967.16	302.55	303.67	89.99	-1,760.14	10,189.88	2,651.10	2,045.28	605.82	4.376		
16,900.03	6,967.60	17,090.63	6,967.27	305.57	306.68	89.99	-1,760.30	10,289.88	2,651.27	2,039.42	611.85	4.333		
17,000.03	6,967.65	17,190.63	6,967.37	308.58	309.69	89.99	-1,760.46	10,389.88	2,651.44	2,033.56	617.88	4.291		
17,100.03	6,967.71	17,290.63	6,967.48	311.59	312.70	90.00	-1,760.62	10,489.88	2,651.61	2,027.70	623.91	4.250		
17,200.03	6,967.77	17,390.63	6,967.59	314.61	315.71	90.00	-1,760.78	10,589.88	2,651.78	2,021.84	629.94	4.210		
17,300.03	6,967.83	17,490.63	6,967.70	317.62	318.73	90.00	-1,760.94	10,689.88	2,651.95	2,015.98	635.97	4.170		
17,400.04	6,967.89	17,590.63	6,967.81	320.64	321.74	90.00	-1,761.10	10,789.88	2,652.12	2,010.11	642.00	4.131		
17,500.04	6,967.95	17,690.63	6,967.91	323.65	324.75	90.00	-1,761.26	10,889.88	2,652.28	2,004.25	648.03	4.093		
17,589.48	6,968.00	17,771.20	6,968.00	326.33	327.18	90.00	-1,761.39	10,970.46	2,652.48	1,999.32	653.15	4.061		



Lonestar Consulting, LLC

Anticollision Report



Company:	Logos Operating LLC	Local Co-ordinate Reference:	Well Rosa Unit 645H - Slot B8
Project:	Rio Arriba, NM NAD83	TVD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Reference Site:	Rosa Unit 27	MD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Site Error:	0.00 ft	North Reference:	True
Reference Well:	Rosa Unit 645H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 ft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction
Reference Design:	Plan #4	Offset TVD Reference:	Offset Datum

Offset Design: Rosa Unit 27 - Rosa Unit 648H - OH - OH													Offset Site Error:	0.00 ft
Survey Program: 25-NS-GYRO-MS, 390-SDI MWD, 6638-SDI MWD, 7777-SDI MWD													Offset Well Error:	0.00 ft
Reference	Vertical	Offset	Vertical	Reference	Semi Major Axis	Offset	Highside	Offset Wellbore Centre		Distance		Minimum	Separation	Warning
Measured	Depth	Depth	Depth	Reference	Reference	Offset	Toolface	+N/-S	+E/-W	Between	Between	Separation	Factor	
Depth	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(°)	(ft)	(ft)	Centres	Ellipses	(ft)		
0.00	0.00	0.51	0.51	0.00	0.00	133.73	-12.09	12.64	17.49					
100.00	100.00	100.46	100.46	0.27	0.16	134.50	-12.35	12.56	17.62	17.19	0.43	40.857		
200.00	200.00	200.52	200.52	0.63	0.41	136.28	-12.78	12.23	17.69	16.65	1.04	17.001		
271.92	271.92	272.44	272.44	0.89	0.60	138.90	-13.29	11.59	17.64	16.15	1.48	11.890		
300.00	300.00	300.46	300.45	0.99	0.66	140.32	-13.62	11.30	17.69	16.05	1.65	10.750 ES		
400.00	400.00	400.37	400.36	1.35	0.79	143.21	-14.68	10.98	18.33	16.20	2.13	8.587		
500.00	500.00	500.35	500.32	1.70	0.85	137.99	-16.20	10.33	19.53	16.98	2.56	7.641		
600.00	599.93	599.91	599.80	2.06	0.96	152.87	-19.16	7.62	24.05	21.02	3.03	7.944		
700.00	699.68	698.20	697.83	2.43	1.12	167.72	-24.31	3.07	35.13	31.58	3.55	9.889		
800.00	799.13	794.52	793.57	2.79	1.33	177.46	-32.54	-3.56	54.40	50.29	4.11	13.242		
900.00	898.20	888.78	886.83	3.16	1.59	-177.10	-43.41	-11.92	80.79	76.11	4.67	17.290		
1,000.00	997.18	983.07	979.76	3.54	1.89	-173.90	-56.05	-21.60	110.24	105.02	5.22	21.113		
1,100.00	1,096.17	1,075.68	1,070.81	3.92	2.22	-171.98	-69.63	-31.70	141.21	135.44	5.77	24.454		
1,200.00	1,195.16	1,169.03	1,162.35	4.31	2.58	-170.71	-84.53	-42.36	173.64	167.30	6.34	27.401		
1,300.00	1,294.14	1,262.54	1,253.90	4.71	2.96	-169.70	-99.77	-53.66	206.65	199.74	6.91	29.920		
1,400.00	1,393.13	1,355.00	1,344.31	5.10	3.33	-169.00	-115.54	-64.98	240.43	232.95	7.47	32.167		
1,500.00	1,492.12	1,445.17	1,432.27	5.49	3.72	-168.53	-131.92	-76.13	275.25	267.21	8.04	34.248		
1,600.00	1,591.10	1,539.41	1,524.10	5.89	4.12	-168.06	-149.18	-88.37	310.47	301.85	8.62	36.016		
1,700.00	1,690.09	1,631.52	1,613.87	6.29	4.49	-167.81	-166.38	-99.79	345.79	336.61	9.18	37.650		
1,800.00	1,789.08	1,723.79	1,703.76	6.69	4.87	-167.77	-184.33	-110.33	381.45	371.70	9.76	39.100		
1,900.00	1,888.06	1,813.19	1,790.72	7.09	5.28	-167.74	-202.24	-120.79	417.72	407.40	10.32	40.470		
2,000.00	1,987.05	1,905.18	1,880.07	7.49	5.72	-167.69	-221.07	-131.96	454.55	443.64	10.91	41.653		
2,100.00	2,086.04	2,001.09	1,973.26	7.89	6.13	-167.66	-240.62	-143.38	491.21	479.69	11.51	42.661		
2,200.00	2,185.02	2,099.62	2,069.22	8.29	6.51	-167.66	-259.98	-154.59	527.02	514.90	12.12	43.487		
2,300.00	2,284.01	2,192.96	2,160.22	8.69	6.89	-167.64	-277.81	-165.21	562.35	549.66	12.70	44.281		
2,400.00	2,383.00	2,282.74	2,247.65	9.09	7.28	-167.60	-295.34	-175.71	598.18	584.91	13.27	45.077		
2,500.01	2,481.98	2,381.05	2,343.39	9.49	7.70	-167.54	-314.32	-187.47	633.92	620.02	13.89	45.629		
2,600.01	2,580.97	2,480.67	2,440.64	9.90	8.11	-167.48	-332.50	-199.07	668.58	654.06	14.52	46.059		
2,700.01	2,679.96	2,576.69	2,534.42	10.30	8.50	-167.39	-349.67	-210.48	703.02	687.90	15.12	46.495		
2,800.01	2,778.95	2,676.70	2,632.28	10.70	8.90	-167.33	-366.87	-221.90	736.69	720.94	15.75	46.784		
2,900.01	2,877.93	2,771.95	2,725.55	11.10	9.28	-167.24	-382.76	-232.91	769.95	753.60	16.35	47.106		
3,000.01	2,976.92	2,866.73	2,818.36	11.51	9.66	-167.17	-398.57	-243.87	803.21	786.26	16.94	47.406		
3,100.01	3,075.91	2,963.17	2,912.84	11.91	10.04	-167.12	-414.62	-254.68	836.31	818.76	17.55	47.664		
3,200.01	3,174.89	3,064.87	3,012.59	12.31	10.42	-167.12	-431.36	-265.30	868.95	850.78	18.18	47.810		
3,300.01	3,273.88	3,187.90	3,133.72	12.71	10.86	-167.08	-448.98	-277.55	899.49	880.58	18.91	47.561		
3,400.01	3,372.87	3,267.01	3,211.66	13.12	11.14	-167.00	-459.48	-286.03	929.43	910.01	19.42	47.861		
3,500.01	3,471.85	3,345.10	3,288.34	13.52	11.46	-166.89	-470.82	-295.60	961.07	941.14	19.93	48.229		
3,600.01	3,570.84	3,435.22	3,376.54	13.93	11.84	-166.71	-484.71	-307.73	993.95	973.44	20.51	48.463		
3,700.01	3,669.83	3,530.90	3,470.20	14.33	12.23	-166.55	-499.55	-320.53	1,026.89	1,005.77	21.12	48.619		
3,800.01	3,768.81	3,638.77	3,575.96	14.73	12.65	-166.42	-515.93	-333.97	1,059.20	1,037.41	21.79	48.600		
3,900.01	3,867.80	3,744.96	3,680.37	15.14	13.04	-166.36	-531.31	-345.74	1,090.36	1,067.91	22.45	48.571		
4,000.01	3,966.79	3,844.33	3,778.21	15.54	13.40	-166.31	-544.96	-356.48	1,120.72	1,097.66	23.06	48.590		
4,100.01	4,065.77	3,934.84	3,867.29	15.94	13.73	-166.24	-557.38	-366.65	1,151.27	1,127.63	23.64	48.707		
4,200.01	4,164.76	4,025.90	3,956.86	16.35	14.08	-166.20	-570.30	-376.70	1,182.14	1,157.92	24.21	48.820		
4,300.01	4,263.75	4,111.11	4,040.61	16.75	14.41	-166.15	-582.70	-386.35	1,213.47	1,188.71	24.76	49.009		
4,400.01	4,362.73	4,194.63	4,122.49	17.16	14.74	-166.10	-595.74	-396.46	1,245.98	1,220.68	25.30	49.252		
4,500.01	4,461.72	4,309.55	4,235.41	17.56	15.19	-166.06	-612.82	-409.21	1,277.38	1,251.36	26.01	49.103		
4,600.01	4,560.71	4,391.25	4,315.67	17.96	15.51	-166.02	-624.92	-418.51	1,308.96	1,282.42	26.54	49.323		
4,700.01	4,659.69	4,482.03	4,404.65	18.37	15.87	-165.98	-639.34	-429.28	1,341.63	1,314.51	27.12	49.472		
4,800.01	4,758.68	4,587.93	4,508.73	18.77	16.28	-165.98	-655.39	-440.41	1,373.10	1,345.32	27.78	49.424		



Lonestar Consulting, LLC

Anticollision Report



Company:	Logos Operating LLC	Local Co-ordinate Reference:	Well Rosa Unit 645H - Slot B8
Project:	Rio Arriba, NM NAD83	TVD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Reference Site:	Rosa Unit 27	MD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Site Error:	0.00 ft	North Reference:	True
Reference Well:	Rosa Unit 645H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 ft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction
Reference Design:	Plan #4	Offset TVD Reference:	Offset Datum

Offset Design: Rosa Unit 27 - Rosa Unit 648H - OH - OH												Offset Site Error:	0.00 ft
Survey Program: 25-NS-GYRO-MS, 390-SDI MWD, 6638-SDI MWD, 7777-SDI MWD												Offset Well Error:	0.00 ft
Reference	Offset	Semi Major Axis	Offset	Highside	Offset Wellbore Centre	Distance	Rule Assigned:	Minimum	Separation	Warning			
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)	Toolface (°)	+N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Separation Factor		
4,900.01	4,857.67	4,687.00	4,606.03	19.18	16.66	-165.99	-670.80	-450.85	1,404.99	1,376.59	28.40	49.467	
5,000.01	4,956.65	4,789.35	4,706.77	19.58	17.04	-166.01	-685.88	-460.89	1,435.85	1,406.81	29.04	49.445	
5,100.01	5,055.64	4,871.23	4,787.28	19.98	17.35	-165.99	-697.85	-469.78	1,467.05	1,437.48	29.57	49.620	
5,200.01	5,154.63	4,982.69	4,896.76	20.39	17.78	-165.95	-714.39	-482.55	1,498.73	1,468.47	30.26	49.529	
5,300.01	5,253.61	5,067.97	4,980.68	20.79	18.10	-165.93	-726.45	-491.79	1,529.51	1,498.71	30.80	49.652	
5,400.01	5,352.60	5,138.61	5,050.02	21.20	18.39	-165.90	-737.09	-500.11	1,561.47	1,530.21	31.27	49.937	
5,500.01	5,451.59	5,221.40	5,131.03	21.60	18.73	-165.86	-750.71	-510.41	1,594.86	1,563.06	31.80	50.146	
5,600.01	5,550.57	5,324.82	5,232.31	22.01	19.15	-165.84	-767.69	-522.58	1,627.99	1,595.53	32.46	50.153	
5,700.01	5,649.56	5,424.20	5,329.72	22.41	19.54	-165.82	-783.68	-534.10	1,660.76	1,627.67	33.09	50.191	
5,800.01	5,748.55	5,510.67	5,414.46	22.81	19.88	-165.79	-797.42	-544.44	1,693.51	1,659.87	33.64	50.337	
5,900.01	5,847.53	5,596.90	5,498.89	23.22	20.23	-165.80	-812.04	-554.11	1,726.88	1,692.68	34.20	50.498	
6,000.01	5,946.52	5,687.35	5,587.41	23.62	20.60	-165.81	-827.71	-564.11	1,760.51	1,725.74	34.78	50.622	
6,100.01	6,045.51	5,778.10	5,676.18	24.03	20.98	-165.82	-843.48	-574.46	1,794.34	1,758.97	35.36	50.743	
6,200.01	6,144.49	5,868.73	5,774.27	24.43	21.47	-165.84	-864.26	-587.59	1,827.90	1,791.78	36.12	50.606	
6,300.01	6,243.48	5,958.21	5,874.54	24.84	21.96	-165.91	-885.25	-599.68	1,859.30	1,822.38	36.93	50.353	
6,400.00	6,342.45	6,047.47	5,974.20	25.24	22.35	-166.01	-902.22	-608.24	1,889.36	1,851.75	37.61	50.236	
6,500.01	6,440.93	6,136.85	6,062.96	25.65	22.78	150.81	-922.16	-613.13	1,920.84	1,882.49	38.35	50.087	
6,600.01	6,536.70	6,226.42	6,152.51	26.06	23.28	132.76	-949.27	-608.68	1,955.06	1,915.82	39.24	49.828	
6,700.01	6,627.42	6,316.53	6,242.64	26.46	23.53	123.77	-963.62	-602.17	1,990.47	1,950.66	39.80	50.008	
6,800.01	6,710.86	6,406.02	6,332.19	26.86	23.47	108.41	-1,092.07	242.81	2,020.19	1,976.02	44.17	45.741	
6,900.01	6,794.97	6,495.86	6,421.43	27.29	23.77	105.63	-1,093.14	304.64	2,012.88	1,967.40	45.49	44.254	
7,000.01	6,847.91	6,544.98	6,470.68	27.78	24.59	102.50	-1,094.71	424.74	2,009.09	1,961.66	47.44	42.354	
7,100.01	6,898.13	6,595.84	6,521.15	28.43	25.35	100.69	-1,094.38	508.60	2,006.42	1,956.97	49.45	40.574	
7,124.02	6,908.15	6,598.32	6,523.34	28.63	25.55	100.34	-1,094.31	528.08	2,006.05	1,956.05	50.00	40.122	
7,200.01	6,934.41	6,624.95	6,550.96	29.33	26.23	99.42	-1,094.30	588.70	2,005.52	1,953.77	51.75	38.755	
7,220.04	6,939.91	6,629.02	6,555.15	29.55	26.46	99.20	-1,094.36	607.77	2,005.52	1,953.23	52.29	38.352	
7,300.01	6,955.84	6,645.85	6,571.37	30.51	27.72	98.50	-1,094.23	703.60	2,005.40	1,950.57	54.84	36.570	
7,332.75	6,959.63	6,649.11	6,575.58	30.97	28.04	98.39	-1,094.18	725.86	2,005.33	1,949.58	55.75	35.973	
7,400.01	6,962.01	6,652.16	6,578.45	31.95	28.79	98.28	-1,094.44	775.91	2,005.64	1,947.99	57.65	34.791	
7,404.46	6,962.01	6,652.02	6,578.27	32.02	29.00	98.28	-1,094.61	789.76	2,005.72	1,947.78	57.94	34.616	
7,500.02	6,962.07	6,652.15	6,578.14	33.61	30.07	98.24	-1,095.79	855.87	2,007.07	1,946.26	60.81	33.003	
7,504.47	6,962.07	6,652.76	6,578.07	33.69	30.13	98.24	-1,095.87	859.48	2,007.16	1,946.19	60.96	32.923	
7,600.02	6,962.12	6,660.60	6,578.21	35.45	32.40	98.23	-1,097.48	990.29	2,008.39	1,943.22	65.17	30.817	
7,620.97	6,962.14	6,664.00	6,578.67	35.87	32.83	98.24	-1,097.45	1,013.69	2,008.42	1,942.37	66.05	30.407	
7,700.02	6,962.18	6,771.18	6,725.80	37.46	34.45	98.28	-1,097.15	1,100.85	2,008.30	1,938.93	69.38	28.948	
7,722.01	6,962.20	6,795.07	6,752.03	37.93	34.91	98.28	-1,097.03	1,124.74	2,008.22	1,937.89	70.33	28.555	
7,800.02	6,962.24	6,873.59	6,752.43	39.61	36.44	98.30	-1,096.58	1,203.26	2,007.84	1,934.21	73.63	27.270	
7,870.52	6,962.28	6,935.10	6,751.94	41.20	37.67	98.28	-1,096.44	1,264.77	2,007.61	1,931.07	76.53	26.232	
7,900.02	6,962.30	6,956.95	6,751.70	41.87	38.12	98.27	-1,096.51	1,286.61	2,007.66	1,929.98	77.68	25.845	
7,904.47	6,962.30	6,960.24	6,751.67	41.97	38.18	98.27	-1,096.53	1,289.91	2,007.68	1,929.82	77.86	25.787	
8,000.02	6,962.36	6,972.79	6,750.42	44.22	40.51	98.23	-1,096.77	1,402.45	2,007.73	1,925.23	82.50	24.336	
8,023.03	6,962.37	6,917.97	6,749.96	44.78	41.47	98.22	-1,096.31	1,447.61	2,007.42	1,923.42	84.00	23.897	
8,100.02	6,962.42	6,918.02	6,749.32	46.65	42.87	98.21	-1,095.82	1,513.66	2,006.71	1,919.36	87.35	22.973	
8,157.11	6,962.45	6,921.57	6,748.99	48.07	43.69	98.20	-1,095.82	1,551.21	2,006.57	1,916.92	89.65	22.383	
8,200.02	6,962.48	6,925.95	6,748.69	49.15	44.52	98.19	-1,095.91	1,589.59	2,006.62	1,915.04	91.58	21.910	
8,300.02	6,962.54	6,936.88	6,749.23	51.70	48.41	98.21	-1,092.01	1,766.45	2,004.13	1,906.20	97.94	20.463	
8,400.02	6,962.60	6,926.22	6,749.75	54.31	50.40	98.24	-1,088.83	1,855.74	2,000.71	1,898.11	102.60	19.500	
8,500.02	6,962.65	6,930.34	6,749.45	56.95	52.75	98.24	-1,085.64	1,959.81	1,997.64	1,890.02	107.62	18.563	
8,600.02	6,962.71	6,911.32	6,748.77	59.64	54.60	98.23	-1,083.38	2,040.75	1,994.77	1,882.55	112.22	17.775	
8,625.64	6,962.73	6,929.02	6,748.41	60.33	55.01	98.22	-1,083.04	2,058.44	1,994.21	1,880.86	113.35	17.594	



