						MIN F
. Carisb	ad Fi	eld Offi	ce			MIN F GURF P
Form 3160-3 (March 2012)	CD H	lobbs	ocv	FORM OMB N	APPROV No. 1004-01 October 31,	YED 137
UNITED STATE DEPARTMENT OF THE	ES INTERIOR	OBBS	018	5. Lease Serial No.	JC100er 51,	2014
BUREAU OF LAND MA	NAGEMEN	THOMA	7.10.	NMLC0065375A	or Tribe	Name
APPLICATION FOR PERMIT TO	DRILL O	RREENTER	CEIN	Port indian, Anotec	or thick	Ivalle
UNITED STATE DEPARTMENT OF THE BUREAU OF LAND MA APPLICATION FOR PERMIT TO la. Type of work:	TER	R	CEIN	7. If Unit or CA Agre	eement, N	lame and No.
lb. Type of Well: 🗹 Oil Well 🗌 Gas Well 🗌 Other		_	ple Zone	8. Lease Name and LEA UNIT 64H	Well No.	709802
2. Name of Operator LEGACY RESERVES OPERATING I	LP (240	974)		9. API Well No. <b>30-025-</b>	4	4735
3a. Address 303 West Wall St., Ste 1800 Midland TX 797	3b. Phone N (432)689-	0. (include area code) -5287		10. Field and Pool, or 1		TY (37580)
4. Location of Well (Report location clearly and in accordance with	any State require	ments.*)		11. Set., T. R.M. OF B	Ik. and St	RAY STARS 7506
At surface NWSE / 2270 FSL / 2619 FEL / LAT 32.557		A REAL PROPERTY AND		SEC 19 / T20S / R	35E / N	MP 135
At proposed prod. zone NENW / 330 FNL / 2210 FWL / L 4. Distance in miles and direction from nearest town or post office*	AT 32.57949	1 / LONG -103.497	9909	12. County or Parish		13. State
26 miles				LEA		NM
<ol> <li>Distance from proposed* location to nearest 2619 feet property or lease line, ft. (Also to nearest drig. unit line, if any)</li> </ol>	16. No. of 239.77	acres in lease	17. Spacin 240	g Unit dedicated to this	well	
<ol> <li>Distance from proposed location* to nearest well, drilling, completed, 50 feet</li> </ol>	19. Propos	ed Depth	20. BLM/I	BIA Bond No. on file		
applied for, on this lease, ft.	9800 feet	t / 17643 feet	FED: N	MB001015		
21. Elevations (Show whether DF, KDB, RT, GL, etc.)	22 Approx 03/30/20	timate date work will sta	rt*	23. Estimated duratio 45 days	n	
		achments				
The following, completed in accordance with the requirements of Onsi	hore Oil and Gas	s Order No.1, must be a	ttached to th	is form:		
1. Well plat certified by a registered surveyor.		4. Bond to cover t Item 20 above).	he operatio	ns unless covered by an	existing	bond on file (see
<ol> <li>A Drilling Plan.</li> <li>A Surface Use Plan (if the location is on National Forest Syste SUPO must be filed with the appropriate Forest Service Office).</li> </ol>	m Lands, the	5. Operator certifi		ormation and/or plans as	s may be	required by the
25. Signature	Name	e (Printed/Typed)			Date	
(Electronic Submission)	Blay	ne Housh / Ph: (40	5)286-9326	3	01/31	/2018
Permitting Specialist						
Approved by (Signature) (Electronic Submission)		e (Printed/Typed) y Layton / Ph: (575)	234-5959		Date	5/2018
Title	Offic		204 0000		04/10	
Supervisor Multiple Resources Application approval does not warrant or certify that the applicant he		RLSBAD	te in the cub	iact lanca which would	untitle the	applicantto
onduct operations thereon. Conditions of approval, if any, are attached.	nus regaror equ	mable the whose ng				
Fitle 18 U.S.C. Section 1001 and Title 43 U.S.C. Section 1212, make it a States any false, fictitious or fraudulent statements or representations	crime for any as to any matter	person knowingly and within its jurisdiction.	willfully to n	nake to any department of	or agency	of the United
(Continued on page 2) 6CP Rec 05/07/18				Kor *(Inst	ruction	ALY FOR
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anD	<b>VED WI</b>	TH CONDIT		11/1	M	
1111				MUT		
Appro	oval Date	: 04/16/2018				

#### INSTRUCTIONS

GENERAL: This form is designed for submitting proposals to perform certain well operations, as indicated on Federal and Indian lands and leases for action by appropriate Federal agencies, pursuant to applicable Federal laws and regulations. Any necessary special instructions concerning the use of this form and the number of copies to be submitted, particularly with regard to local, area, or regional procedures and practices, either are shown below or will be issued by, or may be obtained from local Federal offices.

ITEM 1: If the proposal is to redrill to the same reservoir at a different subsurface location or to a new reservoir, use this form with appropriate notations. Consult applicable Federal regulations concerning subsequent work proposals or reports on the well.

ITEM 4: Locations on Federal or Indian land should be described in accordance with Federal requirements. Consult local Federal offices for specific instructions.

ITEM 14: Needed only when location of well cannot readily be found by road from the land or lease description. A plat, or plats, separate or on the reverse side, showing the roads to, and the surveyed location of, the well, and any other required information, should be furnished when required by Federal agency offices.

ITEMS 15 AND 18: If well is to be, or has been directionally drilled, give distances for subsurface location of hole in any present or objective productive zone.

ITEM 22: Consult applicable Federal regulations, or appropriate officials, concerning approval of the proposal before operations are started.

# NOTICES

The Privacy Act of 1974 and regulation in 43 CFR 2.48(d) provide that you be furnished the following information in connection with information required by this application.

AUTHORITY: 30 U.S.C. 181 et seq., 25 U.S.C. 396; 43 CFR 3160

PRINCIPAL PURPOSES: The information will be used to: (1) process and evaluate your application for a permit to drill a new oil, gas, or service well or to reenter a plugged and abandoned well; and (2) document, for administrative use, information for the management, disposal and use of National Resource Lands and resources including (a) analyzing your proposal to discover and extract the Federal or Indian resources encountered; (b) reviewing procedures and equipment and the projected impact on the land involved; and (c) evaluating the effects of the proposed operation on the surface and subsurface water and other environmental impacts. ROUTINE USE: Information from the record and/or the record will be transferred to appropriate Federal, State, and local or foreign agencies, when relevant to civil, criminal or regulatory investigations or prosecution, in connection with congressional inquiries and for regulatory responsibilities.

EFFECT OF NOT PROVIDING INFORMATION: Filing of this application and disclosure of the information is mandatory only if you elect to initiate a drilling or reentry operation on an oil and gas lease.

The Paperwork Reduction Act of 1995 requires us to inform you that:

The BLM collects this information to allow evaluation of the technical, safety, and environmental factors involved with drilling for oil and/or gas on Federal and Indian oil and gas leases. This information will be used to analyze and approve applications. Response to this request is mandatory only if the operator elects to initiate drilling or reentry operations on an oil and gas lease. The BLM would like you to know that you do not have to respond to this or any other Federal agency-sponsored information collection unless it displays a currently valid OMB control number.

**BURDEN HOURS STATEMENT:** Public reporting burden for this form is estimated to average 8 hours per response, including the time for reviewing instructions, gathering and maintaining data, and completing and reviewing the form. Direct comments regarding the burden estimate or any other aspect of this form to U.S. Department of the Interior, Bureau of Land Management (1004-0137), Bureau Information Collection Clearance Officer (WO-630), 1849 C Street, N.W., Mail Stop 401 LS, Washington, D.C. 20240.

(Continued on page 3)

(Form 3160-3, page 2)

Approval Date: 04/16/2018

## **Additional Operator Remarks**

#### **Location of Well**

 SHL: NWSE / 2270 FSL / 2619 FEL / TWSP: 20S / RANGE: 35E / SECTION: 19 / LAT: 32.5576144 / LONG: -103.496537 (TVD: 0 feet, MD: 0 feet ) PPP: NENW / 1329 FNL / 2234 FWL / TWSP: 20S / RANGE: 35E / SECTION: 18 / LAT: 32.576747 / LONG: -103.497923 (TVD: 9800 feet, MD: 16655 feet ) PPP: SENW / 2641 FSL / 2266 FWL / TWSP: 20S / RANGE: 35E / SECTION: 18 / LAT: 32.573118 / LONG: -103.497823 (TVD: 9800 feet, MD: 15335 feet ) PPP: SWNE / 2508 FNL / 2387 FWL / TWSP: 20S / RANGE: 35E / SECTION: 19 / LAT: 32.55897 / LONG: -103.497823 (TVD: 9800 feet, MD: 10127 feet ) PPP: SESW / 0 FSL / 2328 FWL / TWSP: 20S / RANGE: 35E / SECTION: 18 / LAT: 32.565861 / LONG: -103.497622 (TVD: 9800 feet, MD: 12694 feet ) BHL: NENW / 330 FNL / 2210 FWL / TWSP: 20S / RANGE: 35E / SECTION: 18 / LAT: 32.579491 / LONG: -103.4979090 (TVD: 9800 feet, MD: 17643 feet )

#### **BLM Point of Contact**

Name: Priscilla Perez Title: Legal Instruments Examiner Phone: 5752345934 Email: pperez@blm.gov

Approval Date: 04/16/2018

(Form 3160-3, page 3)

#### **Review and Appeal Rights**

A person contesting a decision shall request a State Director review. This request must be filed within 20 working days of receipt of the Notice with the appropriate State Director (see 43 CFR 3165.3). The State Director review decision may be appealed to the Interior Board of Land Appeals, 801 North Quincy Street, Suite 300, Arlington, VA 22203 (see 43 CFR 3165.4). Contact the above listed Bureau of Land Management office for further information.