Lonestar Consulting, LLC

Anticollision Report



Company:	Logos Operating LLC	Local Co-ordinate Reference:	Well Rosa Unit 645H - Slot B8
Project:	Rio Arriba, NM NAD83	TVD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Reference Site:	Rosa Unit 27	MD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Site Error:	0.00 ft	North Reference:	True
Reference Well:	Rosa Unit 645H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 ft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction
Reference Design:	Plan #4	Offset TVD Reference:	Offset Datum

Offset Design: Rosa Unit 27 - Rosa Unit 648H - OH - OH													Offset Site Error:	0.00 ft
Survey Program: 25-NS-GYRO-MS, 390-SDI MWD, 6638-SDI MWD, 7777-SDI MWD													Offset Well Error:	0.00 ft
Reference	Vertical	Offset	Vertical	Reference	Semi Major Axis	Offset	Highside	Offset Wellbore Centre		Distance		Minimum	Separation	Warning
Measured	Depth	Depth	Depth	Reference	Offset	Offset	Toolface	+N/-S	+E/-W	Between	Between	Separation	Factor	
Depth	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(°)	(ft)	(ft)	Centres	Ellipses	(ft)		
(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(°)	(ft)	(ft)	(ft)	(ft)	(ft)		
8,700.02	6,962.77	9,785.20	7,247.00	62.35	56.31	98.18	-1,082.36	2,114.60	1,993.06	1,876.34	116.72	17.076		
8,722.66	6,962.78	9,801.60	7,246.53	62.97	56.69	98.17	-1,082.28	2,130.99	1,992.87	1,875.13	117.73	16.927		
8,800.02	6,962.83	9,874.19	7,244.36	65.09	58.38	98.11	-1,082.27	2,203.55	1,992.52	1,870.95	121.57	16.390		
8,870.52	6,962.87	9,938.13	7,242.69	67.04	59.88	98.06	-1,082.21	2,267.47	1,992.21	1,867.17	125.04	15.932		
8,900.02	6,962.89	9,960.67	7,242.10	67.86	60.41	98.04	-1,082.30	2,290.00	1,992.22	1,865.82	126.40	15.761		
8,904.47	6,962.89	9,964.07	7,242.01	67.98	60.49	98.04	-1,082.33	2,293.39	1,992.23	1,865.62	126.61	15.736		
9,000.02	6,962.95	10,033.68	7,240.22	70.65	62.13	97.98	-1,083.18	2,362.98	1,993.06	1,862.11	130.95	15.220		
9,004.47	6,962.95	10,036.75	7,240.15	70.77	62.20	97.98	-1,083.24	2,366.05	1,993.13	1,861.99	131.15	15.198		
9,100.02	6,963.01	10,107.48	7,238.93	73.45	63.88	97.94	-1,085.11	2,436.74	1,995.38	1,859.87	135.51	14.725		
9,104.47	6,963.01	10,112.07	7,238.88	73.58	63.99	97.94	-1,085.26	2,441.33	1,995.51	1,859.77	135.75	14.700		
9,200.02	6,963.07	10,220.12	7,238.00	76.28	66.57	97.90	-1,088.33	2,549.33	1,998.12	1,857.10	141.02	14.169		
9,204.47	6,963.07	10,226.30	7,237.95	76.40	66.72	97.89	-1,088.47	2,555.50	1,998.21	1,856.92	141.29	14.142		
9,300.02	6,963.12	10,347.22	7,237.07	79.12	69.62	97.86	-1,090.35	2,676.41	1,999.57	1,852.69	146.88	13.613		
9,304.47	6,963.13	10,352.54	7,237.07	79.24	69.75	97.86	-1,090.40	2,681.73	1,999.61	1,852.47	147.13	13.590		
9,400.02	6,963.18	10,458.16	7,237.59	81.97	72.28	97.87	-1,090.95	2,787.35	2,000.16	1,847.79	152.37	13.127		
9,421.66	6,963.20	10,490.20	7,237.78	82.59	73.06	97.88	-1,090.94	2,819.39	2,000.18	1,846.44	153.74	13.010		
9,500.02	6,963.24	10,591.56	7,237.51	84.83	75.49	97.87	-1,090.07	2,920.74	1,999.44	1,841.08	158.36	12.626		
9,524.47	6,963.26	10,618.79	7,237.22	85.54	76.15	97.86	-1,089.72	2,947.97	1,999.10	1,839.39	159.71	12.517		
9,600.02	6,963.30	10,691.79	7,236.00	87.71	77.91	97.83	-1,088.80	3,020.96	1,997.99	1,834.34	163.65	12.209		
9,623.98	6,963.32	10,713.82	7,235.53	88.40	78.44	97.82	-1,088.58	3,042.98	1,997.68	1,832.80	164.88	12.116		
9,700.02	6,963.36	10,782.44	7,234.22	90.59	80.10	97.78	-1,088.02	3,111.58	1,996.87	1,828.12	168.75	11.833		
9,722.83	6,963.37	10,802.91	7,234.03	91.25	80.60	97.78	-1,087.88	3,132.05	1,996.68	1,826.77	169.91	11.751		
9,800.02	6,963.42	10,869.53	7,233.76	93.49	82.22	97.77	-1,087.57	3,198.67	1,996.29	1,822.52	173.77	11.488		
9,821.25	6,963.43	10,887.59	7,233.65	94.10	82.66	97.76	-1,087.56	3,216.73	1,996.26	1,821.43	174.83	11.418		
9,900.02	6,963.48	10,970.79	7,233.29	96.39	84.68	97.75	-1,087.57	3,299.92	1,996.23	1,817.11	179.12	11.145		
10,000.02	6,963.54	11,146.77	7,234.16	99.30	88.96	97.79	-1,084.10	3,475.85	1,994.58	1,808.56	186.01	10.723		
10,100.02	6,963.60	11,266.06	7,234.10	102.22	91.85	97.81	-1,078.14	3,595.00	1,989.55	1,797.85	191.69	10.379		
10,200.02	6,963.65	11,358.83	7,234.06	105.14	94.10	97.82	-1,073.56	3,687.65	1,984.64	1,787.76	196.89	10.080		
10,300.02	6,963.71	11,446.05	7,232.50	108.07	96.23	97.79	-1,069.89	3,774.78	1,980.24	1,778.24	202.00	9.803		
10,400.02	6,963.77	11,524.25	7,230.79	111.00	98.14	97.75	-1,067.31	3,852.92	1,976.69	1,769.74	206.94	9.552		
10,500.02	6,963.83	11,658.39	7,229.15	113.94	101.42	97.72	-1,062.81	3,986.96	1,973.31	1,760.34	212.98	9.265		
10,600.02	6,963.89	11,715.27	7,228.77	116.88	102.82	97.71	-1,061.09	4,043.81	1,970.00	1,752.49	217.51	9.057		
10,700.02	6,963.95	11,829.37	7,228.56	119.83	105.62	97.72	-1,058.08	4,157.87	1,967.40	1,744.23	223.17	8.816		
10,800.02	6,964.01	11,886.88	7,229.03	122.78	107.04	97.74	-1,056.85	4,215.37	1,965.33	1,737.67	227.66	8.633		
10,861.55	6,964.04	11,927.18	7,229.35	124.60	108.03	97.74	-1,056.62	4,255.67	1,965.03	1,734.54	230.49	8.525		
10,900.02	6,964.07	11,956.50	7,229.55	125.73	108.76	97.75	-1,056.66	4,284.98	1,965.12	1,732.77	232.35	8.458		
10,904.47	6,964.07	11,959.89	7,229.58	125.87	108.84	97.75	-1,056.68	4,288.37	1,965.14	1,732.58	232.56	8.450		
11,000.02	6,964.12	12,004.02	7,229.86	128.69	109.93	97.76	-1,057.03	4,332.50	1,966.46	1,730.05	236.41	8.318		
11,014.47	6,964.13	12,029.43	7,229.96	129.12	110.56	97.76	-1,057.50	4,357.91	1,966.63	1,729.15	237.48	8.281		
11,100.02	6,964.18	12,071.12	7,229.94	131.65	111.60	97.75	-1,059.06	4,399.57	1,969.79	1,728.89	240.90	8.177		
11,104.47	6,964.19	12,096.02	7,229.81	131.79	112.22	97.74	-1,060.45	4,424.43	1,970.27	1,728.55	241.72	8.151		
11,200.02	6,964.24	12,181.16	7,229.68	134.62	114.34	97.72	-1,064.94	4,509.45	1,975.13	1,728.51	246.61	8.009		
11,204.47	6,964.24	12,188.93	7,229.72	134.75	114.54	97.72	-1,065.26	4,517.21	1,975.31	1,728.36	246.95	7.999		
11,300.02	6,964.30	12,270.86	7,230.07	137.58	116.58	97.71	-1,068.93	4,599.06	1,979.60	1,727.86	251.74	7.864		
11,304.47	6,964.30	12,278.02	7,230.10	137.72	116.76	97.71	-1,069.27	4,606.21	1,979.82	1,727.76	252.06	7.855		
11,400.02	6,964.36	12,396.81	7,229.79	140.55	119.72	97.68	-1,074.50	4,724.88	1,984.01	1,726.09	257.91	7.693		
11,404.47	6,964.36	12,404.77	7,229.76	140.68	119.92	97.68	-1,074.77	4,732.83	1,984.16	1,725.91	258.25	7.683		
11,500.02	6,964.42	12,532.80	7,229.59	143.52	123.11	97.66	-1,077.68	4,860.83	1,986.21	1,721.91	264.30	7.515		
11,504.47	6,964.42	12,537.81	7,229.57	143.66	123.24	97.66	-1,077.77	4,865.84	1,986.28	1,721.72	264.56	7.508		
11,600.02	6,964.48	12,651.37	7,229.13	146.50	126.06	97.64	-1,079.21	4,979.39	1,987.44	1,717.24	270.20	7.355		



Lonestar Consulting, LLC

Anticollision Report



Company:	Logos Operating LLC	Local Co-ordinate Reference:	Well Rosa Unit 645H - Slot B8
Project:	Rio Arriba, NM NAD83	TVD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Reference Site:	Rosa Unit 27	MD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Site Error:	0.00 ft	North Reference:	True
Reference Well:	Rosa Unit 645H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 ft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction
Reference Design:	Plan #4	Offset TVD Reference:	Offset Datum

Offset Design: Rosa Unit 27 - Rosa Unit 648H - OH - OH													Offset Site Error: 0.00 ft	
Survey Program: 25-NS-GYRO-MS, 390-SDI MWD, 6638-SDI MWD, 7777-SDI MWD							Rule Assigned:						Offset Well Error: 0.00 ft	
Reference		Offset		Semi Major Axis		Highside Toolface (°)	Offset Wellbore Centre		Distance		Minimum Separation (ft)	Separation Factor	Warning	
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)		+N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)				
11,604.47	6,964.48	12,656.60	7,229.12	146.63	126.19	97.64	-1,079.25	4,984.62	1,987.47	1,717.01	270.46	7.348		
11,700.02	6,964.54	12,763.60	7,229.15	149.47	128.86	97.64	-1,079.61	5,091.61	1,987.78	1,711.86	275.92	7.204		
11,704.47	6,964.54	12,768.07	7,229.16	149.61	128.97	97.64	-1,079.62	5,096.08	1,987.79	1,711.63	276.16	7.198		
11,800.02	6,964.60	12,862.51	7,229.24	152.45	131.32	97.64	-1,079.73	5,190.53	1,987.91	1,706.59	281.33	7.066		
11,804.47	6,964.60	12,866.80	7,229.23	152.58	131.43	97.64	-1,079.74	5,194.82	1,987.92	1,706.36	281.56	7.060		
11,900.02	6,964.65	12,951.28	7,229.16	155.43	133.53	97.63	-1,080.05	5,279.30	1,988.27	1,701.78	286.50	6.940		
11,904.47	6,964.66	12,954.82	7,229.15	155.56	133.62	97.63	-1,080.08	5,282.84	1,988.31	1,701.59	286.72	6.935		
12,000.02	6,964.71	13,033.03	7,229.04	158.41	135.57	97.62	-1,081.10	5,361.04	1,989.52	1,698.03	291.49	6.825		
12,004.47	6,964.72	13,036.89	7,229.03	158.54	135.67	97.62	-1,081.16	5,364.90	1,989.59	1,697.88	291.71	6.820		
12,100.02	6,964.77	13,115.78	7,228.69	161.39	137.64	97.60	-1,082.82	5,443.77	1,991.54	1,695.05	296.49	6.717		
12,104.47	6,964.77	13,118.98	7,228.67	161.53	137.72	97.60	-1,082.91	5,446.97	1,991.65	1,694.96	296.70	6.713		
12,200.02	6,964.83	13,188.03	7,228.33	164.38	139.45	97.58	-1,085.23	5,515.98	1,994.78	1,693.61	301.17	6.623		
12,204.47	6,964.83	13,192.14	7,228.31	164.51	139.55	97.58	-1,085.40	5,520.09	1,994.95	1,693.55	301.40	6.619		
12,300.02	6,964.89	13,279.03	7,228.14	167.36	141.73	97.56	-1,088.72	5,606.91	1,998.59	1,692.22	306.36	6.524		
12,304.59	6,964.89	13,292.83	7,228.15	167.50	142.07	97.56	-1,089.25	5,620.70	1,998.72	1,691.84	306.89	6.513		
12,400.03	6,964.95	13,371.03	7,228.21	170.35	144.03	97.55	-1,092.98	5,698.81	2,003.18	1,691.59	311.59	6.429		
12,404.48	6,964.95	13,371.03	7,228.21	170.48	144.03	97.55	-1,092.98	5,698.81	2,003.39	1,691.70	311.69	6.427		
12,500.03	6,965.01	13,508.62	7,228.58	173.34	147.48	97.53	-1,099.10	5,836.26	2,007.86	1,689.73	318.14	6.311		
12,504.48	6,965.01	13,519.27	7,228.67	173.47	147.75	97.53	-1,099.38	5,846.91	2,007.99	1,689.44	318.55	6.304		
12,600.03	6,965.07	13,625.85	7,229.92	176.33	150.42	97.56	-1,101.26	5,953.47	2,009.75	1,685.71	324.04	6.202		
12,604.48	6,965.07	13,629.83	7,229.96	176.46	150.52	97.56	-1,101.33	5,957.44	2,009.84	1,685.58	324.27	6.198		
12,700.03	6,965.12	13,728.30	7,231.23	179.32	152.98	97.59	-1,103.18	6,055.89	2,011.78	1,682.24	329.54	6.105		
12,719.43	6,965.14	13,778.50	7,232.35	179.90	154.24	97.62	-1,103.65	6,106.07	2,012.05	1,680.71	331.35	6.072		
12,800.03	6,965.18	13,877.43	7,234.95	182.31	156.71	97.69	-1,102.98	6,204.96	2,011.75	1,675.64	336.11	5.985		
12,822.74	6,965.20	13,903.21	7,235.42	182.99	157.35	97.71	-1,102.76	6,230.74	2,011.61	1,674.21	337.40	5.962		
12,900.03	6,965.24	13,990.55	7,236.83	185.31	159.53	97.75	-1,101.69	6,318.06	2,010.83	1,669.03	341.80	5.883		
12,923.91	6,965.26	14,012.38	7,237.07	186.02	160.08	97.76	-1,101.40	6,339.89	2,010.56	1,667.50	343.06	5.861		
13,000.03	6,965.30	14,069.03	7,237.31	188.30	161.49	97.76	-1,100.82	6,396.53	2,009.90	1,663.13	346.77	5.796		
13,029.92	6,965.32	14,096.53	7,237.24	189.20	162.18	97.76	-1,100.72	6,424.03	2,009.79	1,661.43	348.35	5.769		
13,100.03	6,965.36	14,140.32	7,236.91	191.30	163.27	97.75	-1,101.05	6,467.82	2,010.24	1,658.69	351.55	5.718		
13,104.48	6,965.36	14,160.03	7,236.68	191.43	163.77	97.74	-1,101.40	6,487.52	2,010.42	1,658.24	352.17	5.709		
13,200.03	6,965.42	14,244.52	7,236.11	194.29	165.89	97.72	-1,102.76	6,572.00	2,011.78	1,654.64	357.14	5.633		
13,204.48	6,965.42	14,250.01	7,236.11	194.43	166.02	97.72	-1,102.82	6,577.49	2,011.83	1,654.42	357.41	5.629		
13,300.03	6,965.48	14,338.22	7,235.49	197.29	168.23	97.70	-1,103.99	6,665.69	2,012.99	1,650.53	362.46	5.554		
13,304.48	6,965.48	14,342.43	7,235.42	197.42	168.34	97.69	-1,104.06	6,669.90	2,013.05	1,650.35	362.70	5.550		
13,400.03	6,965.54	14,480.29	7,233.88	200.29	171.79	97.64	-1,104.96	6,807.74	2,013.58	1,644.63	368.96	5.457		
13,424.08	6,965.55	14,521.31	7,233.28	201.01	172.82	97.63	-1,104.59	6,848.76	2,013.32	1,642.68	370.64	5.432		
13,500.03	6,965.60	14,598.85	7,232.22	203.29	174.76	97.60	-1,103.49	6,926.29	2,012.12	1,637.28	374.84	5.368		
13,600.03	6,965.65	14,719.29	7,230.91	206.29	177.76	97.57	-1,101.04	7,046.69	2,009.95	1,629.23	380.72	5.279		
13,700.03	6,965.71	14,798.03	7,229.90	209.29	179.73	97.55	-1,099.53	7,125.41	2,007.87	1,622.08	385.79	5.205		
13,724.57	6,965.73	14,820.95	7,229.63	210.02	180.30	97.54	-1,099.21	7,148.32	2,007.50	1,620.40	387.10	5.186		
13,800.03	6,965.77	14,894.62	7,229.16	212.29	182.14	97.53	-1,098.25	7,221.99	2,006.45	1,615.25	391.20	5.129		
13,900.03	6,965.83	15,014.91	7,228.30	215.29	185.15	97.51	-1,095.82	7,342.25	2,004.32	1,607.25	397.07	5.048		
14,000.03	6,965.89	15,103.04	7,228.14	218.29	187.35	97.51	-1,093.88	7,430.36	2,002.12	1,599.81	402.31	4.977		
14,024.63	6,965.90	15,122.43	7,228.19	219.03	187.83	97.51	-1,093.54	7,449.74	2,001.71	1,598.16	403.55	4.960		
14,100.03	6,965.95	15,188.79	7,228.56	221.30	189.49	97.53	-1,092.70	7,516.10	2,000.80	1,593.32	407.48	4.910		
14,124.10	6,965.96	15,214.42	7,228.63	222.02	190.14	97.53	-1,092.39	7,541.73	2,000.53	1,591.70	408.82	4.893		
14,200.03	6,966.01	15,274.86	7,228.49	224.30	191.65	97.53	-1,091.74	7,602.16	1,999.74	1,587.10	412.64	4.846		
14,217.85	6,966.02	15,284.67	7,228.39	224.84	191.90	97.52	-1,091.74	7,611.97	1,999.71	1,586.27	413.44	4.837		
14,300.03	6,966.07	15,344.03	7,227.09	227.30	193.38	97.48	-1,092.64	7,671.31	2,000.56	1,583.14	417.42	4.793		