# **WAFMSS**

U.S. Department of the Interior BUREAU OF LAND MANAGEMENT

# Application Data Report

04/23/2018 2.07

APD ID: 10400026682	Submission Date: 01/3
Operator Name: LEGACY RESERVES OPERATING LP	
Well Name: LEA UNIT	Well Number: 64H
Well Type: OIL WELL	Well Work Type: Drill

01/31/2018

Highlighted data reflects the most recent changes

Show Final Text

# Section 1 - General

APD ID:	10400026682		Tie to previous NOS?		Submission Date: 01/31/2018
BLM Office:	CARLSBAD		User: Blayne Housh	Tit	le: Permitting Specialist
Federal/India	an APD: FED		Is the first lease penetrate	d for produc	tion Federal or Indian? FED
Lease numb	er: NMLC0065375A		Lease Acres: 239.77		
Surface acco	ess agreement in place?	•	Allotted?	Reservation	:
Agreement i	n place? NO		Federal or Indian agreeme	ent:	
Agreement r	number:				
Agreement r	name:				
Keep applica	ation confidential? YES				
Permitting A	gent? YES		APD Operator: LEGACY R	ESERVES OF	PERATING LP
Operator let	ter of designation:	signed L	ea Unit 64H DOA 201801	30125931.pdf	f

# **Operator Info**

Operator Organization Name: LEG	ACY RESERVES OPERATING LP	
Operator Address: 303 West Wall S	St., Ste 1800	<b>7</b> : 70701
Operator PO Box:		<b>Zip:</b> 79701
Operator City: Midland	State: TX	
Operator Phone: (432)689-5287		
Operator Internet Address:		

# Section 2 - Well Information

Well in Master Development Plan? EXISTING	Mater Development Plan name:	: Lea Unit Master Dev Plan
Well in Master SUPO? NO	Master SUPO name:	
Well in Master Drilling Plan? NO	Master Drilling Plan name:	
Well Name: LEA UNIT	Well Number: 64H	Well API Number:
Field/Pool or Exploratory? Field and Pool	Field Name: LEA	Pool Name: BONE SPRING (OIL)

Is the proposed well in an area containing other mineral resources? USEABLE WATER

Page 1 of 3

Describe other minerals: Is the proposed well in a Helium production area? N Use Existing Well Pad? YES New surface disturbance? Y Type of Well Pad: MULTIPLE WELL Multiple Well Pad Name: LEA Number: 62H UNIT Well Class: HORIZONTAL Number of Legs: 1 Well Work Type: Drill Well Type: OIL WELL **Describe Well Type:** Well sub-Type: INFILL Describe sub-type: Distance to town: 26 Miles Distance to nearest well: 50 FT Distance to lease line: 2619 FT Reservoir well spacing assigned acres Measurement: 240 Acres UPDATED\_LEA\_UNIT\_64H\_C\_102\_PLAT\_SIGNED\_05\_10\_17\_20180130071246.pdf Well plat: Agency\_Lease\_Plat\_20180131135942.pdf Well work start Date: 03/30/2018 Duration: 45 DAYS

Well Number: 64H

## Section 3 - Well Location Table

Survey Type: RECTANGULAR

Describe Survey Type:

Datum: NAD83

Survey number:

# Vertical Datum: NAVD88

	NS-Foot	NS Indicator	EW-Foot	EW Indicator	Twsp	Range	Section	Aliquot/Lot/Tract	Latitude	Longitude	County	State	Meridian	Lease Type	Lease Number	Elevation	DM	TVD
SHL Leg #1	227 0	FSL	261 9	FEL	20S	35E	19	Aliquot NWSE	32.55761 44	- 103.4965 37	LEA	NEW MEXI CO	NEW MEXI CO	F	FEE	368 9	0	0
KOP Leg #1	227 0	FSL	261 9	FEL	20S	35E	19	Aliquot NWSE	32.55761 44	- 103.4965 37	LEA	NEW MEXI CO	NEW MEXI CO	F	FEE	- 556 1	925 0	925 0
PPP Leg #1	250 8	FNL	238 7	FWL	20S	35E	19	Aliquot SWNE	32.55897	- 103.4974 31	LEA	NEW MEXI CO		S	STATE	- 611 1	101 27	980 0

# Operator Name: LEGACY RESERVES OPERATING LP

Well Name: LEA UNIT

#### Well Number: 64H

	NS-Foot	NS Indicator	EW-Foot	EW Indicator	Twsp	Range	Section	Aliquot/Lot/Tract	Latitude	Longitude	County	State	Meridian	Lease Type	Lease Number	Elevation	MD	TVD
PPP Leg #1	0	FSL	232 8	FWL	20S	35E	18	Aliquot SESW	32.56586 1	- 103.4976 22	LEA	NEW MEXI CO	NEW MEXI CO	F	NMLC0 065375 A	- 611 1	126 94	980 0
PPP Leg #1	132 9	FNL	223 4	FWL	20S	35E	18	Aliquot NENW	32.57674 7	- 103.4979 23	LEA	NEW MEXI CO	NEW MEXI CO	F	NMLC0 065375 A	- 611 1	166 55	980 0
PPP Leg #1	264 1	FSL	226 6	FWL	20S	35E	18	Aliquot SENW	32.57311 8	- 103.4978 23	LEA	NEW MEXI CO	NEW MEXI CO	F	NMLC0 066147 D	- 611 1	153 <sup>.</sup> 35	980 0
EXIT Leg #1	330	FNL	221 0	FWL	20S	35E	18	Aliquot NENW	32.57949 1	- 103.4979 909	LEA	NEW MEXI CO		F	NMLC0 065375 A	- 611 1	176 43	980 0
BHL Leg #1	330	FNL	221 0	FWL	20S	35E	18	Aliquot NENW	32.57949 1	- 103.4979 909	LEA	NEW MEXI CO		F	NMLC0 065375 A	- 611 1	176 43	980 0



(432) 689-5200

January 22, 2018

Bureau of Land Management Division of Oil and Gas 620 E. Greene Street Carlsbad, NM 88220-6292 Attn: Land Law Examiner

> Re: Legacy Reserves Operating, L.P. Designation of Agent Lea Unit 64H 19-20S-35E NMPM Lea County, NM

To whom it may concern:

Legacy Reserves Operating, L.P. has contracted with Reagan Smith Energy Solutions, Inc. to assist in regulatory compliance associated with the Lea Unit 64H. Reagan Smith Energy Solutions, Inc. has the authority to act as Legacy Reserves Operating, L.P.'s agent to maintain regulatory compliance for the Lea Unit 64H. This includes the submittal of an APD, Communitization Agreement, Designations of Operator, Sundry Notices, and any other regulatory documents on behalf of Legacy Reserves Operating, L.P. in order to maintain regulatory compliance with the Bureau of Land Management in regard to the above referenced project.

Sincerely,

Matthew Dickson Legacy Reserves Operating, L.P.



U.S. Department of the Interior BUREAU OF LAND MANAGEMENT

APD ID: 10400026682

**Operator Name: LEGACY RESERVES OPERATING LP** 

Well Name: LEA UNIT

Well Type: OIL WELL

Well Number: 64H

Well Work Type: Drill

Submission Date: 01/31/2018

Highlighted data reflects the most recent changes

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Show Final Text

# **Section 1 - Geologic Formations**

Formation Name	Elevation	A REALIZED AND A REAL PROPERTY OF	CONTRACTOR OF THE OWNER OWNE	Lithologies	Mineral Resources	Producing
MANZANITA	3663	0	0		USEABLE WATER	No
RUSTLER	1982	1680	1680		NONE	No
TOP SALT	1942	1720	1720	SALT	NONE	No
BOTTOM SALT	513	3150	3150	SALT	NONE	No
CAPITAN REEF	513	3150	3150		NONE	No
SAN ANDRES	-1047	4710	4710		NONE	No
DELAWARE SAND	-2004	5666	5666	SANDSTONE	NATURAL GAS,OIL	No
BONE SPRING LIME	-4542	8205	8205	LIMESTONE	NATURAL GAS,OIL	No
AVALON SAND	-5097	8760	8760	SANDSTONE	NATURAL GAS,OIL	No
BONE SPRING 1ST	-5838	9501	9510		NATURAL GAS,OIL	Yes
	MANZANITA RUSTLER TOP SALT BOTTOM SALT CAPITAN REEF SAN ANDRES DELAWARE SAND BONE SPRING LIME AVALON SAND	MANZANITA3663RUSTLER1982TOP SALT1942BOTTOM SALT513CAPITAN REEF513SAN ANDRES-1047DELAWARE SAND-2004BONE SPRING LIME-4542AVALON SAND-5097	Formation NameElevationDepthMANZANITA36630RUSTLER19821680TOP SALT19421720BOTTOM SALT5133150CAPITAN REEF5133150SAN ANDRES-10474710DELAWARE SAND-20045666BONE SPRING LIME-45428205AVALON SAND-50978760	MANZANITA         3663         0 <th0< th="">         0         0         <th< td=""><td>Formation NameElevationDepthDepthLithologiesMANZANITA3663000RUSTLER198216801680TOP SALT194217201720SALTBOTTOM SALT51331503150SALTCAPITAN REEF51331503150SALTDELAWARE SAND-200456665666SANDSTONEBONE SPRING LIME-454282058205LIMESTONEAVALON SAND-509787608760SANDSTONE</td><td>Formation Name MANZANITAElevation 3663Depth 0LithologiesMineral Resources USEABLE WATERRUSTLER198216801680NONETOP SALT194217201720SALTNONEBOTTOM SALT51331503150SALTNONECAPITAN REEF51331503150SALTNONEDELAWARE SAND-200456665666SANDSTONENATURAL GAS,OILAVALON SAND-509787608760SANDSTONENATURAL GAS,OIL</td></th<></th0<>	Formation NameElevationDepthDepthLithologiesMANZANITA3663000RUSTLER198216801680TOP SALT194217201720SALTBOTTOM SALT51331503150SALTCAPITAN REEF51331503150SALTDELAWARE SAND-200456665666SANDSTONEBONE SPRING LIME-454282058205LIMESTONEAVALON SAND-509787608760SANDSTONE	Formation Name MANZANITAElevation 3663Depth 0LithologiesMineral Resources USEABLE WATERRUSTLER198216801680NONETOP SALT194217201720SALTNONEBOTTOM SALT51331503150SALTNONECAPITAN REEF51331503150SALTNONEDELAWARE SAND-200456665666SANDSTONENATURAL GAS,OILAVALON SAND-509787608760SANDSTONENATURAL GAS,OIL