Lonestar Consulting, LLC

Anticollision Report



Company:	Logos Operating LLC	Local Co-ordinate Reference:	Well Rosa Unit 645H - Slot B8
Project:	Rio Arriba, NM NAD83	TVD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Reference Site:	Rosa Unit 27	MD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Site Error:	0.00 ft	North Reference:	True
Reference Well:	Rosa Unit 645H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 ft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction
Reference Design:	Plan #4	Offset TVD Reference:	Offset Datum

Offset Design: Rosa Unit 27 - Rosa Unit 648H - OH - OH													Offset Site Error:	0.00 ft
Survey Program: 25-NS-GYRO-MS, 390-SDI MWD, 6638-SDI MWD, 7777-SDI MWD													Offset Well Error:	0.00 ft
Reference	Vertical	Offset	Vertical	Semi Major Axis	Offset	Highside	Offset Wellbore Centre		Distance		Minimum	Separation	Warning	
Measured Depth (ft)	Depth (ft)	Depth (ft)	Depth (ft)	Reference (ft)	Offset (ft)	Toolface (°)	+N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Separation (ft)	Factor		
14,304.48	6,966.07	15,344.03	7,227.09	227.44	193.38	97.48	-1,092.64	7,671.31	2,000.61	1,583.07	417.54	4.791		
14,400.03	6,966.12	15,410.15	7,225.20	230.31	195.05	97.42	-1,094.64	7,737.37	2,002.97	1,580.95	422.02	4.746		
14,404.48	6,966.13	15,414.11	7,225.10	230.44	195.15	97.42	-1,094.76	7,741.33	2,003.10	1,580.85	422.25	4.744		
14,500.03	6,966.18	15,523.97	7,223.40	233.32	197.91	97.36	-1,097.90	7,851.12	2,005.64	1,577.69	427.95	4.687		
14,504.48	6,966.19	15,529.46	7,223.39	233.45	198.05	97.36	-1,098.02	7,856.61	2,005.73	1,577.51	428.22	4.684		
14,600.03	6,966.24	15,599.77	7,223.14	236.32	199.82	97.34	-1,100.01	7,926.89	2,008.36	1,575.62	432.74	4.641		
14,604.48	6,966.24	15,603.10	7,223.13	236.45	199.90	97.34	-1,100.13	7,930.22	2,008.51	1,575.56	432.95	4.639		
14,700.03	6,966.30	15,714.86	7,223.05	239.33	202.71	97.32	-1,103.71	8,041.92	2,011.57	1,572.88	438.69	4.585		
14,704.48	6,966.30	15,717.54	7,223.06	239.46	202.78	97.32	-1,103.78	8,044.60	2,011.69	1,572.81	438.88	4.584		
14,800.03	6,966.36	15,810.49	7,223.99	242.33	205.12	97.34	-1,106.25	8,137.52	2,014.32	1,570.30	444.03	4.536		
14,804.48	6,966.36	15,815.00	7,224.05	242.47	205.24	97.34	-1,106.37	8,142.02	2,014.45	1,570.18	444.27	4.534		
14,900.03	6,966.42	15,921.97	7,225.09	245.34	207.93	97.36	-1,109.14	8,248.95	2,017.05	1,567.23	449.82	4.484		
14,904.48	6,966.42	15,928.69	7,225.11	245.48	208.10	97.36	-1,109.29	8,255.67	2,017.15	1,567.02	450.13	4.481		
15,000.03	6,966.48	16,064.22	7,224.00	248.35	211.50	97.32	-1,110.91	8,391.18	2,018.16	1,561.73	456.43	4.422		
15,021.76	6,966.49	16,094.30	7,223.41	249.00	212.26	97.30	-1,110.97	8,421.25	2,018.15	1,560.32	457.83	4.408		
15,100.03	6,966.54	16,209.93	7,220.55	251.36	215.15	97.22	-1,110.03	8,536.84	2,017.30	1,554.35	462.94	4.358		
15,200.03	6,966.60	16,315.52	7,216.64	254.37	217.79	97.12	-1,107.73	8,642.33	2,014.65	1,546.04	468.61	4.299		
15,300.03	6,966.65	16,449.64	7,212.14	257.38	221.15	97.00	-1,104.35	8,776.33	2,011.85	1,537.13	474.72	4.238		
15,400.03	6,966.71	16,537.67	7,209.04	260.39	223.34	96.92	-1,101.56	8,864.26	2,008.25	1,528.15	480.10	4.183		
15,500.03	6,966.77	16,639.33	7,205.25	263.40	225.88	96.82	-1,098.32	8,965.80	2,004.64	1,518.95	485.69	4.127		
15,600.03	6,966.83	16,731.72	7,201.83	266.41	228.19	96.73	-1,095.66	9,058.10	2,001.33	1,510.20	491.13	4.075		
15,700.03	6,966.89	16,827.40	7,199.69	269.42	230.58	96.68	-1,092.75	9,153.71	1,998.06	1,501.47	496.60	4.024		
15,800.03	6,966.95	16,891.03	7,197.97	272.43	232.17	96.63	-1,091.37	9,217.30	1,995.75	1,494.28	501.46	3.980		
15,824.28	6,966.96	16,916.08	7,197.13	273.16	232.80	96.61	-1,091.08	9,242.32	1,995.36	1,492.53	502.83	3.968		
15,900.03	6,967.01	16,963.73	7,195.37	275.44	234.00	96.56	-1,091.04	9,289.95	1,994.99	1,488.57	506.42	3.939		
15,914.03	6,967.02	16,982.03	7,194.64	275.86	234.46	96.54	-1,091.22	9,308.23	1,995.07	1,487.77	507.31	3.933		
16,000.03	6,967.07	17,043.89	7,192.43	278.45	236.01	96.47	-1,092.08	9,370.04	1,995.83	1,484.33	511.49	3.902		
16,004.48	6,967.07	17,047.77	7,192.31	278.58	236.11	96.47	-1,092.14	9,373.92	1,995.88	1,484.16	511.72	3.900		
16,100.03	6,967.12	17,174.46	7,190.22	281.46	239.30	96.40	-1,093.27	9,500.59	1,996.63	1,478.83	517.80	3.856		
16,121.87	6,967.14	17,193.45	7,190.06	282.12	239.77	96.40	-1,093.27	9,519.57	1,996.60	1,477.66	518.94	3.847		
16,200.03	6,967.18	17,270.61	7,188.88	284.47	241.71	96.36	-1,093.23	9,596.72	1,996.44	1,473.20	523.24	3.816		
16,218.30	6,967.19	17,286.34	7,188.59	285.02	242.11	96.35	-1,093.26	9,612.45	1,996.43	1,472.23	524.20	3.809		
16,300.03	6,967.24	17,356.67	7,187.55	287.49	243.88	96.32	-1,093.57	9,682.77	1,996.66	1,468.21	528.44	3.778		
16,304.48	6,967.24	17,360.49	7,187.50	287.62	243.97	96.32	-1,093.60	9,686.59	1,996.69	1,468.01	528.67	3.777		
16,400.03	6,967.30	17,442.67	7,186.65	290.50	246.04	96.29	-1,094.47	9,768.76	1,997.58	1,463.97	533.61	3.744		
16,404.48	6,967.30	17,446.56	7,186.62	290.63	246.14	96.29	-1,094.52	9,772.65	1,997.64	1,463.80	533.84	3.742		
16,500.03	6,967.36	17,530.72	7,186.12	293.51	248.26	96.27	-1,095.94	9,856.80	1,999.17	1,460.37	538.80	3.710		
16,504.48	6,967.36	17,535.52	7,186.10	293.65	248.38	96.27	-1,096.03	9,861.59	1,999.25	1,460.19	539.06	3.709		
16,600.03	6,967.42	17,637.17	7,186.38	296.52	250.94	96.27	-1,097.71	9,963.23	2,000.85	1,456.36	544.49	3.675		
16,604.48	6,967.42	17,641.65	7,186.40	296.66	251.05	96.27	-1,097.77	9,967.71	2,000.92	1,456.19	544.73	3.673		
16,700.03	6,967.48	17,731.72	7,186.36	299.54	253.32	96.26	-1,099.20	10,057.77	2,002.43	1,452.58	549.85	3.642		
16,704.48	6,967.48	17,735.25	7,186.35	299.67	253.41	96.26	-1,099.27	10,061.30	2,002.51	1,452.44	550.07	3.640		
16,800.03	6,967.54	17,815.20	7,186.38	302.55	255.43	96.26	-1,101.16	10,141.22	2,004.75	1,449.87	554.87	3.613		
16,804.48	6,967.54	17,820.16	7,186.37	302.69	255.55	96.25	-1,101.29	10,146.19	2,004.86	1,449.73	555.13	3.611		
16,900.03	6,967.60	17,918.52	7,185.01	305.57	258.03	96.21	-1,103.82	10,244.50	2,007.16	1,446.64	560.52	3.581		
16,904.48	6,967.60	17,922.31	7,184.93	305.70	258.13	96.20	-1,103.93	10,248.29	2,007.27	1,446.52	560.75	3.580		
17,000.03	6,967.65	18,016.83	7,183.13	308.58	260.51	96.14	-1,106.76	10,342.75	2,009.93	1,443.89	566.04	3.551		
17,004.48	6,967.66	18,023.06	7,183.03	308.71	260.67	96.14	-1,106.93	10,348.97	2,010.04	1,443.70	566.34	3.549		
17,100.03	6,967.71	18,113.53	7,181.92	311.59	262.95	96.10	-1,109.02	10,439.41	2,012.13	1,440.64	571.49	3.521		
17,104.48	6,967.72	18,116.50	7,181.89	311.73	263.02	96.10	-1,109.10	10,442.38	2,012.25	1,440.57	571.69	3.520		



Lonestar Consulting, LLC

Anticollision Report



Company:	Logos Operating LLC	Local Co-ordinate Reference:	Well Rosa Unit 645H - Slot B8
Project:	Rio Arriba, NM NAD83	TVD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Reference Site:	Rosa Unit 27	MD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Site Error:	0.00 ft	North Reference:	True
Reference Well:	Rosa Unit 645H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 ft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction
Reference Design:	Plan #4	Offset TVD Reference:	Offset Datum

Offset Design: Rosa Unit 27 - Rosa Unit 648H - OH - OH													Offset Site Error:	0.00 ft
Survey Program: 25-NS-GYRO-MS, 390-SDI MWD, 6638-SDI MWD, 7777-SDI MWD													Offset Well Error:	0.00 ft
Reference													Rule Assigned:	
Measured	Vertical	Measured	Vertical	Reference	Offset	Highside	Offset Wellbore Centre		Distance		Minimum	Separation	Warning	
Depth	Depth	Depth	Depth			Toolface	+N/-S	+E/-W	Between	Between	Separation	Factor		
(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(°)	(ft)	(ft)	Centres	Ellipses	(ft)			
									(ft)	(ft)				
17,200.03	6,967.77	18,180.42	7,181.00	314.61	264.63	96.07	-1,111.50	10,506.25	2,015.68	1,439.75	575.93	3.500		
17,204.48	6,967.77	18,183.42	7,180.96	314.74	264.71	96.06	-1,111.64	10,509.24	2,015.87	1,439.75	576.12	3.499		
17,300.03	6,967.83	18,249.48	7,179.93	317.62	266.38	96.02	-1,115.21	10,575.20	2,020.84	1,440.53	580.31	3.482		
17,304.48	6,967.83	18,253.92	7,179.86	317.76	266.49	96.02	-1,115.48	10,579.63	2,021.11	1,440.55	580.56	3.481		
17,400.04	6,967.89	18,294.04	7,179.21	320.64	267.50	95.99	-1,117.92	10,619.67	2,027.49	1,444.07	583.42	3.475 SF		
17,404.49	6,967.89	18,294.04	7,179.21	320.77	267.50	95.99	-1,117.92	10,619.67	2,027.87	1,444.42	583.45	3.476		
17,500.04	6,967.95	18,294.04	7,179.21	323.65	267.50	95.99	-1,117.92	10,619.67	2,038.53	1,455.07	583.46	3.494		
17,589.48	6,968.00	18,294.04	7,179.21	326.33	267.50	95.99	-1,117.92	10,619.67	2,052.51	1,470.21	582.30	3.525		



Lonestar Consulting, LLC

Anticollision Report



Company:	Logos Operating LLC	Local Co-ordinate Reference:	Well Rosa Unit 645H - Slot B8
Project:	Rio Arriba, NM NAD83	TVD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Reference Site:	Rosa Unit 27	MD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Site Error:	0.00 ft	North Reference:	True
Reference Well:	Rosa Unit 645H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 ft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction
Reference Design:	Plan #4	Offset TVD Reference:	Offset Datum

Offset Design: Rosa Unit 27 - Rosa Unit 649H - OH - Plan #4												Offset Site Error:	0.00 ft
Survey Program: 0-MWD+HDGM												Offset Well Error:	0.00 ft
Reference	Offset	Semi Major Axis		Offset Wellbore Centre		Rule Assigned:		Distance		Minimum	Separation	Warning	
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)	Highside Toolface (°)	+N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Separation (ft)	Factor	
0.00	0.00	0.00	0.00	0.00	0.00	111.34	-22.05	56.45	60.61				
100.00	100.00	100.00	100.00	0.27	0.27	111.34	-22.05	56.45	60.61	60.07	0.54	111.967	
200.00	200.00	200.00	200.00	0.63	0.63	111.34	-22.05	56.45	60.61	59.35	1.26	48.168	
300.00	300.00	300.00	300.00	0.99	0.99	111.34	-22.05	56.45	60.61	58.63	1.98	30.684	
400.00	400.00	400.00	400.00	1.35	1.35	111.34	-22.05	56.45	60.61	57.91	2.69	22.513 CC	
404.45	404.45	404.45	404.45	1.36	1.36	100.99	-22.05	56.45	60.61	57.88	2.72	22.249	
500.00	500.00	499.51	499.51	1.70	1.69	101.74	-22.48	56.49	60.89	57.49	3.40	17.917 ES	
600.00	599.93	598.19	598.13	2.06	2.02	107.46	-25.87	56.81	63.52	59.44	4.08	15.558	
700.00	699.68	696.90	696.64	2.43	2.36	116.94	-31.92	57.39	70.00	65.22	4.78	14.644	
800.00	799.13	795.50	795.05	2.79	2.70	126.70	-38.16	57.98	80.31	74.82	5.49	14.635	
900.00	898.20	893.54	892.88	3.16	3.05	135.46	-44.37	58.57	94.69	88.50	6.20	15.275	
1,000.00	997.18	991.45	990.60	3.54	3.40	142.11	-50.57	59.16	111.20	104.29	6.91	16.101	
1,100.00	1,096.17	1,089.37	1,088.32	3.92	3.75	147.01	-56.77	59.75	128.80	121.18	7.61	16.918	
1,200.00	1,195.16	1,187.29	1,186.04	4.31	4.11	150.73	-62.98	60.34	147.09	138.77	8.32	17.677	
1,300.00	1,294.14	1,285.20	1,283.76	4.71	4.46	153.62	-69.18	60.92	165.86	156.83	9.03	18.367	
1,400.00	1,393.13	1,383.12	1,381.48	5.10	4.82	155.92	-75.38	61.51	184.95	175.21	9.74	18.989	
1,500.00	1,492.12	1,481.04	1,479.19	5.49	5.18	157.79	-81.58	62.10	204.28	193.82	10.45	19.546	
1,600.00	1,591.10	1,578.95	1,576.91	5.89	5.54	159.33	-87.78	62.69	223.77	212.61	11.16	20.047	
1,700.00	1,690.09	1,676.87	1,674.63	6.29	5.90	160.63	-93.98	63.28	243.41	231.53	11.88	20.497	
1,800.00	1,789.08	1,774.79	1,772.35	6.69	6.26	161.74	-100.18	63.87	263.14	250.55	12.59	20.903	
1,900.00	1,888.06	1,872.70	1,870.07	7.09	6.62	162.69	-106.39	64.46	282.96	269.65	13.30	21.271	
2,000.00	1,987.05	1,970.62	1,967.79	7.49	6.98	163.51	-112.59	65.05	302.84	288.82	14.02	21.605	
2,100.00	2,086.04	2,068.54	2,065.50	7.89	7.34	164.24	-118.79	65.63	322.77	308.04	14.73	21.910	
2,200.00	2,185.02	2,166.45	2,163.22	8.29	7.70	164.88	-124.99	66.22	342.75	327.30	15.45	22.189	
2,300.00	2,284.01	2,264.37	2,260.94	8.69	8.06	165.45	-131.19	66.81	362.76	346.60	16.16	22.444	
2,400.00	2,383.00	2,362.29	2,358.66	9.09	8.43	165.96	-137.39	67.40	382.80	365.93	16.88	22.680	
2,500.01	2,481.98	2,460.20	2,456.38	9.49	8.79	166.42	-143.59	67.99	402.87	385.28	17.60	22.897	
2,600.01	2,580.97	2,558.12	2,554.10	9.90	9.15	166.83	-149.80	68.58	422.97	404.66	18.31	23.098	
2,700.01	2,679.96	2,656.04	2,651.81	10.30	9.51	167.21	-156.00	69.17	443.08	424.05	19.03	23.285	
2,800.01	2,778.95	2,753.95	2,749.53	10.70	9.88	167.56	-162.20	69.75	463.21	443.46	19.75	23.459	
2,900.01	2,877.93	2,851.87	2,847.25	11.10	10.24	167.87	-168.40	70.34	483.35	462.89	20.46	23.621	
3,000.01	2,976.92	2,949.79	2,944.97	11.51	10.60	168.16	-174.60	70.93	503.51	482.33	21.18	23.772	
3,100.01	3,075.91	3,047.70	3,042.69	11.91	10.96	168.43	-180.80	71.52	523.68	501.78	21.90	23.914	
3,200.01	3,174.89	3,145.62	3,140.41	12.31	11.33	168.68	-187.00	72.11	543.86	521.24	22.62	24.047	
3,300.01	3,273.88	3,243.54	3,238.13	12.71	11.69	168.91	-193.20	72.70	564.05	540.71	23.33	24.173	
3,400.01	3,372.87	3,341.45	3,335.84	13.12	12.05	169.13	-199.41	73.29	584.25	560.19	24.05	24.291	
3,500.01	3,471.85	3,439.37	3,433.56	13.52	12.41	169.33	-205.61	73.87	604.45	579.68	24.77	24.402	
3,600.01	3,570.84	3,537.29	3,531.28	13.93	12.78	169.52	-211.81	74.46	624.66	599.17	25.49	24.507	
3,700.01	3,669.83	3,635.20	3,629.00	14.33	13.14	169.69	-218.01	75.05	644.88	618.67	26.21	24.607	
3,800.01	3,768.81	3,733.12	3,726.72	14.73	13.50	169.86	-224.21	75.64	665.10	638.17	26.93	24.701	
3,900.01	3,867.80	3,831.04	3,824.44	15.14	13.87	170.01	-230.41	76.23	685.33	657.68	27.64	24.790	
4,000.01	3,966.79	3,928.95	3,922.15	15.54	14.23	170.16	-236.61	76.82	705.56	677.19	28.36	24.875	
4,100.01	4,065.77	4,026.87	4,019.87	15.94	14.59	170.30	-242.82	77.41	725.79	696.71	29.08	24.956	
4,200.01	4,164.76	4,124.79	4,117.59	16.35	14.96	170.43	-249.02	77.99	746.03	716.23	29.80	25.033	
4,300.01	4,263.75	4,222.70	4,215.31	16.75	15.32	170.55	-255.22	78.58	766.28	735.76	30.52	25.107	
4,400.01	4,362.73	4,320.62	4,313.03	17.16	15.68	170.67	-261.42	79.17	786.52	755.28	31.24	25.177	
4,500.01	4,461.72	4,418.54	4,410.75	17.56	16.05	170.78	-267.62	79.76	806.77	774.81	31.96	25.244	
4,600.01	4,560.71	4,516.45	4,508.46	17.96	16.41	170.89	-273.82	80.35	827.02	794.35	32.68	25.308	
4,700.01	4,659.69	4,614.37	4,606.18	18.37	16.77	170.99	-280.02	80.94	847.28	813.88	33.40	25.369	
4,800.01	4,758.68	4,712.29	4,703.90	18.77	17.14	171.09	-286.23	81.53	867.54	833.42	34.12	25.428	



Lonestar Consulting, LLC

Anticollision Report



Company:	Logos Operating LLC	Local Co-ordinate Reference:	Well Rosa Unit 645H - Slot B8
Project:	Rio Arriba, NM NAD83	TVD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Reference Site:	Rosa Unit 27	MD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Site Error:	0.00 ft	North Reference:	True
Reference Well:	Rosa Unit 645H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 ft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction
Reference Design:	Plan #4	Offset TVD Reference:	Offset Datum

Offset Design: Rosa Unit 27 - Rosa Unit 649H - OH - Plan #4													Offset Site Error:	0.00 ft
Survey Program: 0-MWD+HDGM													Offset Well Error:	0.00 ft
Reference		Offset		Semi Major Axis		Highside Toolface (°)	Offset Wellbore Centre		Distance		Minimum Separation (ft)	Separation Factor	Warning	
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)		+N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)				
4,900.01	4,857.67	4,810.20	4,801.62	19.18	17.50	171.18	-292.43	82.12	887.80	852.96	34.84	25.484		
5,000.01	4,956.65	4,908.12	4,899.34	19.58	17.86	171.27	-298.63	82.70	908.06	872.50	35.56	25.538		
5,100.01	5,055.64	5,006.04	4,997.06	19.98	18.23	171.35	-304.83	83.29	928.32	892.04	36.28	25.590		
5,200.01	5,154.63	5,103.96	5,094.77	20.39	18.59	171.43	-311.03	83.88	948.59	911.59	37.00	25.640		
5,300.01	5,253.61	5,201.87	5,192.49	20.79	18.95	171.51	-317.23	84.47	968.85	931.14	37.72	25.688		
5,400.01	5,352.60	5,299.79	5,290.21	21.20	19.32	171.58	-323.43	85.06	989.12	950.69	38.44	25.734		
5,500.01	5,451.59	5,397.71	5,387.93	21.60	19.68	171.65	-329.64	85.65	1,009.39	970.24	39.16	25.778		
5,600.01	5,550.57	5,495.62	5,485.65	22.01	20.04	171.72	-335.84	86.24	1,029.67	989.79	39.88	25.821		
5,700.01	5,649.56	5,593.54	5,583.37	22.41	20.41	171.79	-342.04	86.82	1,049.94	1,009.34	40.60	25.862		
5,800.01	5,748.55	5,691.46	5,681.08	22.81	20.77	171.85	-348.24	87.41	1,070.21	1,028.90	41.32	25.902		
5,900.01	5,847.53	5,789.37	5,778.80	23.22	21.13	171.91	-354.44	88.00	1,090.49	1,048.45	42.04	25.941		
6,000.01	5,946.52	5,887.29	5,876.52	23.62	21.50	171.97	-360.64	88.59	1,110.77	1,068.01	42.76	25.978		
6,100.01	6,045.51	5,985.21	5,974.24	24.03	21.86	172.03	-366.84	89.18	1,131.04	1,087.56	43.48	26.014		
6,200.01	6,144.49	6,083.12	6,071.96	24.43	22.23	172.08	-373.05	89.77	1,151.32	1,107.12	44.20	26.048		
6,300.01	6,243.48	6,181.04	6,169.68	24.84	22.59	172.13	-379.25	90.36	1,171.60	1,126.68	44.92	26.082		
6,400.00	6,342.45	6,278.94	6,267.38	25.24	22.95	172.18	-385.45	90.94	1,191.88	1,146.24	45.64	26.115		
6,500.01	6,440.93	6,380.66	6,368.85	25.65	23.33	130.14	-391.89	93.04	1,212.34	1,165.95	46.39	26.134		
6,600.01	6,536.70	6,489.73	6,476.18	26.06	23.72	113.05	-398.72	110.39	1,232.42	1,185.23	47.19	26.118		
6,700.01	6,627.42	6,600.90	6,580.89	26.46	24.10	104.98	-405.40	146.67	1,251.46	1,203.46	48.00	26.072		
6,800.01	6,710.86	6,714.03	6,679.35	26.86	24.47	100.13	-411.71	201.73	1,268.95	1,220.07	48.88	25.962		
6,900.01	6,784.97	6,828.82	6,767.72	27.29	24.86	96.81	-417.39	274.53	1,284.43	1,234.52	49.92	25.731		
7,000.01	6,847.91	6,944.80	6,842.30	27.78	25.40	94.37	-422.22	363.01	1,297.49	1,246.22	51.27	25.307		
7,100.01	6,898.13	7,061.34	6,899.89	28.43	26.29	92.53	-425.98	464.08	1,307.78	1,254.66	53.12	24.621		
7,200.01	6,934.41	7,177.73	6,938.12	29.33	27.58	91.16	-428.52	573.80	1,315.04	1,259.48	55.56	23.670		
7,300.01	6,955.84	7,293.19	6,955.74	30.51	29.22	90.19	-429.76	687.75	1,319.11	1,260.53	58.58	22.519		
7,400.01	6,962.01	7,398.13	6,957.05	31.95	30.96	89.78	-429.96	792.66	1,320.17	1,258.28	61.89	21.331		
7,500.02	6,962.07	7,498.13	6,957.13	33.61	32.81	89.79	-430.07	892.66	1,320.29	1,254.78	65.51	20.155		
7,600.02	6,962.12	7,598.13	6,957.21	35.45	34.84	89.79	-430.18	992.66	1,320.41	1,250.95	69.46	19.009		
7,700.02	6,962.18	7,698.13	6,957.29	37.46	37.00	89.79	-430.29	1,092.66	1,320.53	1,246.82	73.70	17.917		
7,800.02	6,962.24	7,798.13	6,957.37	39.61	39.27	89.79	-430.41	1,192.66	1,320.65	1,242.46	78.18	16.891		
7,900.02	6,962.30	7,898.13	6,957.44	41.87	41.64	89.79	-430.52	1,292.66	1,320.77	1,237.90	82.86	15.939		
8,000.02	6,962.36	7,998.13	6,957.52	44.22	44.09	89.79	-430.63	1,392.66	1,320.89	1,233.17	87.71	15.059		
8,100.02	6,962.42	8,098.13	6,957.60	46.65	46.61	89.79	-430.74	1,492.66	1,321.01	1,228.30	92.70	14.250		
8,200.02	6,962.48	8,198.13	6,957.68	49.15	49.19	89.79	-430.85	1,592.66	1,321.13	1,223.31	97.81	13.507		
8,300.02	6,962.54	8,298.13	6,957.76	51.70	51.82	89.79	-430.96	1,692.66	1,321.25	1,218.22	103.02	12.825		
8,400.02	6,962.60	8,398.13	6,957.84	54.31	54.48	89.79	-431.08	1,792.66	1,321.37	1,213.04	108.32	12.198		
8,500.02	6,962.65	8,498.13	6,957.91	56.95	57.19	89.79	-431.19	1,892.66	1,321.49	1,207.79	113.70	11.623		
8,600.02	6,962.71	8,598.13	6,957.99	59.64	59.92	89.80	-431.30	1,992.66	1,321.61	1,202.47	119.14	11.093		
8,700.02	6,962.77	8,698.13	6,958.07	62.35	62.68	89.80	-431.41	2,092.66	1,321.72	1,197.09	124.63	10.605		
8,800.02	6,962.83	8,798.13	6,958.15	65.09	65.47	89.80	-431.52	2,192.66	1,321.84	1,191.67	130.18	10.154		
8,900.02	6,962.89	8,898.13	6,958.23	67.86	68.27	89.80	-431.63	2,292.66	1,321.96	1,186.20	135.77	9.737		
9,000.02	6,962.95	8,998.13	6,958.31	70.65	71.09	89.80	-431.75	2,392.66	1,322.08	1,180.69	141.39	9.350		
9,100.02	6,963.01	9,098.13	6,958.38	73.45	73.93	89.80	-431.86	2,492.66	1,322.20	1,175.15	147.05	8.991		
9,200.02	6,963.07	9,198.13	6,958.46	76.28	76.79	89.80	-431.97	2,592.66	1,322.32	1,169.58	152.74	8.657		
9,300.02	6,963.12	9,298.13	6,958.54	79.12	79.65	89.80	-432.08	2,692.66	1,322.44	1,163.98	158.46	8.346		
9,400.02	6,963.18	9,398.13	6,958.62	81.97	82.53	89.80	-432.19	2,792.66	1,322.56	1,158.36	164.20	8.055		
9,500.02	6,963.24	9,498.13	6,958.70	84.83	85.42	89.80	-432.30	2,892.66	1,322.68	1,152.72	169.96	7.782		
9,600.02	6,963.30	9,598.13	6,958.78	87.71	88.31	89.80	-432.42	2,992.66	1,322.80	1,147.06	175.75	7.527		
9,700.02	6,963.36	9,698.13	6,958.86	90.59	91.22	89.80	-432.53	3,092.66	1,322.92	1,141.38	181.55	7.287		
9,800.02	6,963.42	9,798.13	6,958.93	93.49	94.13	89.81	-432.64	3,192.66	1,323.04	1,135.68	187.36	7.061		



Lonestar Consulting, LLC

Anticollision Report



Company:	Logos Operating LLC	Local Co-ordinate Reference:	Well Rosa Unit 645H - Slot B8
Project:	Rio Arriba, NM NAD83	TVD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Reference Site:	Rosa Unit 27	MD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Site Error:	0.00 ft	North Reference:	True
Reference Well:	Rosa Unit 645H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 ft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction
Reference Design:	Plan #4	Offset TVD Reference:	Offset Datum

Offset Design: Rosa Unit 27 - Rosa Unit 649H - OH - Plan #4													Offset Site Error:	0.00 ft
Survey Program: 0-MWD+HDGM													Offset Well Error:	0.00 ft
Reference	Offset	Semi Major Axis		Offset Wellbore Centre		Rule Assigned:		Distance		Minimum	Separation	Warning		
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)	Highside Toolface (°)	+N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Separation (ft)			
9,900.02	6,963.48	9,998.13	6,959.01	96.39	97.05	89.81	-432.75	3,292.66	1,323.16	1,129.97	193.19	6.849		
10,000.02	6,963.54	9,998.13	6,959.09	99.30	99.98	89.81	-432.86	3,392.66	1,323.28	1,124.25	199.04	6.648		
10,100.02	6,963.60	10,098.13	6,959.17	102.22	102.91	89.81	-432.97	3,492.66	1,323.40	1,118.51	204.89	6.459		
10,200.02	6,963.65	10,198.13	6,959.25	105.14	105.85	89.81	-433.09	3,592.66	1,323.52	1,112.76	210.76	6.280		
10,300.02	6,963.71	10,298.13	6,959.33	108.07	108.79	89.81	-433.20	3,692.66	1,323.64	1,107.01	216.63	6.110		
10,400.02	6,963.77	10,398.13	6,959.40	111.00	111.74	89.81	-433.31	3,792.66	1,323.76	1,101.24	222.52	5.949		
10,500.02	6,963.83	10,498.13	6,959.48	113.94	114.69	89.81	-433.42	3,892.66	1,323.88	1,095.46	228.42	5.796		
10,600.02	6,963.89	10,598.13	6,959.56	116.88	117.64	89.81	-433.53	3,992.66	1,324.00	1,089.68	234.32	5.650		
10,700.02	6,963.95	10,698.13	6,959.64	119.83	120.60	89.81	-433.64	4,092.66	1,324.12	1,083.89	240.23	5.512		
10,800.02	6,964.01	10,798.14	6,959.72	122.78	123.56	89.81	-433.76	4,192.66	1,324.24	1,078.09	246.15	5.380		
10,900.02	6,964.07	10,898.14	6,959.80	125.73	126.53	89.82	-433.87	4,292.66	1,324.36	1,072.29	252.07	5.254		
11,000.02	6,964.12	10,998.14	6,959.88	128.69	129.50	89.82	-433.98	4,392.66	1,324.48	1,066.48	258.00	5.134		
11,100.02	6,964.18	11,098.14	6,959.95	131.65	132.47	89.82	-434.09	4,492.66	1,324.60	1,060.66	263.93	5.019		
11,200.02	6,964.24	11,198.14	6,960.03	134.62	135.44	89.82	-434.20	4,592.66	1,324.72	1,054.84	269.87	4.909		
11,300.02	6,964.30	11,298.14	6,960.11	137.58	138.41	89.82	-434.31	4,692.66	1,324.84	1,049.02	275.82	4.803		
11,400.02	6,964.36	11,398.14	6,960.19	140.55	141.39	89.82	-434.43	4,792.66	1,324.96	1,043.19	281.77	4.702		
11,500.02	6,964.42	11,498.14	6,960.27	143.52	144.37	89.82	-434.54	4,892.66	1,325.08	1,037.35	287.72	4.605		
11,600.02	6,964.48	11,598.14	6,960.35	146.50	147.35	89.82	-434.65	4,992.66	1,325.20	1,031.51	293.68	4.512		
11,700.02	6,964.54	11,698.14	6,960.42	149.47	150.33	89.82	-434.76	5,092.66	1,325.32	1,025.67	299.64	4.423		
11,800.02	6,964.60	11,798.14	6,960.50	152.45	153.32	89.82	-434.87	5,192.66	1,325.43	1,019.83	305.61	4.337		
11,900.02	6,964.65	11,898.14	6,960.58	155.43	156.30	89.82	-434.98	5,292.66	1,325.55	1,013.98	311.58	4.254		
12,000.02	6,964.71	11,998.14	6,960.66	158.41	159.29	89.82	-435.10	5,392.66	1,325.67	1,008.13	317.55	4.175		
12,100.02	6,964.77	12,098.14	6,960.74	161.39	162.28	89.83	-435.21	5,492.66	1,325.79	1,002.27	323.52	4.098		
12,200.02	6,964.83	12,198.14	6,960.82	164.38	165.27	89.83	-435.32	5,592.66	1,325.91	996.41	329.50	4.024		
12,300.02	6,964.89	12,298.14	6,960.89	167.36	168.26	89.83	-435.43	5,692.66	1,326.03	990.55	335.48	3.953		
12,400.03	6,964.95	12,398.14	6,960.97	170.35	171.26	89.83	-435.54	5,792.66	1,326.15	984.69	341.46	3.884		
12,500.03	6,965.01	12,498.14	6,961.05	173.34	174.25	89.83	-435.65	5,892.66	1,326.27	978.82	347.45	3.817		
12,600.03	6,965.07	12,598.14	6,961.13	176.33	177.25	89.83	-435.77	5,992.66	1,326.39	972.96	353.44	3.753		
12,700.03	6,965.12	12,698.14	6,961.21	179.32	180.24	89.83	-435.88	6,092.66	1,326.51	967.09	359.42	3.691		
12,800.03	6,965.18	12,798.14	6,961.29	182.31	183.24	89.83	-435.99	6,192.66	1,326.63	961.22	365.42	3.630		
12,900.03	6,965.24	12,898.14	6,961.37	185.31	186.24	89.83	-436.10	6,292.66	1,326.75	955.34	371.41	3.572		
13,000.03	6,965.30	12,998.14	6,961.44	188.30	189.24	89.83	-436.21	6,392.66	1,326.87	949.47	377.41	3.516		
13,100.03	6,965.36	13,098.14	6,961.52	191.30	192.24	89.83	-436.32	6,492.66	1,326.99	943.59	383.40	3.461		
13,200.03	6,965.42	13,198.14	6,961.60	194.29	195.24	89.84	-436.44	6,592.66	1,327.11	937.71	389.40	3.408		
13,300.03	6,965.48	13,298.14	6,961.68	197.29	198.24	89.84	-436.55	6,692.66	1,327.23	931.83	395.40	3.357		
13,400.03	6,965.54	13,398.14	6,961.76	200.29	201.24	89.84	-436.66	6,792.66	1,327.35	925.95	401.40	3.307		
13,500.03	6,965.60	13,498.14	6,961.84	203.29	204.24	89.84	-436.77	6,892.66	1,327.47	920.06	407.41	3.258		
13,600.03	6,965.65	13,598.14	6,961.91	206.29	207.25	89.84	-436.88	6,992.66	1,327.59	914.18	413.41	3.211		
13,700.03	6,965.71	13,698.14	6,961.99	209.29	210.25	89.84	-436.99	7,092.66	1,327.71	908.29	419.42	3.166		
13,800.03	6,965.77	13,798.14	6,962.07	212.29	213.26	89.84	-437.11	7,192.66	1,327.83	902.40	425.43	3.121		
13,900.03	6,965.83	13,898.14	6,962.15	215.29	216.26	89.84	-437.22	7,292.66	1,327.95	896.51	431.43	3.078		
14,000.03	6,965.89	13,998.14	6,962.23	218.29	219.27	89.84	-437.33	7,392.66	1,328.07	890.62	437.44	3.036		
14,100.03	6,965.95	14,098.14	6,962.31	221.30	222.27	89.84	-437.44	7,492.66	1,328.19	884.73	443.46	2.995		
14,200.03	6,966.01	14,198.14	6,962.39	224.30	225.28	89.84	-437.55	7,592.66	1,328.31	878.84	449.47	2.955		
14,300.03	6,966.07	14,298.14	6,962.46	227.30	228.29	89.84	-437.66	7,692.66	1,328.43	872.95	455.48	2.917		
14,400.03	6,966.12	14,398.14	6,962.54	230.31	231.30	89.85	-437.77	7,792.66	1,328.55	867.05	461.50	2.879		
14,500.03	6,966.18	14,498.14	6,962.62	233.32	234.30	89.85	-437.89	7,892.66	1,328.67	861.16	467.51	2.842		
14,600.03	6,966.24	14,598.14	6,962.70	236.32	237.31	89.85	-438.00	7,992.66	1,328.79	855.26	473.53	2.806		
14,700.03	6,966.30	14,698.14	6,962.78	239.33	240.32	89.85	-438.11	8,092.66	1,328.91	849.36	479.54	2.771		
14,800.03	6,966.36	14,798.14	6,962.86	242.33	243.33	89.85	-438.22	8,192.66	1,329.03	843.46	485.56	2.737		



Lonestar Consulting, LLC

Anticollision Report



Company:	Logos Operating LLC	Local Co-ordinate Reference:	Well Rosa Unit 645H - Slot B8
Project:	Rio Arriba, NM NAD83	TVD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Reference Site:	Rosa Unit 27	MD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Site Error:	0.00 ft	North Reference:	True
Reference Well:	Rosa Unit 645H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 ft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction
Reference Design:	Plan #4	Offset TVD Reference:	Offset Datum