# Section 2 - Blowout Prevention

#### Pressure Rating (PSI): 3M

Rating Depth: 5600

Equipment: A 3M BOP will be used to drill from the surface casing shoe (~1800') to the intermediate casing shoe (~5600'). The BOP will be a 5M system, however the "A" section wellhead will be a 3M wellhead (see attached BOP Diagram). Requesting Variance? YES

Variance request: A variance to the requirement of a rigid steel line connecting to the choke manifold is requested. Specifications for the flex hose are provided with BOP schematic in exhibit section Testing Procedure: The BOPs will be tested by an independent service company to 250 psi low and 3000 psi high.

#### **Choke Diagram Attachment:**

McVay 4 Choke Manifold Diagram 20180130090426.pdf

### **BOP Diagram Attachment:**

Well Number: 64H

McVay\_4\_Choke\_Manifold\_Diagram\_20180130090426.pdf

McVay\_4\_BOP\_Schematic\_20180130090433.pdf

Cameron\_Conventional\_3\_String\_Wellhead\_Schematic\_20180130090440.pdf

Pressure Rating (PSI): 5M

Rating Depth: 9800

**Equipment:** Legacy Reserves plans to use a 13-5/8" 5000-psi working pressure BOP system consisting of a double ram BOP with one ram being pipe and one ram being blind, a 5000-psi annular type preventer, a 5000-psi choke manifold and 80 gallon accumulator with floor, five remote operating stations and an auxiliary power system. A rotating head will be utilized as needed. A drill string safety valve in the open position will be available on the rig floor. A mud gas separator will be available for use if needed. A 3M BOP will be used to drill from the surface casing shoe (~1800') to the intermediate casing shoe (~5600'). The BOP will be a 5M system, however the "A" section wellhead will be a 3M wellhead (see attached BOP Diagram). The BOP unit will be hydraulically operated. The BOP will be operated at least once per day while drilling and the blind rams will be operated when out of hole during trips. No abnormal pressure or temperature is expected while drilling. **Requesting Variance?** YES

Variance request: A variance to the requirement of a rigid steel line connecting to the choke manifold is requested.Specifications for the flex hose are provided with BOP schematic in exhibit sectionTesting Procedure: The BOPs will be tested by an independent service company to 250 psi low and 5000 psi high.

#### **Choke Diagram Attachment:**

McVay\_4\_Choke\_Manifold\_Diagram\_20180130090129.pdf

#### **BOP Diagram Attachment:**

Flex\_Hose\_Specs\_20180130090135.pdf

McVay\_4\_BOP\_Schematic\_20180130090143.pdf

Casing ID	String Type	Hole Size	Csg Size	Condition	Standard	Tapered String	Top Set MD	Bottom Set MD	Top Set TVD	Bottom Set TVD	Top Set MSL	Bottom Set MSL	Calculated casing length MD	Grade	Weight	Joint Type	Collapse SF	Burst SF	Joint SF Type	Joint SF	Body SF Type	Body SF
1	SURFACE	17.5	13.375	NEW	API	N	0	1800	0	1800	3689	1889	1800	J-55	54.5	STC	1.42	3.86	DRY	2.59	DRY	2.59
2	INTERMED IATE	12.2 5	9.625	NEW	API	N	0	3901	0	3901	3689	-212	3901	J-55	40	LTC	1.25	1.41	DRY	1.6	DRY	1.6
3	INTERMED IATE	12.2 5	9.625	NEW	API	N	3901	5600	3901	5600	-212	-1911		HCK -55	40	LTC	1.45	1.27	DRY	4.23	DRY	4.23

# Section 3 - Casing

### Operator Name: LEGACY RESERVES OPERATING LP

Well Name: LEA UNIT

#### Well Number: 64H

Casing ID	String Type	Hole Size	Csg Size	Condition	Standard	Tapered String	Top Set MD	Bottom Set MD	Top Set TVD	Bottom Set TVD	Top Set MSL	Bottom Set MSL	Calculated casing length MD	Grade	Weight	Joint Type	Collapse SF	Burst SF	Joint SF Type	Joint SF	Body SF Type	Body SF
4	PRODUCTI ON	8.75	5.5	NEW	API	N	0	17643	0	9800	3689	- 13954	17643	P- 110		OTHER - BTC	2.17	1.26	DRY	1.6	DRY	1.6

#### **Casing Attachments**

Casing ID: 1

String Type: SURFACE

Inspection Document:

Spec Document:

**Tapered String Spec:** 

Casing Design Assumptions and Worksheet(s):

Lea\_Unit\_64H\_Casing\_Design\_20180130075640.pdf

Casing ID: 2 String Type: INTERMEDIATE

Inspection Document:

**Spec Document:** 

**Tapered String Spec:** 

Casing Design Assumptions and Worksheet(s):

Lea\_Unit\_64H\_Casing\_Design\_20180130080139.pdf

Operator Name: LEGACY RESERVES OPERATING LP			
Well Name: LEA UNIT	Well Number: 64H	2	*

#### **Casing Attachments**

Casing ID: 3 String Type: INTERMEDIATE

**Inspection Document:** 

Spec Document:

**Tapered String Spec:** 

#### Casing Design Assumptions and Worksheet(s):

Lea\_Unit\_64H\_Casing\_Design\_20180130081437.pdf

Casing ID: 4 String Type: PRODUCTION

**Inspection Document:** 

**Spec Document:** 

**Tapered String Spec:** 

# Casing Design Assumptions and Worksheet(s):

Lea\_Unit\_64H\_Casing\_Design\_20180130081559.pdf

# Section 4 - Cement

String Type	Lead/Tail	Stage Tool Depth	Top MD	Bottom MD	Quantity(sx)	Yield	Density	Cu Ft	Excess%	Cement type	Additives
SURFACE	Lead		0	1523	1100	1.93	13.5	2123	75	Class C cement	4% bwoc bentonite II + 2% bwoc Calcium Chloride + 0.25 lbs/sack Cello Flake + 0.005% bwoc Static Free + 0.005 gps FP-6L
SURFACE	Tail		1523	1800	200	1.34	14.8	268	75	Class C cement	1.5% bwoc Calcium Chloride + 0.005 Ibs/sack Static Free + 0.005 gps FP-6L

# Operator Name: LEGACY RESERVES OPERATING LP

Well Name: LEA UNIT

#### Well Number: 64H

String Type	Lead/Tail	Stage Tool Depth	Top MD	Bottom MD	Quantity(sx)	Yield	Density	Cu Ft	Excess%	Cement type	Additives
PRODUCTION	Lead		0	3352	1600	2.38	11.9	3808	80	Poz (fly ash) Class H cement	10% bwoc bentonite II + 5% bwow sodium chloride + 5 pps LCM-1 + 0.005 Ibs/sk Static Free + 0.005 gps FP-6L
PRODUCTION	Tail			1764 3	1700	1.62	13.2	2754	20	Class H	CSE-2 + 4% bwow sodium chloride + 3 pps LCM- 1 + 0.6% bwoc FL-25 + 0.005 gps FP- 6L + 0.005% bwoc Static Free
INTERMEDIATE	Lead		0	4900	1400	2.13	12.5	2982	80	Poz (fly ash) Class C cement	4% bwoc bentonite II + 5% bwoc MPA-5 + 0.25% bwoc FL- 52 + 5 Ibs/sack LCM-1 +0.125 Ibs/sk cello flake+ 0.005 Ibs/sk defoamer + 0.005 gpsFP-6L + 1.2% bwoc Sodium Metasilicate + 5% bwow Sodium Chloride
INTERMEDIATE	Tail		4900	5600	200	1.33	14.8	266	80	Class C cement	none
INTERMEDIATE	Lead		0	4900	1400	2.13	12.5	2982	80	Paz (fly ash) Class C	4% bwoc bentonite II + 5% bwoc MPA-5 + 0.25% bwoc FL- 52 + 5 Ibs/sack LCM-1 +0.125 Ibs/sk cello flake + 0.005 Ibs/sk defoamer + 0.005 gpsFP-6L + 1.2% bwoc Sodium Metasilicate + 5% bwow Sodium Chloride
INTERMEDIATE	Tail		4900	5600	200	1.33	14.8	266	80	Class C cement	none

Well Number: 64H

# **Section 5 - Circulating Medium**

Mud System Type: Closed

Will an air or gas system be Used? NO

Description of the equipment for the circulating system in accordance with Onshore Order #2:

Diagram of the equipment for the circulating system in accordance with Onshore Order #2:

**Describe what will be on location to control well or mitigate other conditions:** Sufficient mud materials will be kept on location at all times in order to combat lost circulation or unexpected kicks. Mud logging program: 2 man unit from approximately after setting intermediate casing. No open hole logs, DSTs, or cores are planned.