Offset Design: Rosa Unit 27 - Rosa Unit 649H - OH - Plan #4													Offset Site Error:	0.00 ft
Survey Program: 0-MWD+HDGM													Offset Well Error:	0.00 ft
Reference	Offset	Semi Major Axis		Offset Wellbore Centre		Distance		Rule Assigned:		Warning				
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)	Highside Toolface (°)	+N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Minimum Separation (ft)	Separation Factor		
14,900.03	6,966.42	14,898.14	6,962.93	245.34	246.34	89.85	-438.33	8,292.66	1,329.15	837.56	491.58	2.704		
15,000.03	6,966.48	14,998.14	6,963.01	248.35	249.35	89.85	-438.44	8,392.66	1,329.26	831.66	497.60	2.671		
15,100.03	6,966.54	15,098.14	6,963.09	251.36	252.36	89.85	-438.56	8,492.66	1,329.38	825.76	503.62	2.640		
15,200.03	6,966.60	15,198.14	6,963.17	254.37	255.38	89.85	-438.67	8,592.66	1,329.50	819.86	509.64	2.609		
15,300.03	6,966.65	15,298.14	6,963.25	257.38	258.39	89.85	-438.78	8,692.66	1,329.62	813.96	515.66	2.578		
15,400.03	6,966.71	15,398.14	6,963.33	260.39	261.40	89.85	-438.89	8,792.66	1,329.74	808.06	521.69	2.549		
15,500.03	6,966.77	15,498.14	6,963.40	263.40	264.41	89.85	-439.00	8,892.66	1,329.86	802.15	527.71	2.520		
15,600.03	6,966.83	15,598.14	6,963.48	266.41	267.42	89.86	-439.11	8,992.66	1,329.98	796.25	533.73	2.492		
15,700.03	6,966.89	15,698.14	6,963.56	269.42	270.44	89.86	-439.23	9,092.66	1,330.10	790.34	539.76	2.464		
15,800.03	6,966.95	15,798.14	6,963.64	272.43	273.45	89.86	-439.34	9,192.66	1,330.22	784.44	545.78	2.437		
15,900.03	6,967.01	15,898.14	6,963.72	275.44	276.46	89.86	-439.45	9,292.66	1,330.34	778.53	551.81	2.411		
16,000.03	6,967.07	15,998.14	6,963.80	278.45	279.48	89.86	-439.56	9,392.66	1,330.46	772.63	557.83	2.385		
16,100.03	6,967.12	16,098.14	6,963.88	281.46	282.49	89.86	-439.67	9,492.66	1,330.58	766.72	563.86	2.360		
16,200.03	6,967.18	16,198.14	6,963.95	284.47	285.51	89.86	-439.78	9,592.66	1,330.70	760.81	569.89	2.335		
16,300.03	6,967.24	16,298.14	6,964.03	287.49	288.52	89.86	-439.90	9,692.66	1,330.82	754.90	575.92	2.311		
16,400.03	6,967.30	16,398.14	6,964.11	290.50	291.54	89.86	-440.01	9,792.66	1,330.94	749.00	581.94	2.287		
16,500.03	6,967.36	16,498.14	6,964.19	293.51	294.55	89.86	-440.12	9,892.66	1,331.06	743.09	587.97	2.264		
16,600.03	6,967.42	16,598.14	6,964.27	296.52	297.57	89.86	-440.23	9,992.66	1,331.18	737.18	594.00	2.241		
16,700.03	6,967.48	16,698.14	6,964.35	299.54	300.58	89.87	-440.34	10,092.66	1,331.30	731.27	600.03	2.219		
16,800.03	6,967.54	16,798.14	6,964.42	302.55	303.60	89.87	-440.45	10,192.66	1,331.42	725.36	606.06	2.197		
16,900.03	6,967.60	16,898.14	6,964.50	305.57	306.61	89.87	-440.57	10,292.66	1,331.54	719.45	612.09	2.175		
17,000.03	6,967.65	16,998.14	6,964.58	308.58	309.63	89.87	-440.68	10,392.66	1,331.66	713.53	618.12	2.154		
17,100.03	6,967.71	17,098.14	6,964.66	311.59	312.65	89.87	-440.79	10,492.66	1,331.78	707.62	624.16	2.134		
17,200.03	6,967.77	17,198.14	6,964.74	314.61	315.66	89.87	-440.90	10,592.66	1,331.90	701.71	630.19	2.113		
17,300.03	6,967.83	17,298.14	6,964.82	317.62	318.68	89.87	-441.01	10,692.66	1,332.02	695.80	636.22	2.094		
17,400.04	6,967.89	17,398.14	6,964.90	320.64	321.70	89.87	-441.12	10,792.66	1,332.14	689.89	642.25	2.074		
17,500.04	6,967.95	17,498.14	6,964.97	323.65	324.71	89.87	-441.24	10,892.66	1,332.26	683.97	648.29	2.055		
17,589.48	6,968.00	17,531.98	6,965.00	326.33	325.73	89.87	-441.27	10,926.50	1,333.55	682.30	651.25	2.048 SF		



Lonestar Consulting, LLC

Anticollision Report

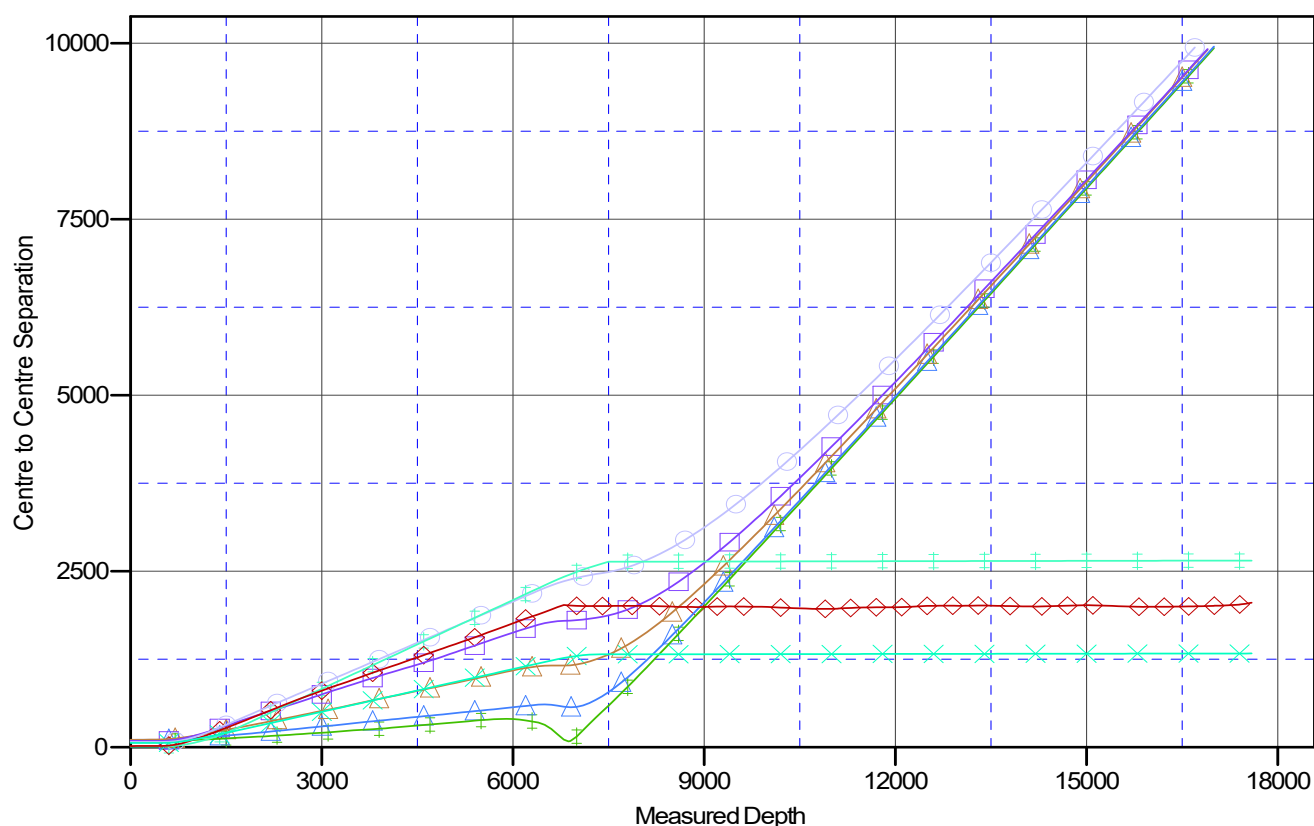


Company:	Logos Operating LLC	Local Co-ordinate Reference:	Well Rosa Unit 645H - Slot B8
Project:	Rio Arriba, NM NAD83	TVD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Reference Site:	Rosa Unit 27	MD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Site Error:	0.00 ft	North Reference:	True
Reference Well:	Rosa Unit 645H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 ft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction
Reference Design:	Plan #4	Offset TVD Reference:	Offset Datum

Reference Depths are relative to GL 6305' & RKB 24.5' @ 6329.50ft (E)
 Offset Depths are relative to Offset Datum
 Central Meridian is -107.8333334

Coordinates are relative to: Rosa Unit 645H - Slot B8
 Coordinate System is US State Plane 1983, New Mexico Western Zone
 Grid Convergence at Surface is: 0.26°

Ladder Plot



LEGEND

Rosa Unit 640H OH/CH V0	Rosa Unit 643H OH/CH V0	Rosa Unit 646H OH/CH V0
Rosa Unit 641H OH/CH V0	Rosa Unit 644H OH/CH V0 n#1 V0	Rosa Unit 649H OH/CH V0 n#4 V0
Rosa Unit 642H OH/CH V0	Rosa Unit 647H OH/CH V0 n#4 V0	



Lonestar Consulting, LLC

Anticollision Report

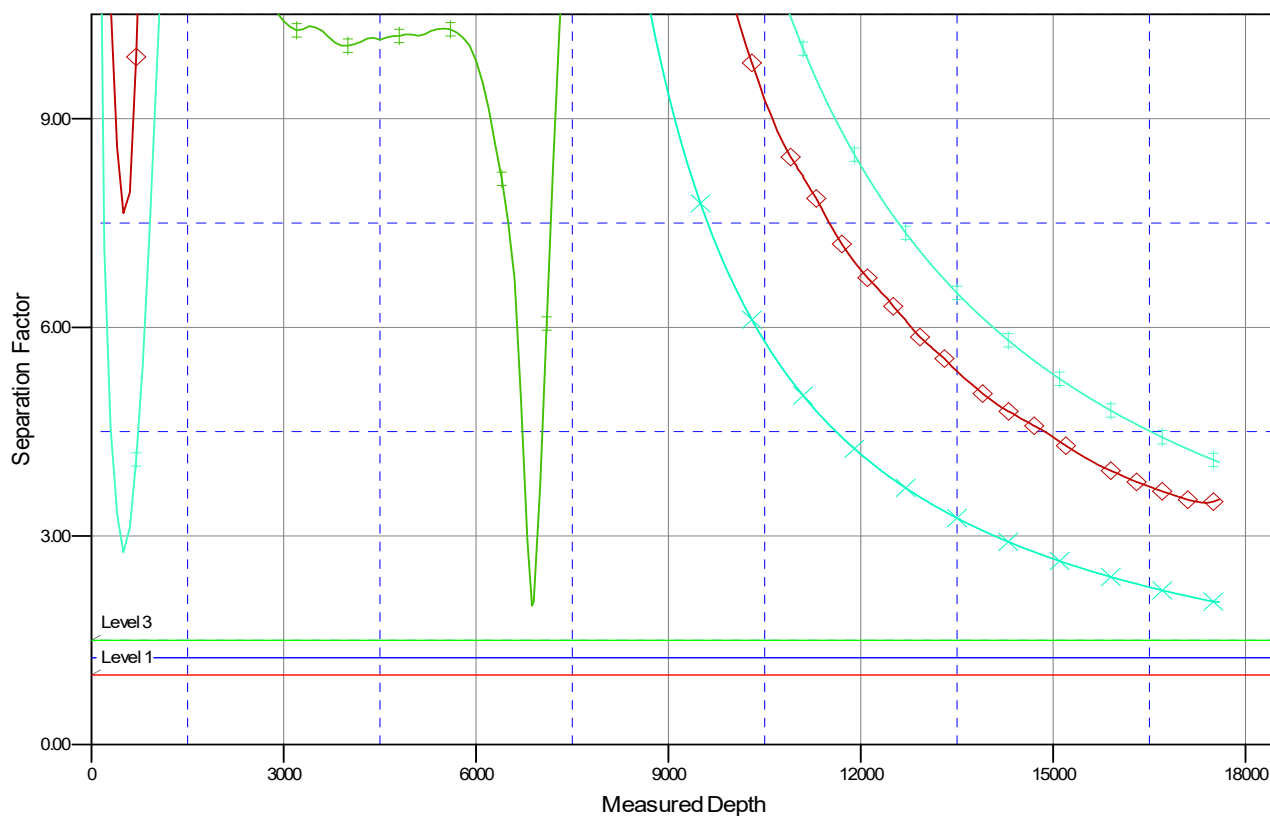


Company:	Logos Operating LLC	Local Co-ordinate Reference:	Well Rosa Unit 645H - Slot B8
Project:	Rio Arriba, NM NAD83	TVD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Reference Site:	Rosa Unit 27	MD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Site Error:	0.00 ft	North Reference:	True
Reference Well:	Rosa Unit 645H	Survey Calculation Method:	Minimum Curvature
Well Error:	0.00 ft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	Grand Junction
Reference Design:	Plan #4	Offset TVD Reference:	Offset Datum

Reference Depths are relative to GL 6305' & RKB 24.5' @ 6329.50ft (E)
 Offset Depths are relative to Offset Datum
 Central Meridian is -107.833334

Coordinates are relative to: Rosa Unit 645H - Slot B8
 Coordinate System is US State Plane 1983, New Mexico Western Zone
 Grid Convergence at Surface is: 0.26°

Separation Factor Plot



LEGEND

Rosa Unit 640H OH OH V0	Rosa Unit 643H OH OH V0	Rosa Unit 648H OH OH V0
Rosa Unit 641H OH OH V0	Rosa Unit 644H OH OH n#1 V0	Rosa Unit 649H OH OH n#4 V0
Rosa Unit 642H OH OH V0	Rosa Unit 647H OH OH n#4 V0	

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Company: Logos Operating LLC
Project: Rio Arriba, NM NAD83
Site: Rosa Unit 27
Well: Rosa Unit 645H
Wellbore: OH
Design: Plan #4

PROJECT DETAILS: Rio Arriba, NM NAD83

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



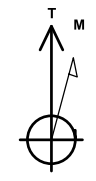
WELL DETAILS: Rosa Unit 645H

GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)

+N/-S	+E/-W	Northing	Easting	Latitude	Longitude	
0.00	0.00	2143470.17	2847960.54	36.8897396	-107.4063290	B8

Plan: Plan #4 (Rosa Unit 645H/OH)

Created By: Janie Collins Date: 8:41, April 07 2022



Azimuths to True North:
Magnetic North: 8.36°

Magnetic Field:
Strength: 49683.3 μT
Dip Angle: 63.37°
Date: 6/14/2021
Model: HDGM2021_FIT

DESIGN TARGET DETAILS

Name	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
645H POE Rev 2	6962.00	890.20	782.80	2144363.86	2848739.35	36.8921847	-107.4036521
645H BHL Rev 2	6968.00	891.05	10982.65	2144410.35	2858939.07	36.8921811	-107.3687720

SECTION DETAILS

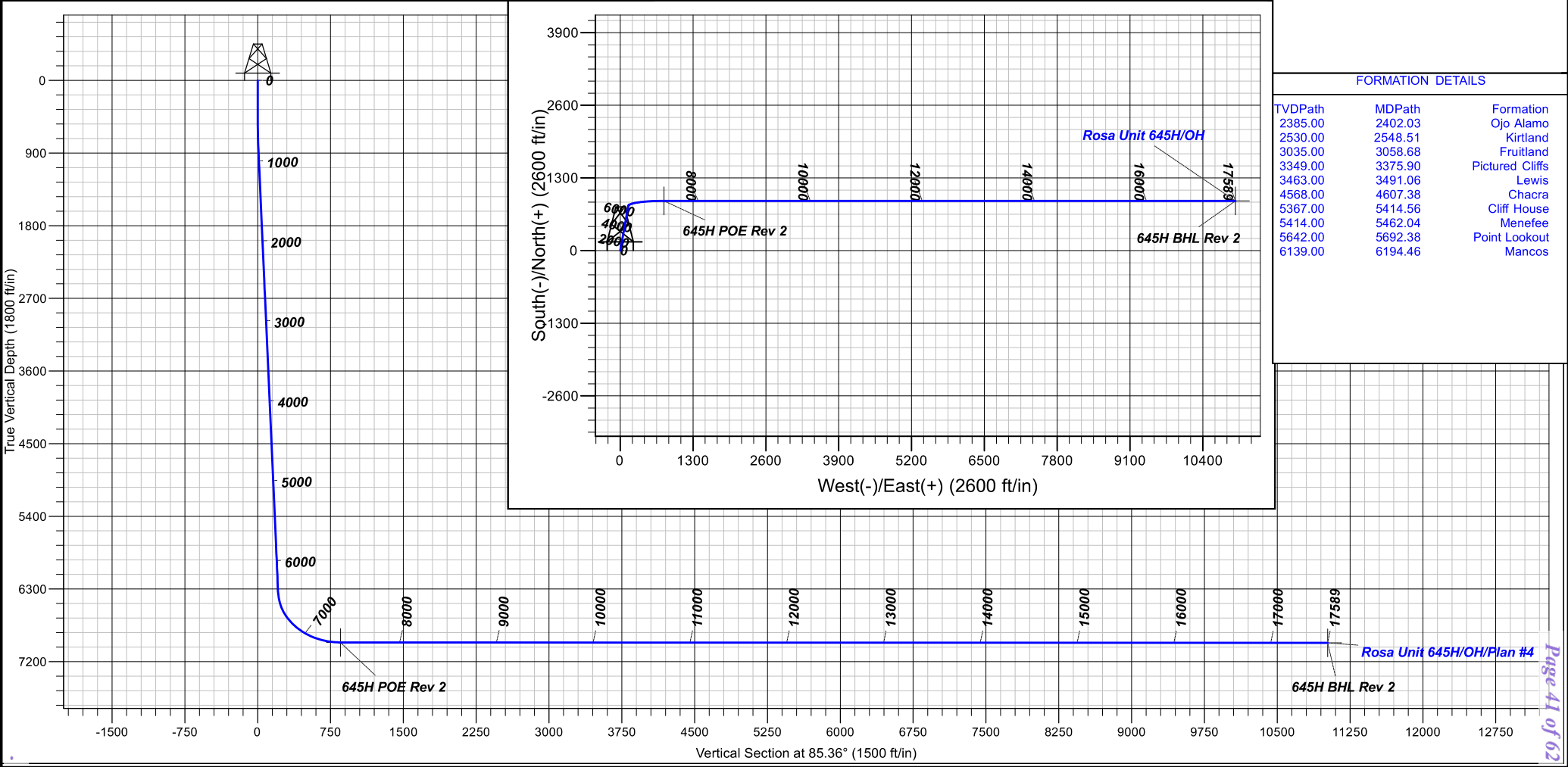
MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	VSect
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
450.00	0.00	0.00	450.00	0.00	0.00	0.00	0.00	0.00
858.22	8.16	10.35	856.84	28.56	5.22	2.00	10.35	7.51
6405.31	8.16	10.35	6347.71	803.50	148.77	0.00	0.00	211.26
7388.69	89.97	90.00	6962.00	890.20	782.80	9.00	79.75	852.22
17588.54	89.97	90.00	6968.00	891.05	10982.65	0.00	0.00	11018.74