**Describe the mud monitoring system utilized:** A Pason PVT system will be rigged up prior to spudding this well. A volume monitoring system that measures, calculates, and displays readings from the mud system on the rig to alert the rig crew of impending gas kicks and lost circulation. In order to effectively run casing, the mud viscosity and fluid loss properties may be adjusted.

### **Circulating Medium Table**

Top Depth	Bottom Depth	Mud Type	Min Weight (Ibs/gal)	Max Weight (Ibs/gal)	Density (Ibs/cu ft)	Gel Strength (lbs/100 sqft)	Н	Viscosity (CP)	Salinity (ppm)	Filtration (cc)	Additional Characteristics
5600	9800	OTHER : Fresh water/brine	8.4	8.6							
1800	5600	OTHER : Brine water	9.8	10							
0	1800	SPUD MUD	8.4	8.9							
9800	1764 3	OTHER : Fresh water/brine	8.9	9.1							

Operator Name: LEGACY RESERVES OPERATING LP Well Name: LEA UNIT

Well Number: 64H

## Section 6 - Test, Logging, Coring

List of production tests including testing procedures, equipment and safety measures: Mud logging program: 2 man unit from approximately after setting intermediate casing.

List of open and cased hole logs run in the well: MUDLOG

Coring operation description for the well:

No coring No open hole logs, DST's or cores are planned.

# Section 7 - Pressure

Anticipated Bottom Hole Pressure: 4312

Anticipated Surface Pressure: 2156

Anticipated Bottom Hole Temperature(F): 162

Anticipated abnormal pressures, temperatures, or potential geologic hazards? NO

Describe:

Contingency Plans geoharzards description:

Contingency Plans geohazards attachment:

Hydrogen Sulfide drilling operations plan required? YES

Hydrogen sulfide drilling operations plan:

LEA\_UNIT\_64H\_HS2\_Plan\_20180130083412.pdf

**Section 8 - Other Information** 

Proposed horizontal/directional/multi-lateral plan submission:

Lea\_Unit\_\_64H\_Design\_\_1\_Rpt\_20180130083615.pdf Lea\_Unit\_\_64H\_Design\_\_1\_AC\_Rpt\_20180130084030.pdf

# Other proposed operations facets description:

Other proposed operations facets attachment:

Lea\_Unit\_64H\_Drilling\_Plan\_20180130084052.pdf Lea\_Unit\_\_64H\_GasCapturePlan\_20180130084105.pdf

#### Other Variance attachment:

Flex\_Hose\_Specs\_20180130134524.pdf















**QUOTATION** 

Surface System Cameron Intl Corp CAM SURFACE SYS H CAMERON 3505 W SAM HOUSTO HOUSTON TX 77043 JSA			Page 1 of 6 Date Issued Payment Terms	: US10/HT11/1489470-A : MAY 09 2017 : Net 30 Days s :As Attached/Included :FOB Ship Pt-PPD/Add-No Pro EX-WORKS - ODESSA, TX
Sold to : 22039905 LEGACY RESERVES L P.O. Box 10848 MIDLAND TX 79702 JSA			Ship To: 220 LEGACY RESERVE 303 W WALL STE MIDLAND TX 7970 USA	1400
	Joycelyn M. FAILLA/713-469-7221 David Treece/432-337-5475			yn.failla@c-a-m.com .treece@c-a-m.com
	Customer Reference Valid From Valid To Project Reference	: :	CONVENTIONAL MAY 08 2017 JUN 09 2017	

WE APPRECIATE THE OPPORTUNITY OF SUBMITTING THIS QUOTATION FOR YOUK REQUIREMENT. SHOULD YOU REQUIRE ANY ADDITIONAL INFORMATION, PLEASE DO NOT HESITATE TO CONTACT US.

#### **CONVENTIONAL 3-STRING**

CASING PROGRAM: 13-3/8" X 9-5/8" X 5-1/2"

\_\_\_\_\_

Item	Material Number E Description	Extended Weight	Qty	UM	Unit Net Price USD	Extended Price USD
	Section A - CASING HEAD ASSY	=				
20	2161182-02-01 ASSY, CSG HEAD, IC-2-BP 13-5/8" API 3M X 13-3/8" SOW W/TWO 2" LPO'S API 6A 20TH ED., PSL-1; T/C P,U; M/C AA,DD-NL; PR-2 (PREPPED FOR STANDARD 'CR' LANDING BA	652 lb SE)	1	EA	2,807.66	2,807.66
30	2057661-02-01 ASSY; TYPE 'CR' LANDING BASE FOR 13-5/8 FLG., 24 IN OD. BASE PLATE 850,000 LBS CAPACITY (MATL 36,000 YIELD)	257 lb	1	EA	1,297.66	1,297.66
40	021013-12 NIPPLE, API 2 IN LP, 6.00 IN LG SEAMLESS 5L GR B, 9.03 LB	4 lb	1	EA	24.33	24.33
50	2168084-10-31 VALVE, BALL, FLOATING, 2 IN (50 MM) X 1-1/2 IN (40 MM), B136-CS-43-CS FIGURE NUMBER, THREADED END (FXF), WKM, 310C 3000 PSI (206 BAR) MOP, 2719 PSI (187 BAR) MOP AT MAX TEMP, CARBON STEEL B4		1	EA	102.89	102.89

Cameron Intl Corp



Document number :US10/HT11/1489470-A Page 2 of 6 .

Item	Material Number Description	Extended Weight	Qty	UM	Unit Net Price USD	Extended Price USD
	CARBON STEEL/CHR PLATED BALL, CARB STEEL/ZINC PLATED STEM, ACETAL PLAS SEAT, WRENCH WITH LOCK DEVICE LESS API 607, B16.34, -20 F (-29 C) - +220 F (+104 C), ADJUSTABLE STEM PACKING	TIC				
50	007481-01 Bull Plug, 2" LP, Tapped 1/2" NPT, 3.75" Long.	3 lb	1	EA	27.34	27.34
70	2738068-02 Fitting, vent straight 1/2 npt Safty vent, 4140 nace / Zn pl Tungsten carbide Ball, 10,000 psi Max	0 kg	1	EA	14.28	14.28
	Total Section A - CASING HEAD ASSY					4,274.16
	Section B - CASING SPOOL ASSY	===				
00	702001-57-02 RING GASKET, API TYPE R-57 LOW C STL OR SOFT IRON -PLATED /API 6A PSL 4, API MONOGRAM, REQUIRED	3 lb	1	EA	24.70	24.70
10	621650-03 ASSY: STUD & NUTS, 1.375 X 10.750" Long (B7 & 2H)	130 lb	20	EA	15.65	313.00
20	Y15000-23300001 CASING HANGER, IC-2, 13-5/8" X 9-5/8", API 6A 20TH ED., TEMP CLASS S, MATL CLASS AA,DD-NL, PSL 3, PR 2, GROUP 3. (-20F TO 150F MAX) (CARBOXYLATED NITRILE 70/80 DURO)	44 kg	1	EA	2,538.05	2,538.05
30	2216433-03-01 ASSY, SPOOL, TYPE 'IC-2-BP', 13-5/8 API 3K BTM X 11 API 5K FLGD TOP, W/TWO 2-1/16 API 5K SIDE STD'D OUTLETS W/2-1/16 API VR, TWO TYPE 'N' TIEDOWN SCREWS,W/'NX' BTM PREP, API 6A; 20TH ED; T/C U; M/C DD-NL; PSL 1; PR-2 (4130 MATERIAL)	1,446 lb	1	EA	4,769.22	4,769.22
40	640518-10 'NX' BUSHING, 13-5/8 NOM X 9-5/8	16 lb	1	EA	1,454.59	1,454.59



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ltem	Material Number Description	Extended Weight	Qty	UM	Unit Net Price USD	Extended Price USD
	OD CSG, STD OR NACE SERVICE					
150	2222164-02-01 VALVE REMOVAL PLUG, 2-1/16" 10K MAX W W/1-1/2" VEE TUBING THD, API 6A 20TH ED/ISO 10423, MATL CLASS DD-NL	1 lb /P,	1	EA	74.93	74.93
60	2737400-01-01 ASSEMBLY, AOP COMMERCIAL GATE VALV 2-1/16 API 5,000 FLG X FLG, EXPANDING GATE, 6A 20TH EDITION, TEMP CLASS P+U, MATERIAL CLASS AA, PSL 1, PR 1	175 lb /E,	1	EA	746.80	746.80
170	142362-01-03-02 FLANGE, COMPANION, 2-1/16" API 5000 X 2" API LP THREAD, API 6A 20TH EDITION, T/C: U, M/C: DD-NL, PSL 2	24 kg	2	EA	78.64	157.28
80	007481-01 Bull Plug, 2" LP, TAPPED 1/2" NPT, 3.75" Long.	3 lb	1	EA	27.34	27.34
90	2738068-02 Fitting, vent straight 1/2 npt Safty vent, 4140 nace / Zn pl Tungsten carbide ball, 10,000 psi Max	0 kg	1	EA	14.28	14.28
200	702001-24-02 RING GASKET, API TYPE R-24, LOW C STL OR SOFT IRON, PLATED, API 6A PSL 4, API MONOGRAM	2 lb	3	EA	5.13	15.39
210	Y51201-20220301 Stud W/Two Nuts, 7/8" X 6" Lg, B7/2H, Plated	12 lb	8	EA	3.27	26.16
	Total Section B - CASING SPOOL ASSY					10,161.74
	Section C - TUBING SPOOL	==				
240	702001-54-02 RING GASKET, API TYPE R-54, LOW C STL OR SOFT IRON, PLATED, API 6A PSL 4, API MONOGRAM	5 lb	1	EA	28.19	28.19

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ltem	Material Number Description	Extended Weight	Qty	UM	Unit Net Price USD	Extended Price USD
250	621650-14 ASSY, STUD & NUTS, 1.875 X 14.750" Long (B7 & 2H)	180 lb	12	EA	35.18	422.16
60	Y15001-21002901 CASING HANGER, IC",-2, 11" X 5-1/2 API 6A 20TH ED, M/C AA, T/C S, PSL-3, PR2, GROUP-3/2	115 lb	I	EA	973.43	973.43
270	2309361-01-02 ASSY, SPOOL, TBG HEAD, TYPE 'C', 11 API 5K FLG BTM X 7-1/16 API 10K FLG TOP; W/ TWO 1-13/16 API 10K STD'D OUTLETS; W/ 1-13/16 API VR PREP; W/'NX' BTM PREP; API 6A 20TH ED; T/C: U; M/C: DD-NL; PSL-2, PR-2. (4130 LAS MATERIAL)	1,350 lb	I	EA	4,774.41	4,774.41
80	2348293-01-01 ASSY 11 X 5-1/2 'NT' BUSHING W/ DBL 'T'SEALS AND DBL 'S' SEALS, W/ INTERGRA BIT GUIDE (FOR STANDARD AND NACE SERVICE)	57 lb L	1	EA	942.17	942.17
90	141510-41-95-02 ASSEMBLY, FLS MANUAL GATE VALVE, 1-13/16 API 10,000 FLG, ISO 10423 AND API 6A 20TH EDITION, TEMP CLASS P+U, MATERIALS CLASS EE-1.5, PSL 2, PR 2	500 lb	2	EA	1,927.05	3,854.10
00	142359-01-03-02 Flange, companion, 1-13/16 Api 10,000 With 2" Api Line Pipe, 5000 pSi Wp Api 6A 20th Edition, temp class U, Matl class DD-NL, pSL 2	40 lb	2	EA	78.86	157.72
10	007481-01 Bull Plug, 2" LP, Tapped 1/2" NPT, 3.75" Long.	3 lb	1	EA	27.34	27.34
20	2738068-02 FITTING, VENT STRAIGHT 1/2 NPT SAFTY VENT, 4140 NACE / ZN PL TUNGSTEN CARBIDE BALL, 10,000 PSI MAX	0 kg	1	EA	14.28	14.28
30	702003-15-12 Ring Gasket, api type BX-151, low C STL, plated, api 6a psl 4, api Monogram.	1 lb	4	EA	2.89	11.56

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Item	Material Number Description	Extended Weight	Qty	UM	Unit Net Price USD	Extended Price USD
340	Y51201-20120201 STUD W/TWO NUTS, 3/4"-10 X 5-1/4" LG, A193 B7 STUD/A194 2H HVY HEX NUT, ZINC PLATED	16 lb	16	EA	3.77	60.32
	Total Section C - TUBING SPOOL					11,265.68
Section	Summary:					
	TotalSection A - CASING HEAD ASSYTotalSection B - CASING SPOOL ASSYTotalSection C - TUBING SPOOL				1	4,274.16 0,161.74 1,265.68
Price S	ummary :	Total Total Quotation	Price : Price :			5,701.58 USD 5,701.58 USD
ESTIM	ATED DELIVERY: TBA				,	

ESTIMATED DELIVERY: TBA EX-WORKS CAMERON ODESSA, TX AFTER RECEIPT OF ORDER; SUBJECT TO PRIOR SALE \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

CAMERON DIVISION RESERVES THE RIGHT TO ISSUE A REVISED QUOTATION SHOULD THERE BE ANY DEVIATION OR ADDITIONS TO THIS QUOTATION.

DELIVERIES OFFERED HEREIN ARE BASED UPON MATERIAL AVAILABILITY AND MANUFACTURING CAPACITY AT TIME OF QUOTATION.

CAMERON DIVISION'S TERMS AND CONDITIONS OF SALE FORM A PART OF THIS QUOTATION AND SHALL APPLY TO ANY CONTRACT OF SALE.

PRICES QUOTED HEREIN ARE FIRM THROUGH DELIVERY IF ORDER IS PLACED WITHIN THE VALIDITY PERIOD OF THIS QUOTATION.

QUALIFICATION OF CAMERON WELD PROCEDURES INCLUDES HARDNESS TESTING OF THE WELD, BASE METAL AND HEAT-AFFECTED ZONE (HAZ) USING THE ROCKWELL B AND C SCALES. THIS IS CONSISTENT WITH OUR LONG ESTABLISHED AND SUCCESSFUL PAST PRACTICE. IT IS ALSO CONSISTENT WITH PREVIOUS EDITIONS OF NACE MR0175 AND WITH THE LATEST EDITION PROVIDED THAT THIS TESTING METHOD IS ACCEPTED BY THE BUYER.

CAMERON WILL CONTINUE TO USE ROCKWELL B AND C SCALES IN LIEU OF OTHER METHODS NOW LISTED IN NACE MR0175 / ISO 15156. BY ITS PURCHASE OF THESE PRODUCTS, THE BUYER ACKNOWLEDGES THE FOREGOING AND GIVES ITS CONSENT TO THE USE OF ROCKWELL B AND C HARDNESS TESTING FOR QUALIFICATION OF WELD PROCEDURES.



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# AND CONDITIONS **FERMS**

1. CONTRACT ACCEPTANCE: Any written or oral purchase order rescired from Buser by Seller shall be constructed as a written acceptance of Selfe's offer o. and self and accondance with the terms and conditions of Sale's ACCEPTANCE. FITIS ORDER, IS EXPRESSLY CONDITIONED VERSUS ASSERVIT OTHE: EXPRESSLY TO NOTIFIONED VERSUS ASSERVIT OTHE: THIS CONTAINED HEREIN. The terms and conditions of Sale's proposal (if any) and acknowledgement shall prevail or or any conflicting to different terms in poer's order unsets Buser routes. Seller's proposal (if any) and acknowledgement able reveal (if there (1)) does not approxed to the selfer or any selfer terms of conditions of Sale's acknowledgement. Buser's standard statement. Buser's standard statement. Buser's standard statement. Buser's action video constructed a subtlet container of Saler's acknowledgement. Buser's standard statement. Buser's standard statement and statement. Buser's standard statement and statement. Buser's standard statement. Buser's standard statement. Buser's standard statement and conditions of state. The statement and conditions of statement. Buser's standard statement and statement and statement. Buser's standard statement and statement. Buser's statement and statement. Buser's statematicated and statement and statement

2 QUOTATIONS AND PRICES Any product, service capability or manufacturing capability, which may be available as the first and the standard proper state. Proceed generates are under to change without more: The proceed first and the time of dynamic including any scattaline formula will apply, unless a valid control growth more more than the first of a state of the time of dynamic including any scattaline formula will apply, unless a valid are FO B. Schrist ability and are for a contrast in the reserves the related for places a structure and are FO B. Schrist ability apply and schrist change on structure and are for any documentation reserves the relation for places are structured are excounts in the highest me prantice by his. Any documentation processes must be deminded by the Boyer at the time of quotation (d any) or at the time of coder placement.

i of goods or the performance of services shall must be made by Seller, in which case Buy er n dubes, consular fees, insurance charges and e or production such payment n e price Custom 3 TAXES Any tax or other charge imposed by law on the sale be puild but the Byoer, unless the any specially provides that a shall reimburss. Seller for such payment as part of the purchase other comparable charges will be borne by Buy or

4 SHIPPING SCHEDULE AND DELIVERY: Shipment schedules are given as accurately as conditions permit and every effort will be made to make informents as scheduled. Selfer will not be responsible for elevations in the impleming ablending to the responsible for elevations in the impleming schedule. Be whether due to Axis of Cod, eden Nearen grown, many schedules and perry occasations in the impleming schedule. Be have due to the cases by one of an implement to environment of an implement or an optimate strates by one Selfer reasonable control. Nuclear of the power or transportation, head and a schedules are for a microbial schedules for the supervision schedules and the cover and schedules are distantiant and every or equipment or any optimate and schedules are distantian strates. Solid schedules are distantiant and every or equipment or any optimation. Read, and Selfer variantials, supplies, the power or transportation, head and schedules are distantiant and schedules are distantiant and schedules are also for a schedules of frammaticant schedules. The constrates and shall not farmitly commercially equivalent or best responsed in a cumurance and solid remains a within which to perform as may the restand and schedules are distantiant and schedules are scheduled. Selfer reserves the right to farmitly commercially equivalent or best responsed in any consider to the supervist data are scheduled as solid commercially equivalent or best are also dones are independent as a schedules and schedules are based on schedules are schedules are supported for any contrast in the provision mater and particular data are similar annet are mater and are are schedules are are are schedules are schedules

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canceled credit or 2 D 6 CANCELLATIONS AND RETURNS Purchase orders once placed by Buy et and accepted by Seller can only with Seller's written consent and upon terms which will save Seller from loss. No products may be returned adjustment without written permission from Seller's office authorized to issue such permission.