CASING DETAILS

No casing data is available

FORMATION DETAILS

TVDPath	MDPath	Formation
2385.00	2402.03	Ojo Alamo
2530.00	2548.51	Kirtland
3035.00	3058.68	Fruitland
3349.00	3375.90	Pictured Cliffs
3463.00	3491.06	Lewis
4568.00	4607.38	Chacra
5367.00	5414.56	Cliff House
5414.00	5462.04	Menefee
5642.00	5692.38	Point Lookout
6139.00	6194.46	Mancos



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Logos Operating LLC

Rio Arriba, NM NAD83

Rosa Unit 27

Rosa Unit 645H - Slot B8

OH

Plan: Plan #4

Standard Planning Report

07 April, 2022





Lonestar Consulting, LLC Planning Report



Database:	Grand Junction	Local Co-ordinate Reference:	Well Rosa Unit 645H - Slot B8
Company:	Logos Operating LLC	TVD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Project:	Rio Arriba, NM NAD83	MD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Site:	Rosa Unit 27	North Reference:	True
Well:	Rosa Unit 645H	Survey Calculation Method:	Minimum Curvature
Wellbore:	OH		
Design:	Plan #4		

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

Site		Rosa Unit 27				
Site Position:		Northing:	2,143,451.58	usft	Latitude:	36.8896880
From:	Lat/Long	Easting:	2,848,002.44	usft	Longitude:	-107.4061860
Position Uncertainty:	0.00	ft	Slot Radius:	13.200	in	

Well	Rosa Unit 645H - Slot B8					
Well Position	+N/-S	0.00 ft	Northing:	2,143,470.17 usft	Latitude:	36.8897395
	+E/-W	0.00 ft	Easting:	2,847,960.54 usft	Longitude:	-107.4063290
Position Uncertainty		0.00 ft	Wellhead Elevation:	ft	Ground Level:	6,305.00 ft
Grid Convergence:		0.26 °				

Wellbore	OH				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	HDGM2021_FILE	6/14/2021	8.68	63.37	49,683.80000000

Design	Plan #4			
Audit Notes:				
Version:	Phase:	PLAN	Tie On Depth:	0.00
Vertical Section:	Depth From (TVD) (ft)	+N/-S (ft)	+E/-W (ft)	Direction (°)
	0.00	0.00	0.00	85.36

Plan Survey Tool Program	Date	4/7/2022		
Depth From (ft)	Depth To (ft)	Survey (Wellbore)	Tool Name	Remarks
1	0.00	17,588.54 Plan #4 (OH)	MWD+HDGM	
			OWSG MWD + HDGM	

Plan Sections										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)	TFO (°)	Target
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
450.00	0.00	0.00	450.00	0.00	0.00	0.00	0.00	0.00	0.00	
858.22	8.16	10.35	856.84	28.56	5.22	2.00	2.00	0.00	10.35	
6,405.31	8.16	10.35	6,347.71	803.50	146.77	0.00	0.00	0.00	0.00	
7,388.69	89.97	90.00	6,962.00	890.20	782.80	9.00	8.32	8.10	79.75	645H POE Rev 2
17,588.54	89.97	90.00	6,968.00	891.05	10,982.65	0.00	0.00	0.00	0.00	645H BHL Rev 2



Lonestar Consulting, LLC

Planning Report



Database:	Grand Junction	Local Co-ordinate Reference:	Well Rosa Unit 645H - Slot B8
Company:	Logos Operating LLC	TVD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Project:	Rio Arriba, NM NAD83	MD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Site:	Rosa Unit 27	North Reference:	True
Well:	Rosa Unit 645H	Survey Calculation Method:	Minimum Curvature
Wellbore:	OH		
Design:	Plan #4		

Planned Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)	
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	
450.00	0.00	0.00	450.00	0.00	0.00	0.00	0.00	0.00	0.00	
500.00	1.00	10.35	500.00	0.43	0.08	0.11	2.00	2.00	0.00	
600.00	3.00	10.35	599.93	3.86	0.71	1.02	2.00	2.00	0.00	
700.00	5.00	10.35	699.68	10.72	1.96	2.82	2.00	2.00	0.00	
800.00	7.00	10.35	799.13	21.01	3.84	5.52	2.00	2.00	0.00	
858.22	8.16	10.35	856.84	28.56	5.22	7.51	2.00	2.00	0.00	
900.00	8.16	10.35	898.20	34.40	6.28	9.04	0.00	0.00	0.00	
1,000.00	8.16	10.35	997.18	48.37	8.84	12.72	0.00	0.00	0.00	
1,100.00	8.16	10.35	1,096.17	62.34	11.39	16.39	0.00	0.00	0.00	
1,200.00	8.16	10.35	1,195.16	76.31	13.94	20.06	0.00	0.00	0.00	
1,300.00	8.16	10.35	1,294.14	90.28	16.49	23.74	0.00	0.00	0.00	
1,400.00	8.16	10.35	1,393.13	104.25	19.04	27.41	0.00	0.00	0.00	
1,500.00	8.16	10.35	1,492.12	118.22	21.59	31.08	0.00	0.00	0.00	
1,600.00	8.16	10.35	1,591.10	132.19	24.15	34.76	0.00	0.00	0.00	
1,700.00	8.16	10.35	1,690.09	146.16	26.70	38.43	0.00	0.00	0.00	
1,800.00	8.16	10.35	1,789.07	160.13	29.25	42.10	0.00	0.00	0.00	
1,900.00	8.16	10.35	1,888.06	174.10	31.80	45.78	0.00	0.00	0.00	
2,000.00	8.16	10.35	1,987.05	188.07	34.35	49.45	0.00	0.00	0.00	
2,100.00	8.16	10.35	2,086.03	202.04	36.91	53.12	0.00	0.00	0.00	
2,200.00	8.16	10.35	2,185.02	216.01	39.46	56.80	0.00	0.00	0.00	
2,300.00	8.16	10.35	2,284.01	229.98	42.01	60.47	0.00	0.00	0.00	
2,400.00	8.16	10.35	2,382.99	243.95	44.56	64.14	0.00	0.00	0.00	
2,500.00	8.16	10.35	2,481.98	257.92	47.11	67.81	0.00	0.00	0.00	
2,600.00	8.16	10.35	2,580.97	271.89	49.66	71.49	0.00	0.00	0.00	
2,700.00	8.16	10.35	2,679.95	285.86	52.22	75.16	0.00	0.00	0.00	
2,800.00	8.16	10.35	2,778.94	299.83	54.77	78.83	0.00	0.00	0.00	
2,900.00	8.16	10.35	2,877.93	313.80	57.32	82.51	0.00	0.00	0.00	
3,000.00	8.16	10.35	2,976.91	327.77	59.87	86.18	0.00	0.00	0.00	
3,100.00	8.16	10.35	3,075.90	341.74	62.42	89.85	0.00	0.00	0.00	
3,200.00	8.16	10.35	3,174.89	355.71	64.98	93.53	0.00	0.00	0.00	
3,300.00	8.16	10.35	3,273.87	369.68	67.53	97.20	0.00	0.00	0.00	
3,400.00	8.16	10.35	3,372.86	383.65	70.08	100.87	0.00	0.00	0.00	
3,500.00	8.16	10.35	3,471.84	397.63	72.63	104.55	0.00	0.00	0.00	
3,600.00	8.16	10.35	3,570.83	411.60	75.18	108.22	0.00	0.00	0.00	
3,700.00	8.16	10.35	3,669.82	425.57	77.74	111.89	0.00	0.00	0.00	
3,800.00	8.16	10.35	3,768.80	439.54	80.29	115.56	0.00	0.00	0.00	
3,900.00	8.16	10.35	3,867.79	453.51	82.84	119.24	0.00	0.00	0.00	
4,000.00	8.16	10.35	3,966.78	467.48	85.39	122.91	0.00	0.00	0.00	
4,100.00	8.16	10.35	4,065.76	481.45	87.94	126.58	0.00	0.00	0.00	
4,200.00	8.16	10.35	4,164.75	495.42	90.49	130.26	0.00	0.00	0.00	
4,300.00	8.16	10.35	4,263.74	509.39	93.05	133.93	0.00	0.00	0.00	
4,400.00	8.16	10.35	4,362.72	523.36	95.60	137.60	0.00	0.00	0.00	
4,500.00	8.16	10.35	4,461.71	537.33	98.15	141.28	0.00	0.00	0.00	
4,600.00	8.16	10.35	4,560.70	551.30	100.70	144.95	0.00	0.00	0.00	
4,700.00	8.16	10.35	4,659.68	565.27	103.25	148.62	0.00	0.00	0.00	
4,800.00	8.16	10.35	4,758.67	579.24	105.81	152.30	0.00	0.00	0.00	
4,900.00	8.16	10.35	4,857.66	593.21	108.36	155.97	0.00	0.00	0.00	



Lonestar Consulting, LLC

Planning Report



Database:	Grand Junction	Local Co-ordinate Reference:	Well Rosa Unit 645H - Slot B8
Company:	Logos Operating LLC	TVD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Project:	Rio Arriba, NM NAD83	MD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Site:	Rosa Unit 27	North Reference:	True
Well:	Rosa Unit 645H	Survey Calculation Method:	Minimum Curvature
Wellbore:	OH		
Design:	Plan #4		

Planned Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)	
5,000.00	8.16	10.35	4,956.64	607.18	110.91	159.64	0.00	0.00	0.00	
5,100.00	8.16	10.35	5,055.63	621.15	113.46	163.32	0.00	0.00	0.00	
5,200.00	8.16	10.35	5,154.61	635.12	116.01	166.99	0.00	0.00	0.00	
5,300.00	8.16	10.35	5,253.60	649.09	118.56	170.66	0.00	0.00	0.00	
5,400.00	8.16	10.35	5,352.59	663.06	121.12	174.33	0.00	0.00	0.00	
5,500.00	8.16	10.35	5,451.57	677.03	123.67	178.01	0.00	0.00	0.00	
5,600.00	8.16	10.35	5,550.56	691.00	126.22	181.68	0.00	0.00	0.00	
5,700.00	8.16	10.35	5,649.55	704.97	128.77	185.35	0.00	0.00	0.00	
5,800.00	8.16	10.35	5,748.53	718.94	131.32	189.03	0.00	0.00	0.00	
5,900.00	8.16	10.35	5,847.52	732.91	133.88	192.70	0.00	0.00	0.00	
6,000.00	8.16	10.35	5,946.51	746.88	136.43	196.37	0.00	0.00	0.00	
6,100.00	8.16	10.35	6,045.49	760.85	138.98	200.05	0.00	0.00	0.00	
6,200.00	8.16	10.35	6,144.48	774.82	141.53	203.72	0.00	0.00	0.00	
6,300.00	8.16	10.35	6,243.47	788.79	144.08	207.39	0.00	0.00	0.00	
6,400.00	8.16	10.35	6,342.45	802.76	146.63	211.07	0.00	0.00	0.00	
6,405.31	8.16	10.35	6,347.71	803.50	146.77	211.26	0.00	0.00	0.00	
6,500.00	12.79	51.56	6,440.92	816.66	156.20	221.73	9.00	4.88	43.52	
6,600.00	20.56	67.89	6,536.69	830.17	181.19	247.72	9.00	7.77	16.34	
6,700.00	29.02	75.26	6,627.41	842.98	221.00	288.44	9.00	8.47	7.37	
6,800.00	37.72	79.49	6,710.85	854.75	274.65	342.86	9.00	8.70	4.22	
6,900.00	46.52	82.31	6,784.96	865.21	340.82	409.67	9.00	8.80	2.82	
7,000.00	55.38	84.41	6,847.90	874.10	417.89	487.20	9.00	8.85	2.10	
7,100.00	64.26	86.10	6,898.13	881.18	503.95	573.55	9.00	8.88	1.69	
7,200.00	73.16	87.55	6,934.40	886.30	596.88	666.59	9.00	8.90	1.45	
7,300.00	82.06	88.87	6,955.84	889.33	694.41	764.04	9.00	8.91	1.32	
7,388.69	89.97	90.00	6,962.00	890.20	782.80	852.22	9.00	8.91	1.27	
7,400.00	89.97	90.00	6,962.01	890.20	794.12	863.50	0.00	0.00	0.00	
7,500.00	89.97	90.00	6,962.07	890.21	894.12	963.17	0.00	0.00	0.00	
7,600.00	89.97	90.00	6,962.12	890.22	994.12	1,062.84	0.00	0.00	0.00	
7,700.00	89.97	90.00	6,962.18	890.22	1,094.12	1,162.52	0.00	0.00	0.00	
7,800.00	89.97	90.00	6,962.24	890.23	1,194.12	1,262.19	0.00	0.00	0.00	
7,900.00	89.97	90.00	6,962.30	890.24	1,294.12	1,361.86	0.00	0.00	0.00	
8,000.00	89.97	90.00	6,962.36	890.25	1,394.12	1,461.54	0.00	0.00	0.00	
8,100.00	89.97	90.00	6,962.42	890.26	1,494.12	1,561.21	0.00	0.00	0.00	
8,200.00	89.97	90.00	6,962.48	890.26	1,594.12	1,660.88	0.00	0.00	0.00	
8,300.00	89.97	90.00	6,962.54	890.27	1,694.12	1,760.56	0.00	0.00	0.00	
8,400.00	89.97	90.00	6,962.60	890.28	1,794.12	1,860.23	0.00	0.00	0.00	
8,500.00	89.97	90.00	6,962.65	890.29	1,894.12	1,959.90	0.00	0.00	0.00	
8,600.00	89.97	90.00	6,962.71	890.30	1,994.12	2,059.57	0.00	0.00	0.00	
8,700.00	89.97	90.00	6,962.77	890.30	2,094.12	2,159.25	0.00	0.00	0.00	
8,800.00	89.97	90.00	6,962.83	890.31	2,194.12	2,258.92	0.00	0.00	0.00	
8,900.00	89.97	90.00	6,962.89	890.32	2,294.12	2,358.59	0.00	0.00	0.00	
9,000.00	89.97	90.00	6,962.95	890.33	2,394.12	2,458.27	0.00	0.00	0.00	
9,100.00	89.97	90.00	6,963.01	890.34	2,494.12	2,557.94	0.00	0.00	0.00	
9,200.00	89.97	90.00	6,963.07	890.34	2,594.12	2,657.61	0.00	0.00	0.00	
9,300.00	89.97	90.00	6,963.12	890.35	2,694.12	2,757.29	0.00	0.00	0.00	
9,400.00	89.97	90.00	6,963.18	890.36	2,794.12	2,856.96	0.00	0.00	0.00	
9,500.00	89.97	90.00	6,963.24	890.37	2,894.12	2,956.63	0.00	0.00	0.00	
9,600.00	89.97	90.00	6,963.30	890.38	2,994.12	3,056.31	0.00	0.00	0.00	
9,700.00	89.97	90.00	6,963.36	890.39	3,094.12	3,155.98	0.00	0.00	0.00	
9,800.00	89.97	90.00	6,963.42	890.39	3,194.12	3,255.65	0.00	0.00	0.00	
9,900.00	89.97	90.00	6,963.48	890.40	3,294.12	3,355.33	0.00	0.00	0.00	



Lonestar Consulting, LLC

Planning Report



Database:	Grand Junction	Local Co-ordinate Reference:	Well Rosa Unit 645H - Slot B8
Company:	Logos Operating LLC	TVD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Project:	Rio Arriba, NM NAD83	MD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Site:	Rosa Unit 27	North Reference:	True
Well:	Rosa Unit 645H	Survey Calculation Method:	Minimum Curvature
Wellbore:	OH		
Design:	Plan #4		

Planned Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)	
10,000.00	89.97	90.00	6,963.54	890.41	3,394.12	3,455.00	0.00	0.00	0.00	
10,100.00	89.97	90.00	6,963.60	890.42	3,494.12	3,554.67	0.00	0.00	0.00	
10,200.00	89.97	90.00	6,963.65	890.43	3,594.12	3,654.35	0.00	0.00	0.00	
10,300.00	89.97	90.00	6,963.71	890.43	3,694.12	3,754.02	0.00	0.00	0.00	
10,400.00	89.97	90.00	6,963.77	890.44	3,794.12	3,853.69	0.00	0.00	0.00	
10,500.00	89.97	90.00	6,963.83	890.45	3,894.11	3,953.37	0.00	0.00	0.00	
10,600.00	89.97	90.00	6,963.89	890.46	3,994.11	4,053.04	0.00	0.00	0.00	
10,700.00	89.97	90.00	6,963.95	890.47	4,094.11	4,152.71	0.00	0.00	0.00	
10,800.00	89.97	90.00	6,964.01	890.47	4,194.11	4,252.38	0.00	0.00	0.00	
10,900.00	89.97	90.00	6,964.07	890.48	4,294.11	4,352.06	0.00	0.00	0.00	
11,000.00	89.97	90.00	6,964.12	890.49	4,394.11	4,451.73	0.00	0.00	0.00	
11,100.00	89.97	90.00	6,964.18	890.50	4,494.11	4,551.40	0.00	0.00	0.00	
11,200.00	89.97	90.00	6,964.24	890.51	4,594.11	4,651.08	0.00	0.00	0.00	
11,300.00	89.97	90.00	6,964.30	890.52	4,694.11	4,750.75	0.00	0.00	0.00	
11,400.00	89.97	90.00	6,964.36	890.52	4,794.11	4,850.42	0.00	0.00	0.00	
11,500.00	89.97	90.00	6,964.42	890.53	4,894.11	4,950.10	0.00	0.00	0.00	
11,600.00	89.97	90.00	6,964.48	890.54	4,994.11	5,049.77	0.00	0.00	0.00	
11,700.00	89.97	90.00	6,964.54	890.55	5,094.11	5,149.44	0.00	0.00	0.00	
11,800.00	89.97	90.00	6,964.60	890.56	5,194.11	5,249.12	0.00	0.00	0.00	
11,900.00	89.97	90.00	6,964.65	890.56	5,294.11	5,348.79	0.00	0.00	0.00	
12,000.00	89.97	90.00	6,964.71	890.57	5,394.11	5,448.46	0.00	0.00	0.00	
12,100.00	89.97	90.00	6,964.77	890.58	5,494.11	5,548.14	0.00	0.00	0.00	
12,200.00	89.97	90.00	6,964.83	890.59	5,594.11	5,647.81	0.00	0.00	0.00	
12,300.00	89.97	90.00	6,964.89	890.60	5,694.11	5,747.48	0.00	0.00	0.00	
12,400.00	89.97	90.00	6,964.95	890.60	5,794.11	5,847.16	0.00	0.00	0.00	
12,500.00	89.97	90.00	6,965.01	890.61	5,894.11	5,946.83	0.00	0.00	0.00	
12,600.00	89.97	90.00	6,965.07	890.62	5,994.11	6,046.50	0.00	0.00	0.00	
12,700.00	89.97	90.00	6,965.12	890.63	6,094.11	6,146.18	0.00	0.00	0.00	
12,800.00	89.97	90.00	6,965.18	890.64	6,194.11	6,245.85	0.00	0.00	0.00	
12,900.00	89.97	90.00	6,965.24	890.64	6,294.11	6,345.52	0.00	0.00	0.00	
13,000.00	89.97	90.00	6,965.30	890.65	6,394.11	6,445.20	0.00	0.00	0.00	
13,100.00	89.97	90.00	6,965.36	890.66	6,494.11	6,544.87	0.00	0.00	0.00	
13,200.00	89.97	90.00	6,965.42	890.67	6,594.11	6,644.54	0.00	0.00	0.00	
13,300.00	89.97	90.00	6,965.48	890.68	6,694.11	6,744.21	0.00	0.00	0.00	
13,400.00	89.97	90.00	6,965.54	890.69	6,794.11	6,843.89	0.00	0.00	0.00	
13,500.00	89.97	90.00	6,965.60	890.69	6,894.11	6,943.56	0.00	0.00	0.00	
13,600.00	89.97	90.00	6,965.65	890.70	6,994.11	7,043.23	0.00	0.00	0.00	
13,700.00	89.97	90.00	6,965.71	890.71	7,094.11	7,142.91	0.00	0.00	0.00	
13,800.00	89.97	90.00	6,965.77	890.72	7,194.11	7,242.58	0.00	0.00	0.00	
13,900.00	89.97	90.00	6,965.83	890.73	7,294.11	7,342.25	0.00	0.00	0.00	
14,000.00	89.97	90.00	6,965.89	890.73	7,394.11	7,441.93	0.00	0.00	0.00	
14,100.00	89.97	90.00	6,965.95	890.74	7,494.11	7,541.60	0.00	0.00	0.00	
14,200.00	89.97	90.00	6,966.01	890.75	7,594.11	7,641.27	0.00	0.00	0.00	
14,300.00	89.97	90.00	6,966.07	890.76	7,694.11	7,740.95	0.00	0.00	0.00	
14,400.00	89.97	90.00	6,966.12	890.77	7,794.11	7,840.62	0.00	0.00	0.00	
14,500.00	89.97	90.00	6,966.18	890.77	7,894.11	7,940.29	0.00	0.00	0.00	
14,600.00	89.97	90.00	6,966.24	890.78	7,994.11	8,039.97	0.00	0.00	0.00	
14,700.00	89.97	90.00	6,966.30	890.79	8,094.11	8,139.64	0.00	0.00	0.00	
14,800.00	89.97	90.00	6,966.36	890.80	8,194.11	8,239.31	0.00	0.00	0.00	
14,900.00	89.97	90.00	6,966.42	890.81	8,294.11	8,338.99	0.00	0.00	0.00	
15,000.00	89.97	90.00	6,966.48	890.81	8,394.11	8,438.66	0.00	0.00	0.00	
15,100.00	89.97	90.00	6,966.54	890.82	8,494.11	8,538.33	0.00	0.00	0.00	