7 WARRANTIES Contractor variants that goods of its manufacture shall be free from defects in materials and revolvantants for a period of nex (1) year after being placed in service or eighteen (1) months from defects in materials and revolvantants) for a period of one (1) year after being placed in service or eighteen (1) months from defects in materials and revolvantants for a period of one (1) year after being placed in service or eighteen (1) months from defects in materials and revolvantants. The presence of the presence of the product of the presence of the product of the presence of the pres

applicable the United 8 ENGINEERING AND SERVICE Upon reguest. Selfer will provide engineering and or technical information regaring products and ther nects and if feasible, will provide personnel to assist Baye in effecting field unsultations and/or technical information. Earlier or assistance so provided, whether with or without charge, shall be advisory only service charged that the set without charge, shall be advisory only 9 LABOR STANDARDS selfer hereby certificities that these products were produced in accordance with all applic requirements of Seconds. T and 12 of the Far Labor Standards Act as amended and of regulations and or to the Us Statis Expandence of Labor issued under Seconds.

Seller's defects in such its must be made at S as regards latent de prior to shipment in products evcept ceptance of p conclusive e ing working | ac ac otherwise agreed in writing. final inspection and receiving point designated by Seller and shall inspect at the Seller's plant or shipping point of with operations. 10 INSPECTION Unless of plant or other shipping or re Buyer's representatives may a manner as will not interfere w.

11. DELIVERY AND ACCEPTANCE. Delivery shall be in accordance with the requirements in the Parchase Contriported in the creat Bayer at unable to accept delivery upon completion of the manufasture of the Goost in accordance with such requirements. Bayer agree that (i) this of network of connecteding to the Goost in accordance with such requirements. Bayer agree that (i) this day and fixed for succeeding that and the for the constraints and the for excerdance with such recursivery and the for the constraint accordance with such requirements. Bayer agree that (i) this day and fixed for succeeding that the formation that days after the formation of the succeeding the formation of the succeeding that the succeeding the succeeding the succeeding that the formation of the succeeding that the succeeding the succeeding that the succeeding that the succeeding that the succeeding the succeeding that the succeeding the succeeding that the succeeding that the succeeding that the succeeding the succeeding that the succeeding the suc

12 EXPORT COMPLANCE: The Buy or shall provide the Selfer with relevant end-use: and-user and country of end-use functionation with speech to the goods: services, software or technology to be supplied hereander (collecture). Items the state of information with scheme the state and compliance with physician compliance with physician compliance with appendix the state and characterized and in relatince on such information. the Scheme that will specify each state and characterized and in relatince on such information. The Scheme that here with the state and characterized and the United States of America. The Scheme state and the Barer acknowledge that an externed are there are extensible to the United States of America. The Scheme state and the Barer acknowledge that an externed are the state or comparison with all tands and customes laws including a shiptometor become commers ohn than the US 3 may be compliance with physician cardo and the Mare state. The Scheme state and custome states are common to the state and custome states and customes the state and customes that and the state of the states and the states and customes the states and customes that the tands and extension and the Bare states and the states and the states and the states and discomestate the states and the states and th

13 TRANSPORTATION CHARGES ALLOWANCES CLAINS All press are FOB Seller's plant or other designated between Seller and Bares and an event of the Seller's quotation (if m) or in a virtue contrast which may exist trength is allowed and Bares and ancient started in Seller's quotation or a virtue or unsert started and or an antion contrast which may exist trength is allowed. all press are the mus of knyment IE Seller's quotation or a virtue or unsert started and or an antion contrast started by the seller's approximation or a virtue or antion contrast started by the observation and bare and the grout or other designated ablyping point, with most economical must comparation allowed. If the quoted or other designation of segment to the seller or economical most common carry are and to sign the manner in desime extending approximation. Seller is the dediced form the seller present the manner in desime extension allowed. If the quoted or contrast intrast start with a layoration, to dedicated by the seller or behaves attrastic start with allowabourded by Seller to the designated by the designated designated by the design and to spin the manner in desim most corronical Midde cost due to special notang requested by the design and the grout and the manner in desime more corronical most contrast interaction to dedicate not when the seller present in the manner in desime more contrast interaction to dedicate the mit when a manner and the manner in desime more contrast interaction or dedication with the manner and the manner in the manner start includes transportation. The design and the manner in design and the manner and the manner in design and the manner and the manner and the manner in plant unstration or dedication or dedication to dedicate the manner and the manner in plant unstration or dedication or dedication to dedicate the manner and the

regardless of who pays shipping costs. Seller endencors to pack or prepare all shipments so that they will not break, must or acteriorate in transit, then does not guarantee against such damage. Unless requested in writing bit, Buyer, no shipments instared by Seller against damage to foss it marini. Seller will pack to instance active an sossible in accordance with Buyer's written instructions but in such case Seller acts only as agein between the instance. Company and the Buyer and Expressibility and hould be for a linguing toss, breakage or damage (obvious or conceled) are Buyer's responsibility and hould be made to the carrier. All claims regarding shortness must be made within thirty (30) days for recept of shipment and must be accompatived by the packing fissity for criting the shipment 14. INDEMNIPFCATION AND LIMITATION OF LIABILITY:

A INDEMNIFICATION: Boost Group means Buyer, its parent (if any,) subsidiaries, affiliates, co-owners, co-sentuers, neurors and any entry, with whom Buyer has an economic interest with respect to the Work including Buyer's constoner and the respective employees, provided a for the constraint of the constraint and security and distribution and distribution of any tor or level and has are on included within the Selfer Group). Selfer Group means Selfer, the provide Service and distribution and many tor or level and who are on included within the Selfer Group). Selfer Group means Selfer, the prenet of any to the distribution and table and their nespective employees prosoned. Infections and structures approximations and structures and its the sector and advecture of the set of any tor or level and builter, behavior distribution distribution to the sector and advecture on solution of any tor or level and misconduct.

(1) Selfer shall release, defend avec, indemnify (collectively. Indemnify, ) and hold Bayer Group Hamless from and again dimmits to the formatic, hosse, damages and causes of actions of whatever kind or nature (collectively Claims ). For loss of admings to the property of the members of the Selfer Group over if such Claims arise from or attributable to the Negligen of the members of Bayer Group.

sonal injury members of the pers and against all Claums for the death(s) of or from or attributable to the Negligence of r (2) Seller shall Indemnify and hold Buyer Group harmless from (ies) to members of the Seller Group even if such Claims arise Buyer Group

harmless from au r Group even if s (3) (incl

to the property Negligence of mage to the loss of or dam attributable to and against all Claims for l such Claims arise from or Buyer shall Indemnify and hold Seller Group h (luding the Work) of the members of the Buyer members of Seller Group

the r from and against all Claims for the death(s) of or arise from or attributable to the Negligence of t (4) Buyer shall Indemntfy and hold Seller Group harmless ( (ies) to members of the Buyer Group even if such Claims Seller Group.

a behalf of Seller Group) I them by or on behalf of \$) of or damage(\$) to the ler Group. It is agreed by d against them by a third (5) Buy et (on its own behalf and on behalf of Buyer Group) and Sellert (on its own behalf and on b all indomnity and hold each other harmless from and against any and all (Laims asserted against it any third party for the death(s) for the corresting to(s) to such a third party, as well as loss (es) to property of stach a third party. A third party is a person or early not included in Buyer Group or Seller Buyer and Seller that their irrespective dath of indexton a control and in Buyer Group or Seller party: pursuant to this Article 14 (A) (5) shall be limited to their respective degree of Negligence.

of arrisin to th d hold the member or hydrocarbons) an f or attributable to (6) Notwithstanding any other provision contained in this Agreement. Buyer shall Indemnify and I Selber Group humaties from and against all Claims (including clean-up costs and loss (es) of oil, gas of from polyhour, containination, damping or signillarg of any substance and even if arising out of c Nephpence of the members of the Selfer Group.

B INDEMNITY FOR CONSEQUENTIAL DAMAGES UNDER NOCRICUMSTANCES SHALL SELLER BE LIABLE FOR ANY SPECIAL. CONSEQUENTIAL INCIDENTIAL. ENERTIARL SEXEMPLARY OR PUNITIVE DAMAGES (collection) CONSEQUENTIAL). AND ENERD BY THE LAWS GOVERNING THIS PRICHASE GODER, MORE POR ANY LOSS OF STICTERATED PROFITS. LOSS OF BUSINESS OPPORTUNIT. LOSS OF USE OF DATO STATICATION. SYSTEM OR FALLITY NION WICH SELLER'S BUJURMENT MAY BE LOCATED OR AT INSTALLATION. SYSTEM OR FALLITY NION WICH SELLER'S BUJURMENT MAY BE CLOCATED OR AT INSTALLATION. SYSTEM OR FALLITY NION WICH SELLER'S BUJURMENT MAY BE FOLDERED FOR OCCOSCOURTED PROFIES. LOSS OF BUSINESS OF DAMAGES AND AGAINST ANY CLAINS FOR SECON UNICH MIERS OF THE SELLER GROUP MANY BE PERPORAINDO WORK, AND BUVER AGREES TO INDEMNIFY AND HOLD SELLER GROUP MANLESS FROM AND AGAINST ANY CLAINS FOR SUCH ONSQUENTED PARCES EVEN IF ARISING OUT OF OR ATTRIBUTABLE TO THE MELLORAGE OF THE MENBERS OF THE SELLER GROUP.

C LIMITATION OF LIABILITY EXCEPT AS OTHERWISE EXPRESSAV LIMITED IN THIS AGREEMENT IT IS THE EXPRESS INTENTION OF THE PARTIES SHILL RE (I) SUPPORTED BY TRUEWATTONS AND/OR LIABILITIES HRREN ASJUNED NT THE FARTIES SHILL RE (I) SUPPORTED BY TRUEWATCH, (II) MITHOUT LIABILITIES HRREN ASJUNED NT HE CAUSE OR CAUSES THEREOF INCLUDING, BUT AND THATIES I. D. PRESSTATING CONDITIONS (INTER ALICH CONDITIONS RE PATIEST OR LATENT). THE UNSERMORTHINESS OF ANY VIESSEL OR VISSELS (INTERTHERE OF AND TRUEWATION). THE UNSERMORTHINESS OF ANY VIESSEL OR VISSELS (INTERTIES AND THATIAN). THE UNSERMORTHINESS OF ANY VIESSEL OR VISSELS (INTERTIES AND THAT OR LATENCI. THE INTERDED RELACID OF CONTRACT. RELACH OF DUTY (STATUTONY CONTRACT/LAL. COMMON LAW OR INTERVISE). STRUCT LIABILITY: CONDITION OF RUIN OR DEFECTIVE PREMISES. BOUTHAREN OTHERWISE, STRUCT LIABILITY: CONDITION OF RUIN OR DEFECTIVE PREMISES. BOUTHAREN OTHERWISE, STRUCT LIABILITY: CONDITION OF RUIN OR DEFECTIVE PREMISES. BOUTHAREN OTHERWISE, STRUCT LIABILITY: CONDITION OF RUIN OR DEFECTIVE PREMISES. BOUTHAREN OTHERWISE, STRUCT LIABILITY: CONDITION OF RUIN OR DEFECTIVE PREMISES. BOUTHAREN OTHERWISE, STRUCT LIABILITY: CONDITION OF RUIN OR DEFECTIVE PREMISES. BOUTHAREN OTHERWISE, STRUCT LIABILITY: CONDITION OF RUIN OR DEFECTIVE PREMISES. BOUTHAREN OTHERWISE, STRUCT LIABILITY: CONDITION OF RUIN OR DEFECTIVE PREMISES. BOUTHAREN OTHERWISE, STRUCT LIABILITY: CONDITION OF RUIN OR DEFECTIVE PREMISES. BOUTHAREN OTHERWISE, STRUCT LIABILITY: CONDITION OF RUIN OR DEFECTIVE PREMISES. BOUTHAREN OTHERWISE, STRUCT LIABILITY: CONDITION OF RUIN OF DEFECTIVE PREMISES. BOUTHAREN OTHERWISE, STRUCT LIABILITY: CONDITION OF RUIN OF DEFECTIVE PREMISES. BOUTHAREN OTHERWISE, STRUCT LIABILITY OR ANY PARTY UNDER OF AND DARY OR RUNN LAW OR DEFECTIVE PREMISES. BOUTHARENTINE OF PRESONS OF CARGO. DARY OF DARY PARTY OF DARY OR DARY OR RUIN OF DARY OF RUNN LAW OF DARY OF DAR

13 MODIFICATION, RESCISSION & WAVER. The terms herein may not be modified or reseinded nor any of its performance of the source or variety and signed by an authorized employe of the performance of the modified in Housian. These, Ealmer of Saller to usis in any or er more instance, upon the performance of any of the source of the future of Saller to usis in any or er more instance, upon the performance of the time source of the future of Saller to usis in any or er more instance, upon the performance of the time and conditions of the contract or the future of Saller to usis in any order and sall not ke contract or the future of Saller to usis in any order and sall not ke contract of the future source or the future of Saller to using any order and sall not ke contract or the future of saller to arrive the model and the source of the time and conditions of the contract of the numeric state of the source of the time and conditions and first of the numeric state of the time and conditions and first of the number of the same and effect of the provide state of the providest state of the provide state of the p REV08/06





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General Inform	rnal Hydrost	,.	
General Inform	Contraction of the second s	atic Test Certificate	
	Chirachel and the contract descent of the	atte test eettijteate	
	nation	Hose Specif	fications
Tustomer	HOBBS	Hose Assembly Type	Rotary/Vibrator
AWH Sales Representative	CHARLES ASH	Certification	API 7K/FSL LEVEL2
Date Assembled	2/19/2017	Hose Grade	D
ocation Assembled	ОКС	Hose Working Pressure	5000
ales Order #	318810	Hose Lot # and Date Code	10958-08/13
Customer Purchase Order #	356945	Hose I.D. (Inches)	3.5"
Assembly Serial # (Pick Ticket #)	384842	Hose O.D. (Inches)	5.45"
lose Assembly Length	20FT	Armor (yes/no)	NO
	Fit	tings	
End A		End E	3
tem (Part and Revision #)	R3.5X64WB	Stem (Part and Revision #)	R3.5X64WB
item (Heat #)	13105653	Stem (Heat #)	13105653
errule (Part and Revision #)	RF3.5X5330	Ferrule (Part and Revision #)	RF3.5X5330
errule (Heat #)	34038185	Ferrule (Heat #)	3403818
Connection . Flange Hammer Union Part	4-1/16 5K	Connection (Part #)	4-1/16 5K
Connection (Heat #)		Connection (Heat #)	
Nut (Part #)		Nut (Part #)	
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	5.62"		5.53"
Vut (Heat#)	and the second se	Nut (Heat #)	5.53"
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MHSI-008 Rev. 0.0 Proprietary

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	Midw	est Hose	
	& Spec	cialty, Inc.	
	Certificate	of Conformity	
Customer: HOBBS		Customer P.O.# 356945	
Sales Order # 318810		Date Assembled: 2/19/2017	
	Speci	fications	
Hose Assembly Type:	Rotary/Vibrator	Rig #	
Assembly Serial #	384842	Hose Lot # and Date Code	10958-08/13
Hose Working Pressure (psi)	5000	Test Pressure (psi)	7500
Hose Assembly Description:		TRH56D-645KH-645KH-20.00	' FT
o the requirements of the purc Supplier: Midwest Hose & Specialty, Inc. 1312 S I-35 Service Rd	hase order and currer	or the referenced purchase orde nt industry standards.	r to be true according
o the requirements of the purc upplier: <b>Midwest Hose &amp; Specialty, Inc.</b>	hase order and currer		r to be true according
o the requirements of the purc upplier: Aidwest Hose & Specialty, Inc. 1312 S I-35 Service Rd Oklahoma City, OK 73129	hase order and currer		

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MHSI-009 Rev.0.0 Proprietary





February 19, 2017

	<b> V</b>		
Interi	& Spec	est Hose cialty, Inc. <b>atic Test Certificate</b>	2
General Inform	the second s	Hose Speci	
Customer	HOBBS	Hose Assembly Type	Rotary/Vibrator
MWH Sales Representative	CHARLES ASH	Certification	API 7K/FSL LEVEL2
Date Assembled	2/19/2017	Hose Grade	D
ocation Assembled	OKC	Hose Working Pressure	5000
Sales Order #	318810	Hose Lot # and Date Code	10958-08/13
Customer Purchase Order #	356945	Hose I.D. (Inches)	3.5"
Assembly Serial # (Pick Ticket #)	384842	Hose O.D. (Inches)	5.45"
Hose Assembly Length	20FT	Armor (yes/no)	NO
	Fit	tings	and the second second
End A		End	В
tem (Part and Revision #)	R3.5X64WB	Stem (Part and Revision #)	R3.5X64WB
Stem (Heat #)	13105653	Stem (Heat #)	13105653
errule (Part and Revision #)	RF3.5X5330	Ferrule (Part and Revision #)	RF3.5X5330
Ferrule (Heat #)	34038185	Ferrule (Heat #)	3403818
Connection . Flange Hammer Union Part	4-1/16 5K	Connection (Part #)	4-1/16 5K
Connection (Heat #)		Connection (Heat #)	
Nut (Part #)		Nut (Part #)	
Vut (Heat#)		Nut (Heat #)	
Dies Used	5.62"	Dies Used	5.53"
and the second states of the second second	Hydrostatic Te	est Requirements	
Fest Pressure (psi)	7,500	Hose assembly was teste	d with ambient water
Test Pressure Hold Time (minutes)	10 1/2	tempera	ture.
Date Tested	Teste	d Bu	Approved P:
Date restea	Teste	u by	Approved By

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MHSI-008 Rev. 0.0 Proprietary

	h V		
	Midw	est Hose	
	& Spec	cialty, Inc.	
	Certificate	of Conformity	
Customer: HOBBS		Customer P.O.# 356945	
Sales Order # 318810		Date Assembled: 2/19/2017	
	Speci	fications	
Hose Assembly Type:	Rotary/Vibrator	Rig #	
Assembly Serial #	384842	Hose Lot # and Date Code	10958-08/13
Hose Working Pressure (psi)	5000	Test Pressure (psi)	7500
Hose Assembly Description:		TRH56D-645KH-645KH-20.00	' FT
o the requirements of the purc upplier: Aidwest Hose & Specialty, Inc. 1312 S I-35 Service Rd	hase order and currer	or the referenced purchase orde nt industry standards.	r to be true according
o the requirements of the purc upplier: <b>Aidwest Hose &amp; Specialty, Inc.</b>	hase order and currer		r to be true according
o the requirements of the purc upplier: Aidwest Hose & Specialty, Inc. 1312 S I-35 Service Rd Oklahoma City, OK 73129	hase order and currer		r to be true according
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QUOTATION

Surface System
Cameron Intl Corp
CAM SURFACE SYS HQ - HOUSTON HQ
CAMERON
3505 W SAM HOUSTON PKWY NORTH
HOUSTON TX 77043
USA

Document number	:US10/HT11/1489470-A
Page 1 of 6	
Date Issued	:MAY 09 2017
Payment Terms	: Net 30 Days
Terms and conditions	:As Attached/Included
Freight Terms	:FOB Ship Pt-PPD/Add-No Pro
U	EX-WORKS - ODESSA, TX

22039905

Email: joycelyn.failla@c-a-m.com

Sold to : 22039905 LEGACY RESERVES LP P.O. Box 10848 MIDLAND TX 79702 USA

	Customer Reference	:
Outside Sales Contact:	David Treece/432-337-5475	
Inside Sales Contact:	Joycelyn M. FAILLA/713-469-7221	

Email: david.treece@c-a-m.com e : CONVENTIONAL : MAY 08 2017 : JUN 09 2017

Ship To:

USA

LEGACY RESERVES LP

303 W WALL STE 1400

MIDLAND TX 79701-5126

: JUN 09 2017 :

WE APPRECIATE THE OPPORTUNITY OF SUBMITTING THIS QUOTATION FOR YOUK REQUIREMENT. SHOULD YOU REQUIRE ANY ADDITIONAL INFORMATION, PLEASE DO NOT HESITATE TO CONTACT US.