Lonestar Consulting, LLC

Planning Report



Database:	Grand Junction	Local Co-ordinate Reference:	Well Rosa Unit 645H - Slot B8
Company:	Logos Operating LLC	TVD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Project:	Rio Arriba, NM NAD83	MD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Site:	Rosa Unit 27	North Reference:	True
Well:	Rosa Unit 645H	Survey Calculation Method:	Minimum Curvature
Wellbore:	OH		
Design:	Plan #4		

Planned Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)	
15,200.00	89.97	90.00	6,966.60	890.83	8,594.11	8,638.01	0.00	0.00	0.00	
15,300.00	89.97	90.00	6,966.65	890.84	8,694.11	8,737.68	0.00	0.00	0.00	
15,400.00	89.97	90.00	6,966.71	890.85	8,794.11	8,837.35	0.00	0.00	0.00	
15,500.00	89.97	90.00	6,966.77	890.86	8,894.11	8,937.02	0.00	0.00	0.00	
15,600.00	89.97	90.00	6,966.83	890.86	8,994.11	9,036.70	0.00	0.00	0.00	
15,700.00	89.97	90.00	6,966.89	890.87	9,094.11	9,136.37	0.00	0.00	0.00	
15,800.00	89.97	90.00	6,966.95	890.88	9,194.11	9,236.04	0.00	0.00	0.00	
15,900.00	89.97	90.00	6,967.01	890.89	9,294.11	9,335.72	0.00	0.00	0.00	
16,000.00	89.97	90.00	6,967.07	890.90	9,394.11	9,435.39	0.00	0.00	0.00	
16,100.00	89.97	90.00	6,967.12	890.90	9,494.11	9,535.06	0.00	0.00	0.00	
16,200.00	89.97	90.00	6,967.18	890.91	9,594.11	9,634.74	0.00	0.00	0.00	
16,300.00	89.97	90.00	6,967.24	890.92	9,694.11	9,734.41	0.00	0.00	0.00	
16,400.00	89.97	90.00	6,967.30	890.93	9,794.11	9,834.08	0.00	0.00	0.00	
16,500.00	89.97	90.00	6,967.36	890.94	9,894.11	9,933.76	0.00	0.00	0.00	
16,600.00	89.97	90.00	6,967.42	890.94	9,994.11	10,033.43	0.00	0.00	0.00	
16,700.00	89.97	90.00	6,967.48	890.95	10,094.11	10,133.10	0.00	0.00	0.00	
16,800.00	89.97	90.00	6,967.54	890.96	10,194.11	10,232.78	0.00	0.00	0.00	
16,900.00	89.97	90.00	6,967.60	890.97	10,294.11	10,332.45	0.00	0.00	0.00	
17,000.00	89.97	90.00	6,967.65	890.98	10,394.11	10,432.12	0.00	0.00	0.00	
17,100.00	89.97	90.00	6,967.71	890.98	10,494.11	10,531.80	0.00	0.00	0.00	
17,200.00	89.97	90.00	6,967.77	890.99	10,594.11	10,631.47	0.00	0.00	0.00	
17,300.00	89.97	90.00	6,967.83	891.00	10,694.11	10,731.14	0.00	0.00	0.00	
17,400.00	89.97	90.00	6,967.89	891.01	10,794.11	10,830.82	0.00	0.00	0.00	
17,500.00	89.97	90.00	6,967.95	891.02	10,894.11	10,930.49	0.00	0.00	0.00	
17,588.54	89.97	90.00	6,968.00	891.05	10,982.65	11,018.74	0.00	0.00	0.00	

Design Targets									
Target Name	Dip Angle (°)	Dip Dir. (°)	TVD (ft)	+N/-S (ft)	+E/-W (ft)	Northing (usft)	Easting (usft)	Latitude	Longitude
645H POE Rev 2	0.00	0.00	6,962.00	890.20	782.80	2,144,363.86	2,848,739.35	36.8921846	-107.4036521
- hit/miss target									
- Shape									
- plan hits target center									
- Point									
645H BHL Rev 2	0.00	0.00	6,968.00	891.05	10,982.65	2,144,410.35	2,858,939.07	36.8921811	-107.3687720
- hit/miss target									
- Shape									
- plan hits target center									
- Point									



Lonestar Consulting, LLC
Planning Report



Database:	Grand Junction	Local Co-ordinate Reference:	Well Rosa Unit 645H - Slot B8
Company:	Logos Operating LLC	TVD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Project:	Rio Arriba, NM NAD83	MD Reference:	GL 6305' & RKB 24.5' @ 6329.50ft (Ensign T223)
Site:	Rosa Unit 27	North Reference:	True
Well:	Rosa Unit 645H	Survey Calculation Method:	Minimum Curvature
Wellbore:	OH		
Design:	Plan #4		

Formations					
Measured Depth (ft)	Vertical Depth (ft)	Name	Lithology	Dip (°)	Dip Direction (°)
2,402.03	2,385.00	Ojo Alamo		0.00	0.00
2,548.51	2,530.00	Kirtland		0.00	0.00
3,058.68	3,035.00	Fruitland		0.00	0.00
3,375.90	3,349.00	Pictured Cliffs		0.00	0.00
3,491.06	3,463.00	Lewis		0.00	0.00
4,607.38	4,568.00	Chacra		0.00	0.00
5,414.56	5,367.00	Cliff House		0.00	0.00
5,462.04	5,414.00	Menefee		0.00	0.00
5,692.38	5,642.00	Point Lookout		0.00	0.00
6,194.46	6,139.00	Mancos		0.00	0.00

Plan Annotations				
Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
450.00	450.00	0.00	0.00	Start Build 2.00
858.22	856.84	28.56	5.22	Start 5547.10 hold at 858.22 MD
6,405.31	6,347.71	803.50	146.77	Start DLS 9.00 TFO 79.75
7,388.69	6,962.00	890.20	782.80	Start 10199.85 hold at 7388.69 MD
17,588.54	6,968.00	891.05	10,982.65	TD at 17588.54



LOGOS Operating, LLC Operations Plan

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

Date:	April 8, 2022	Pool:	Basin Mancos
Well Name:	Rosa Unit 645H	GL Elevation:	6,305'
Surface Location:	Sec 19, T31N, R5W 943 FNL, 424 FWL (36.8899740° N, 107.406329° W – NAD83)	Measured Depth:	17,598' (KB)
Bottom Hole Location:	Sec 21, T31N, R5W 52 FNL, 2320 FWL (36.892181° N, 107.368772° W – NAD83)	County:	Rio Arriba

Lease Serial #NMSF078769, CA Serial #NMNM78407E

I. GEOLOGY

A. Formation Tops (Based on 25' KB Elevation): Estimated top of important geological markers:
SURFACE FORMATION – NACIMIENTO

NAME	MD	TVD	NAME	MD	TVD
OJO ALAMO	2400	2383	*POINT LOOKOUT	5691	5640
KIRTLAND	2547	2528	*MANCOS	6193	6137
*FRUITLAND	3057	3033	KICKOFF POINT	6406	6348
*PICTURED CLIFFS	3374	3347	LANDING POINT	7398	6970
LEWIS	3489	3461			
CHACRA	4606	4566			
*CLIFF HOUSE	5413	5365			
MENEFEE	5461	5412	TD	17598	6965

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

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

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

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

II. DRILLING

A. MUD PROGRAM: LSND mud (WBM) will be used to drill the 17-1/2" surface hole as well as the 12-1/4" directional vertical hole. A LSND (WBM) or (OBM) will be used to drill the 8-3/4" curve and lateral portion of the wellbore. Treat for lost circulation as necessary. Obtain 100% returns prior to cementing. Notify Engineering of any mud losses. Mud weights of 8.8-13 ppg will be used as necessary to maintain sufficient overbalance of reservoir pressure.

Above ground steel pits will be used for fluid and cuttings while drilling. In the unlikely event that a tank develops a leak, upon immediate visual discovery, the fluid would be transferred to another tank and contaminated soil would be removed and disposed. Any leaks, spills or other undesirable events will be reported in accordance with BLM NTL 3A. Rig crews will monitor the tanks at all

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times.

- B. BOP TESTING:** The BOPE will be tested to **250 psi (Low) for 5 minutes** and **1500 psi (High) for 10 minutes**. Pressure test surface casing to **600 psi for 30 minutes** and intermediate casing to **1500 psi for 30 minutes**. Utilize a BOPE Testing Unit with a recording chart and appropriate test plug for testing. The drum brakes will be inspected and tested each tour. BOP equipment will be tested every 30 days, after any repairs are made to the BOP equipment, and after the BOP equipment is subjected to pressure. Annular preventers will be functionally operated at least once per week. Pipe and blind rams shall be activated each trip or but not more than once a day. The New Mexico Oil & Gas Conservation Commission and the BLM will be notified 24 hours in advance of testing of BOPE. **All tests and inspections will be recorded and logged with time and results.** A full BOP test will be conducted when initially installed for the first well on the pad or if seals subject to test pressure are broken, following related repairs and at a minimum of 30 day intervals. A BOPE Shell Test only will be conducted for subsequent wells on the pad when seals subject to pressure have not been broken or repaired and fall within the 30 day interval of first full test.
- C. GeoHazards:** There are no Geohazards
- D. Maximum Anticipated Pressure:** $6970' \text{ TVD} \times 0.43 = 2997 \text{ psi}$
- E. H2S Concerns:** — There is no record of any naturally occurring H2S in any formation in the Rosa Unit. No H2S is anticipated in this formation or this well.

III. MATERIALS

A. CASING EQUIPMENT:

CASING TYPE	OHSIZE (IN)	DEPTH (MD)	CSG SIZE	WEIGHT	GRADE	CONN
SURFACE	17.5"	320' or greater	13.375"	54.5 LBS	J-55 or equiv	LTC/BTC
INTERMEDIATE	12.25"	6,268'	9.625"	43.5 LBS	N-80 or equiv	LTC/BTC
PRODUCTION	8.5"	17,598'	5.5"	20 LBS	P-110 or equiv	LTC/BTC

NOTE: All casing depths are approximate, based on KB elevation (25') and will be based on drilling conditions +/- 50'. Weights, grades and connections will be based on availability and may vary but will be equivalent or greater.

B. FLOAT EQUIPMENT:

- SURFACE CASING:** 13-3/8" notched regular pattern guide shoe. Run (1) standard centralizer on each of the bottom (3) joints of Surface Casing.
- INTERMEDIATE CASING:** 9-5/8" cement nose guide shoe with a self-fill insert float. Place float collar one joint above the shoe. Install (1) centralizer on each of the bottom (3) joints and one standard centralizer every (3) joints to 2,500 ft. Run (1) centralizer at 2,500 ft., 2,300ft., 2,000ft., 1,500 ft., and 1,000 ft. Optional use of DV Tools (2) will be strategically placed above loss circulation zones anticipated in the Mesaverde and Fruitland Coal. Optional use of cancellation plugs for DV tools may be used if losses while cementing are not encountered.
- PRODUCTION CASING:** Run 5-1/2" casing with cement nose guide Float Shoe, 5-1/2" full or pup joints as necessary, Landing Collar, 5-1/2" full or pup joints as necessary, at least (1) one Toe Sleeve (Sliding Sleeve) positioned inside the applicable production area. Centralizer program will be determined by wellbore conditions. Production casing to be pressure tested during completion operations with frac stack installed.

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C. CEMENTING:

(Note: Cement type and volumes may be adjusted onsite due to actual conditions and availability)

1. SURFACE: Casing shall be set at ~ 320' and cemented to surface. TOC at Surface.
263 sks of 15.8 ppg Type Neat G, 1.18 cuft/sk yield or equivalent 223 sks of 14.6 ppg Type III with 1.39 cuft/sk yield, 30% excess.
2. INTERMEDIATE: Intermediate casing shall be kept fluid filled while running in to the hole to meet BLM minimum collapse requirements. The intermediate casing will be cemented in 2 or 3 stages using DV/STAGE tools in order to reduce cement losses and maximize cement coverage. Operator proposes optional DV tools above anticipated loss circulation zones in the Mesaverde and in the Fruitland coal. If losses are not observed during the second stage a cancelation plug will be pumped and the remaining cement will be pumped during stage 2. If cement does not circulate to the DV tool(s) or to surface, a CBL will be run to determine TOC.

	Top (ft)	Footage (ft)	Cement (ft3/ft) Annular Capacity	Excess (30%)	Total (ft3)	Total (bbl)	Slurry Yield (ft3/sk)	Sacks Cement	Density (PPG)
Stage 1 Tail	5,791	477	0.31318	1.3	212	38	1.15	184	15.8
Stage 1 Lead	4,657	1,134	0.31318	1.3	462	82	2.30	201	12.3
					673	120		385	
Stage 2 Tail	3,574	1,083	0.31318	1.3	441	79	1.50	294	13.5
Stage 2 Lead	3,107	467	0.31318	1.3	190	34	2.30	83	12.3
					631	112		377	
Stage 3 Tail	2,357	750	0.31318	1.3	305	54	1.99	153	12.8
Stage 3 Lead	320	2,037	0.31318	1.3	829	148	2.53	328	12
Stage 3 Lead	-	320	0.36268	1	116	21	2.53	46	12
					1,251	223		527	
All Stage Totals					2,555	455		1,289	

Calculations based on 30% excess for open hole and cement to surface. Actual excess pumped will be determined by well conditions.

3. PRODUCTION: Production casing will be cemented in 1 stage with 100' of cement overlap above intermediate shoe. A CBL, or alternatively, a Temperature Survey will be used to determine TOC.

	Top (ft)	Footage (ft)	Cement (ft3/ft) Annular Capacity	Excess (15%)	Total (ft3)	Total (bbl)	Slurry Yield (ft3/sk)	Sacks Cement	Density (PPG)
Cased Lead	6,168	100	0.2531	1	25	5	1.56	16	13
Open Hole Lead	6,268	11,330	0.2291	1.15	2,996	534	1.56	1,920	13
					3,021	538		1,936	

Calculations based on 15% excess for open hole and 100' overlap into intermediate casing. Actual volumes will vary.

Cement calculations are used for volume estimation. Well conditions will dictate final cement job design. Actual volumes will be calculated and determined by conditions onsite. All cement slurries will meet or exceed minimum BLM and New Mexico Oil Conservation Division requirements. Slurries used will be the slurries listed above or equivalent slurries depending on service provider selected. Cement yields may change depending on slurries selected. All waiting on cement times shall be a minimum of 8 hours or adequate to achieve a minimum of 500 psi compressive strength at the casing shoe prior to drilling out.

IV. COMPLETION

ROSA UNIT 645H



A. CBL

CBLs and/or Temperature Surveys will be performed as needed or required to determine cement top if cement is not circulated.

B. PRESSURE TEST

- C. Pressure test 5-1/2" casing to 1532 psi (0.22 psi/ft * 6,965' TVD) for 30 minutes. Increase pressure to Open RSI sleeves.

D. STIMULATION

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

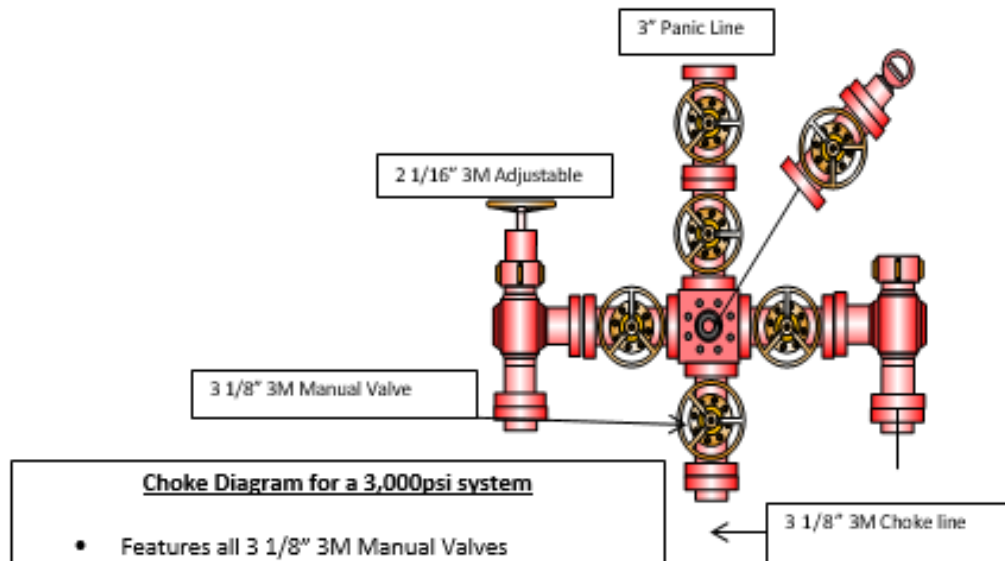
E. PRODUCTION TUBING

2-7/8", 6.5#, J-55 or L-80, EUE tubing will be run once volumes and pressures dictate. Due to the extremely high initial flow rates and pressures seen in offset wells, tubing will be installed once it is safe to do so, typically 12-18 months after completion.

*NOTE: Although this horizontal well may be drilled past the applicable setbacks, an unorthodox location application is not required because the completed interval in this well, as defined by 19.15.16.7 8(1) NMAC, will be entirely within the applicable setbacks. This approach complies with all applicable rules, including 19.15.16.14 A(3) NMAC, 19.15.16.14 8(2) NMAC, 19.15.16.15 8(2)NMAC, and 19.15.16.15. 8(4) NMAC.

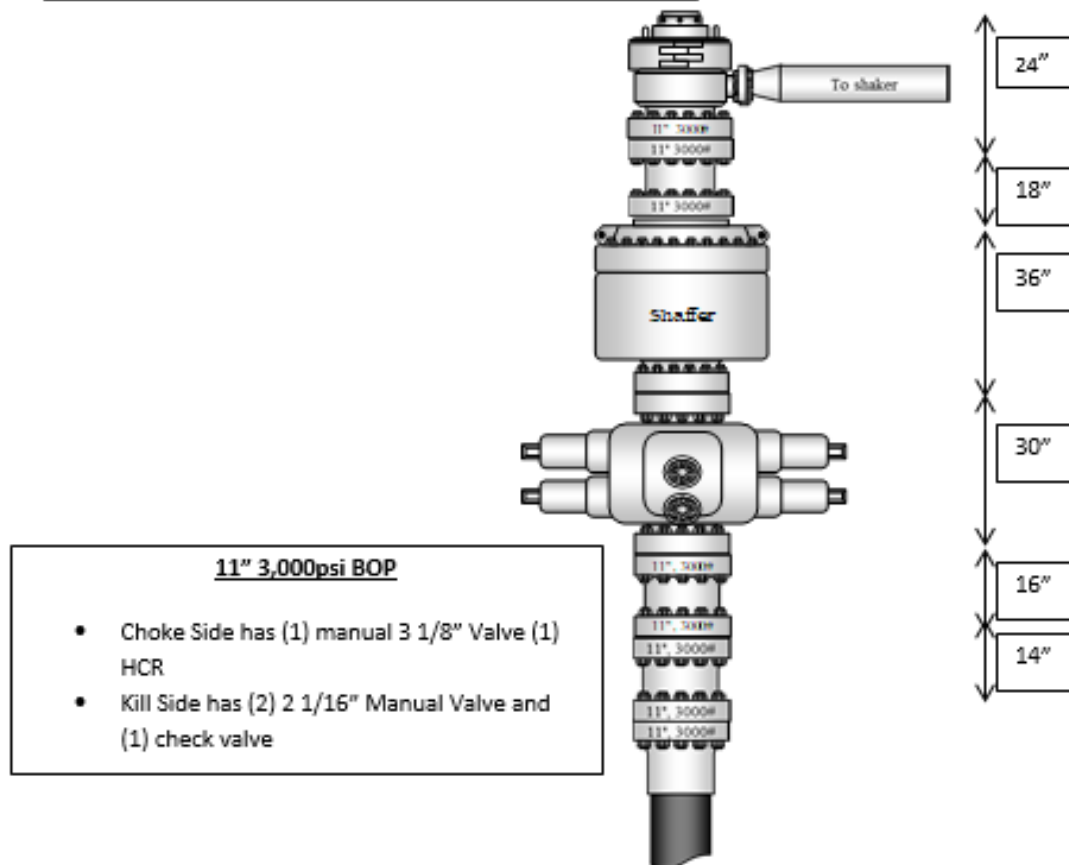


3M 11" B.O.P.E Diagram



Choke Diagram for a 3,000psi system

- Features all 3 1/8" 3M Manual Valves
- Two 2 1/16" Manual Adjustable Choke Valves
- 3" Panic Line and 2" Vent lines
- (2) 3 1/8" 3M Coflex Hose f/Choke to BOP



ROSA UNIT 645H

State of New Mexico
Energy, Minerals and Natural Resources Department

Submit Electronically
Via E-permitting

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

NATURAL GAS MANAGEMENT PLAN

This Natural Gas Management Plan must be submitted with each Application for Permit to Drill (APD) for a new or recompleted well.

Section 1 – Plan Description Effective May 25, 2021

I. Operator: LOGOS Operating, LLC **OGRID:** 289408 **Date:** 03/11/2022

II. Type: ☒ Original ☐ Amendment due to ☐ 19.15.27.9.D(6)(a) NMAC ☐ 19.15.27.9.D(6)(b) NMAC ☐ Other.

If Other, please describe: _____

III. Well(s): Provide the following information for each new or recompleted well or set of wells proposed to be drilled or proposed to be recompleted from a single well pad or connected to a central delivery point.

Well Name	API	ULSTR	Footages	Anticipated Oil BBL/D	Anticipated Gas MCF/D	Anticipated Produced Water BBL/D
Rosa Unit 645H	30-039-31415	C 19 T31N R5W	960FNL 497FWL	N/A	11,205	508
Rosa Unit 647H	30-039-31411	C 19 T31N R5W	952FNL 422FWL	N/A	11,205	506
Rosa Unit 649H	30-039-31410	C 19 T31N R5W	965FNL 480FWL	N/A	11,205	506

IV. Central Delivery Point Name: Harvest Gathering System [See 19.15.27.9(D)(1) NMAC]

V. Anticipated Schedule: Provide the following information for each new or recompleted well or set of wells proposed to be drilled or proposed to be recompleted from a single well pad or connected to a central delivery point.

Well Name	API	Spud Date	TD Reached Date	Completion Commencement Date	Initial Flow Back Date	First Production Date
Rosa Unit 645H	30-039-31415	Pending	Pending	Pending	Pending	Pending
Rosa Unit 647H	30-039-31411	Pending	Pending	Pending	Pending	Pending
Rosa Unit 649H	30-039-31410	Pending	Pending	Pending	Pending	Pending

VI. Separation Equipment: ☒ Attach a complete description of how Operator will size separation equipment to optimize gas capture.

VII. Operational Practices: ☒ Attach a complete description of the actions Operator will take to comply with the requirements of Subsection A through F of 19.15.27.8 NMAC.

VIII. Best Management Practices: ☒ Attach a complete description of Operator's best management practices to minimize venting during active and planned maintenance.

Section 3 - Certifications

Effective May 25, 2021

Operator certifies that, after reasonable inquiry and based on the available information at the time of submittal:

☒ Operator will be able to connect the well(s) to a natural gas gathering system in the general area with sufficient capacity to transport one hundred percent of the anticipated volume of natural gas produced from the well(s) commencing on the date of first production, taking into account the current and anticipated volumes of produced natural gas from other wells connected to the pipeline gathering system; or

☐ Operator will not be able to connect to a natural gas gathering system in the general area with sufficient capacity to transport one hundred percent of the anticipated volume of natural gas produced from the well(s) commencing on the date of first production, taking into account the current and anticipated volumes of produced natural gas from other wells connected to the pipeline gathering system.

If Operator checks this box, Operator will select one of the following:

Well Shut-In. ☐ Operator will shut-in and not produce the well until it submits the certification required by Paragraph (4) of Subsection D of 19.15.27.9 NMAC; or

Venting and Flaring Plan. ☐ Operator has attached a venting and flaring plan that evaluates and selects one or more of the potential alternative beneficial uses for the natural gas until a natural gas gathering system is available, including:

- (a) power generation on lease;
- (b) power generation for grid;
- (c) compression on lease;
- (d) liquids removal on lease;
- (e) reinjection for underground storage;
- (f) reinjection for temporary storage;
- (g) reinjection for enhanced oil recovery;
- (h) fuel cell production; and
- (i) other alternative beneficial uses approved by the division.

Section 4 - Notices

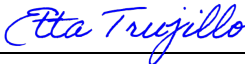
1. If, at any time after Operator submits this Natural Gas Management Plan and before the well is spud:

(a) Operator becomes aware that the natural gas gathering system it planned to connect the well(s) to has become unavailable or will not have capacity to transport one hundred percent of the production from the well(s), no later than 20 days after becoming aware of such information, Operator shall submit for OCD's approval a new or revised venting and flaring plan containing the information specified in Paragraph (5) of Subsection D of 19.15.27.9 NMAC; or

(b) Operator becomes aware that it has, cumulatively for the year, become out of compliance with its baseline natural gas capture rate or natural gas capture requirement, no later than 20 days after becoming aware of such information, Operator shall submit for OCD's approval a new or revised Natural Gas Management Plan for each well it plans to spud during the next 90 days containing the information specified in Paragraph (2) of Subsection D of 19.15.27.9 NMAC, and shall file an update for each Natural Gas Management Plan until Operator is back in compliance with its baseline natural gas capture rate or natural gas capture requirement.

2. OCD may deny or conditionally approve an APD if Operator does not make a certification, fails to submit an adequate venting and flaring plan which includes alternative beneficial uses for the anticipated volume of natural gas produced, or if OCD determines that Operator will not have adequate natural gas takeaway capacity at the time a well will be spud.

I certify that, after reasonable inquiry, the statements in and attached to this Natural Gas Management Plan are true and correct to the best of my knowledge and acknowledge that a false statement may be subject to civil and criminal penalties under the Oil and Gas Act.

Signature:	
Printed Name:	Etta Trujillo
Title:	Regulatory Specialist
E-mail Address:	etrujillo@logosresourcesllc.com
Date:	03/11/2022
Phone:	(505) 324-4154
OIL CONSERVATION DIVISION (Only applicable when submitted as a standalone form)	
Approved By:	
Title:	
Approval Date:	
Conditions of Approval:	

LOGOS Operating, LLC

VI. Separation Equipment

The operator will select separation equipment for the maximum anticipated throughput and pressure to optimize gas capture. Separation equipment is sized according to manufacturer's design specifications. Separation vessels are built following the A.S.M.E. section VII division 1 codes for pressure vessel design, fabrication, inspection, testing and certification. Anticipated well pressures and production rates are evaluated to select separation equipment according to the equipment's designed operating pressure and throughput.

After completion, the operator utilizes flowback equipment, including separators, to manage wellbore fluids and solids during the initial separation period. After the initial flowback period is complete the operator utilizes iterative facility separation equipment to ensure that optimal separation is achieved.

VII. Operational Practices 19.15.27.8 NMAC A through F

- A. The operator will maximize the recovery of natural gas and minimize the amount of gas vented or flared when technically and safely feasible as further described and detailed within the following subsections (B-F of 19.15.27.8). In all cases where natural gas venting and flaring requires regulatory reporting, reporting will be submitted accurately and within the required time frames.
- B. Venting and flaring during drilling operations:
 - a. New Drill HZ Gas Wells: The operator drills wells in the area by utilizing a balanced mud to safely drill the wellbore. This technique prevents gas from coming to surface during the drilling process. If there is an emergency or malfunction and natural gas does come to surface the natural gas will be captured and routed to sales if technically and safely feasible.
- C. Venting and flaring during completion or recompletion operations:
 - a. New Drill HZ Gas Wells: The operator's facilities are designed to handle the maximum throughput and pressures from the newly drilled and completed wellbores. The amount of gas vented and flared will be minimized when technically and safely feasible. During initial flowback and initial separation flowback the operator will utilize contracted flowback equipment, including separators, to manage wellbore fluids and solids. The initial flowback period will be minimized and flow will be sent to separation equipment as soon as possible to reduce the amount of gas that is vented to atmosphere. The natural gas will be utilized on site as needed for fuel gas and natural gas will be sold.
- D. Venting and flaring during production operations:
 - a. New Drill HZ Gas Wells: The operator's facilities are designed to handle the maximum throughput and pressures from producing wellbores. The amount of gas vented and flared will be minimized when technically and safely feasible.

Operations will effectively manage the following scenarios to minimize the quantity of natural gas that is vented or flared:

- (a) If there is an emergency or malfunction vented or flared natural gas will be reported, if required, and the emergency or malfunction will be resolved as soon as technically and safely feasible.
- (b) If the wellbore needs to be unloaded to atmosphere the operator will not vent the well after the well has achieved a stabilized rate and pressure. The operator will remain on site during unloading. Plunger lift systems will be optimized to reduce the amount of natural gas venting. Downhole maintenance, such as workovers, swabbing, etc. will only be conducted as needed and best management practices will be utilized to reduce venting of natural gas.
- (c) The operator will minimize the amount of time that natural gas is vented to atmosphere from gauging and sampling a storage tank or low-pressure vessel, automatic tank gauges will be the primary means of gauging. The formation is only anticipated to produce water and therefore tank emissions are anticipated to be negligible.
- (d) The operator will reduce the amount of time needed for loading out liquids from a storage tanks or other low-pressure vessels whenever feasible. Operations will always utilize the water transfer systems when available. Water loading emissions are anticipated to be negligible.
- (e) Equipment will be repaired and maintained routinely to minimize the venting or flaring of natural gas. Repairs and maintenance will be conducted in a manner that minimizes the amount of natural gas vented to atmosphere through the isolation of the equipment that is being repaired or maintained.
- (f) Electric controllers and pumps will be installed to replace pneumatic controllers whenever feasible. Pneumatic controllers and pumps will be inspected frequently to ensure that no excess gas is vented to atmosphere.
- (g) No dehydration or amine units are anticipated to be set on location.
- (h) Compressors, compressor engines, turbines, flanges, connectors, valves, storage tanks, and other low-pressure vessels and flanges will be routinely inspected to ensure that no excess venting occurs outside of normal operations.
- (i) Regulatory required testing, such as bradenhead and packer testing will be performed in a manner that minimizes the amount of natural gas vented to atmosphere.
- (j) If natural gas does not meet gathering pipeline specifications gas samples will be collected twice per week to determine when pipeline specification gas content has been achieved. During this time frame gas will be flared and not vented to atmosphere. Natural gas that meets pipeline specifications will be sold via pipeline and natural gas that can be utilized for fuel gas will be used during this time.
- (k) If pipeline, equipment, or facilities need purged of impurities gas losses will be minimized as much as technically and safely feasible.

E. Performance standards:

- a. The production facilities are designed to handle the maximum throughput and pressures from producing wellbores and will be designed to minimize waste. The amount of gas vented and flared will be minimized when technically and safely feasible.
- b. All tanks that are routed to a control device that is installed after 5/25/2021 will have an automatic gauging system to minimize the amount of vented natural gas.
- c. If a flare stack is installed or replaced after 5/25/2021 it will be equipped with an automatic ignitor or continuous pilot. The flare stack will be properly sized and designed to ensure proper combustion efficiency. The flare stack will be located 100 feet away from the nearest wellhead or storage tank.
- d. AVO inspections will be conducted weekly for the year after completion and for all wells producing greater than 60,000 cubic feet of natural gas daily. The AVO inspection will include all components, including flare stacks, thief hatches, closed vent systems, pumps, compressors, pressure relief devices, valves, lines, flanges, connectors, and associated pipeline to identify any leaks and releases by comprehensive auditory, visual, and olfactory inspection. The AVO inspection records will be maintained for 5 years which will be available at the department's request. Identified leaks will be repaired as soon as feasible to minimize the amount of vented natural gas.

F. Measurement or estimation of vented and flared natural gas.

- a. The volume of natural gas that is vented, flared or consumed for beneficial use will be measured when possible, or estimated, during drilling, completions, or production operations.
- b. Equipment will be installed to measure the volume of natural gas flared for all APD's issued after 5/25/2021 on facilities that will have an average daily gas rate greater than 60,000 cubic feet of natural gas. Measurement equipment will conform to API MPMS Chapter 14.10 regulations. The measurement equipment will not have a manifold that allows the diversion of natural gas around the metering element except for the sole purpose of inspecting and servicing the measurement equipment. If metering is not practical then the volume of gas will be estimated.

Well Name: ROSA UNIT	Well Location: T31N / R5W / SEC 19 / NENW / 36.889712 / -107.406179	County or Parish/State: RIO ARRIBA / NM
Well Number: 645H	Type of Well: CONVENTIONAL GAS WELL	Allottee or Tribe Name:
Lease Number: NMSF078764	Unit or CA Name: ROSA UNIT-MANCOS PA	Unit or CA Number: NMNM78407E
US Well Number: 300393141500X1	Well Status: Temporarily Abandoned	Operator: LOGOS OPERATING LLC

Notice of Intent

Sundry ID: 2666045

Type of Submission: Notice of Intent	Type of Action: Other
Date Sundry Submitted: 04/08/2022	Time Sundry Submitted: 08:43
Date proposed operation will begin: 04/08/2022	

Procedure Description: LOGOS Operating LLC, request a change in plans below: Original surface-hole location from 960' FNL & 497' FWL to new surface-hole location 943' FNL & 424' FWL Attached: New C102, Operation and Directional Drill plans.

Surface Disturbance

Is any additional surface disturbance proposed?: No

NOI Attachments

Procedure Description

3160_5_Rosa_Unit_645H_Change_in_Plans_SURF_20220408_20220408084054.pdf

Well Name: ROSA UNIT	Well Location: T31N / R5W / SEC 19 / NENW / 36.889712 / -107.406179	County or Parish/State: RIO ARRIBA / NM
Well Number: 645H	Type of Well: CONVENTIONAL GAS WELL	Allottee or Tribe Name:
Lease Number: NMSF078764	Unit or CA Name: ROSA UNIT-MANCOS PA	Unit or CA Number: NMNM78407E
US Well Number: 300393141500X1	Well Status: Temporarily Abandoned	Operator: LOGOS OPERATING LLC

Operator Certification

I certify that the foregoing is true and correct. 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. Electronic submission of Sundry Notices through this system satisfies regulations requiring a submission of Form 3160-5 or a Sundry Notice.

Operator Electronic Signature: ETTA TRUJILLO	Signed on: APR 08, 2022 08:40 AM
Name: LOGOS OPERATING LLC	
Title: Regulatory Specialist	
Street Address: 2010 AFTON PLACE	
City: Farmington	State: NM
Phone: (505) 324-4154	
Email address: ETRUJILLO@LOGOSRESOURCESLLC.COM	

Field Representative

Representative Name:		
Street Address:		
City:	State:	Zip:
Phone:		
Email address:		

BLM Point of Contact

BLM POC Name: KENNETH G RENNICK	BLM POC Title: Petroleum Engineer
BLM POC Phone: 5055647742	BLM POC Email Address: krennick@blm.gov
Disposition: Approved	Disposition Date: 04/08/2022
Signature: Kenneth Rennick	

District I
1625 N. French Dr., Hobbs, NM 88240
Phone:(575) 393-6161 Fax:(575) 393-0720
District II
811 S. First St., Artesia, NM 88210
Phone:(575) 748-1283 Fax:(575) 748-9720
District III
1000 Rio Brazos Rd., Aztec, NM 87410
Phone:(505) 334-6178 Fax:(505) 334-6170
District IV
1220 S. St Francis Dr., Santa Fe, NM 87505
Phone:(505) 476-3470 Fax:(505) 476-3462

State of New Mexico
Energy, Minerals and Natural Resources
Oil Conservation Division
1220 S. St Francis Dr.
Santa Fe, NM 87505

CONDITIONS

Action 96983

CONDITIONS

Operator: LOGOS OPERATING, LLC 2010 Afton Place Farmington, NM 87401	OGRID: 289408
	Action Number: 96983
	Action Type: [C-103] NOI Change of Plans (C-103A)

CONDITIONS

Created By	Condition	Condition Date
kpickford	Adhere to previous NMOCD Conditions of Approval	4/8/2022