Valid From

**Project Reference** 

Valid To

#### **CONVENTIONAL 3-STRING**

CASING PROGRAM: 13-3/8" X 9-5/8" X 5-1/2"

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Item	Material Number Description	Extended Weight	Qty UM	Unit Net Price USD	Extended Price USD
	Section A - CASING HEAD ASSY	<b>5 2</b>			
20	2161182-02-01 ASSY, CSG HEAD, IC-2-BP 13-5/8" API 3M X 13-3/8" SOW W/TWO 2" LPO'S API 6A 20TH ED., PSL-1; T/C P,U; M/C AA,DD-NL; PR-2 (PREPPED FOR STANDARD 'CR' LANDING B.	652 lb ASE)	1 EA	2,807.66	2,807.66
30	2057661-02-01 ASSY; TYPE 'CR' LANDING BASE FOR 13-5/8 FLG., 24 IN OD. BASE PLATE 850,000 LBS CAPACITY (MATL 36,000 YIELD)	257 lb	1 EA	1,297.66	1,297.66
40	021013-12 NIPPLE, API 2 IN LP, 6.00 IN LG SEAMLESS 5L GR B, 9.03 LB	4 lb	1 EA	24.33	24.33
50	2168084-10-31 VALVE, BALL, FLOATING, 2 IN (50 MM) X 1-1/2 IN (40 MM), B136-CS-43-CS FIGURE NUMBER, THREADED END (FXF), WKM, 310 3000 PSI (206 BAR) MOP, 2719 PSI (187 BAR) MOP AT MAX TEMP, CARBON STEEL F		1 EA	102.89	102.89



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Item	Material Number Description	Extended Weight	Qty	UM	Unit Net Price USD	Extended Price USD
	CARBON STEEL/CHR PLATED BALL, CARB STEEL/ZINC PLATED STEM, ACETAL PLAS SEAT, WRENCH WITH LOCK DEVICE LESS API 607, B16.34, -20 F (-29 C) - +220 F (+104 C), ADJUSTABLE STEM PACKING	TIC				
0	007481-01 Bull Plug, 2" LP, Tapped 1/2" NPT, 3.75" Long.	3 lb	1	EA	27.34	27.34
70	2738068-02 Fitting, vent straight 1/2 npt Safty vent, 4140 nace / Zn pl Tungsten carbide Ball, 10,000 psi Maz	0 kg	1	EA	14.28	14.28
	Total Section A - CASING HEAD ASSY					4,274.16
	Section B - CASING SPOOL ASSY	===				
00	702001-57-02 RING GASKET, API TYPE R-57 LOW C STL OR SOFT IRON -PLATED /API 6A PSL 4, API MONOGRAM, REQUIRED	3 lb	1	EA	24.70	24.70
10	621650-03 ASSY: STUD & NUTS, 1.375 X 10.750" Long (B7 & 2H)	130 lb	20	EA	15.65	313.00
20	Y15000-23300001 CASING HANGER, IC-2, 13-5/8" X 9-5/8", API 6A 20TH ED., TEMP CLASS S, MATL CLASS AA,DD-NL, PSL 3, PR 2, GROUP 3. (-20F TO 150F MAX) (CARBOXYLATED NITRILE 70/80 DURO)	44 kg	1	EA	2,538.05	2,538.05
30	2216433-03-01 ASSY, SPOOL, TYPE 'IC-2-BP', 13-5/8 API 3K BTM X 11 API 5K FLGD TOP, W/TWO 2-1/16 API 5K SIDE STD'D OUTLETS W/2-1/16 API VR, TWO TYPE 'N' TIEDOWN SCREWS,W/'NX' BTM PREP, API 6A; 20TH ED; T/C U; M/C DD-NL; PSL 1; PR-2 (4130 MATERIAL)	1,446 lb	1	EA	4,769.22	4,769.22
40	640518-10 'NX' BUSHING, 13-5/8 NOM X 9-5/8	16 lb	1	EA	1,454.59	1,454.59



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**Document number** :US10/HT11/148947Q-A Page 3 of 6

ltem	Material Number Description	Extended Weight	Qty	UM	Unit Net Price USD	Extended Price USD
	OD CSG, STD OR NACE SERVICE					
150	2222164-02-01 VALVE REMOVAL PLUG, 2-1/16" 10K MAX W W/1-1/2" VEE TUBING THD, API 6A 20TH ED/ISO 10423, MATL CLASS DD-NL	l lb /P,	1	EA	74.93	74.93
60	2737400-01-01 ASSEMBLY, AOP COMMERCIAL GATE VALV 2-1/16 API 5,000 FLG X FLG, EXPANDING GATE, 6A 20TH EDITION, TEMP CLASS P+U, MATERIAL CLASS AA, PSL 1, PR 1	175 lb /E,	1	EA	746.80	746.80
70	142362-01-03-02 FLANGE, COMPANION, 2-1/16" API 5000 X 2" API LP THREAD, API 6A 20TH EDITION, T/C: U, M/C: DD-NL, PSL 2	24 kg	2	EA	78.64	157.28
80	007481-01 Bull Plug, 2" LP, Tapped 1/2" NPT, 3.75" Long.	3 lb	1	EA	27.34	27.34
90	2738068-02 Fitting, vent straight 1/2 npt Safty vent, 4140 nace / Zn pl Tungsten carbide ball, 10,000 psi Max	0 kg	1	EA	14.28	14.28
00	702001-24-02 Ring Gasket, api type R-24, low C Stl or Soft Iron, plated, api 6a PSL 4, api Monogram	2 lb	3	EA	5.13	15.39
10	Y51201-20220301 Stud W/Two Nuts, 7/8" X 6" Lg, B7/2H, Plated	12 lb	8	EA	3.27	26.16
	Total Section B - CASING SPOOL ASSY					10,161.74
	Section C - TUBING SPOOL	==				
240	702001-54-02 RING GASKET, API TYPE R-54, LOW C STL OR SOFT IRON, PLATED, API 6A PSL 4, API MONOGRAM	5 lb	1	EA	28.19	28.19



Document number :US10/HT11/1489470-A Page 4 of 6

tem	Material Number Description	Extended Weight	Qty	UM	Unit Net Price USD	Extended Price USD
250	621650-14 ASSY, STUD & NUTS, 1.875 X 14.750" Long (B7 & 2H)	180 lb	12	EA	35.18	422.16
260	Y15001-21002901 CASING HANGER, IC",-2, 11" X 5-1/2 API 6A 20TH ED, M/C AA, T/C S, PSL-3, PR2, GROUP-3/2	115 lb	1	EA	973.43	973.43
270	2309361-01-02 ASSY, SPOOL, TBG HEAD, TYPE 'C', 11 API 5K FLG BTM X 7-1/16 API 10K FLG TOP; W/ TWO 1-13/16 API 10K STD'D OUTLETS; W/ 1-13/16 API VR PREP; W/'NX' BTM PREP; API 6A 20TH ED; T/C: U; M/C: DD-NL; PSL-2, PR-2. (4130 LAS MATERIAL)	1,350 lb	1	EA	4,774.41	4,774.41
80	2348293-01-01 ASSY 11 X 5-1/2 'NT' BUSHING W/ DBL 'T'SEALS AND DBL 'S' SEALS, W/ INTERGRA BIT GUIDE (FOR STANDARD AND NACE SERVICE)	57 lb L	1	EA	942.17	942.17
90	141510-41-95-02 ASSEMBLY, FLS MANUAL GATE VALVE, 1-13/16 API 10,000 FLG, ISO 10423 AND API 6A 20TH EDITION, TEMP CLASS P+U, MATERIALS CLASS EE-1.5, PSL 2, PR 2	500 lb	2	EA	1,927.05	3,854.10
00	142359-01-03-02 FLANGE, COMPANION, 1-13/16 API 10,000 WITH 2" API LINE PIPE, 5000 PSI WP API 6A 20TH EDITION, TEMP CLASS U, MATL CLASS DD-NL, PSL 2	40 lb	2	EA	78.86	157.72
10	007481-01 BULL PLUG, 2" LP, TAPPED 1/2" NPT, 3.75" LONG.	3 lb	1	EA	27.34	27.34
20	2738068-02 FITTING, VENT STRAIGHT 1/2 NPT SAFTY VENT, 4140 NACE / ZN PL TUNGSTEN CARBIDE BALL, 10,000 PSI MAX	0 kg	1	EA	14.28	14.28
30	702003-15-12 Ring Gasket, api type BX-151, low C STL, plated, api 6a psl 4, api Monogram.	I Ib	4	EA	2.89	11.56



Document number :US10/HT11/1489470-A Page 5 of 6

Item	Mater Descri	ial Number ption	Extended Weight	Qty	UM	Unit Net Price USD	Extended Price USD
							(0.00
340		01-20120201	16 lb	16	EA	3.77	60.32
		W/TWO NUTS, 3/4"-10 X 5-1/4" 193 B7 STUD/A194 2H HVY HEX					
		ZINC PLATED					
	NOT,	LINCTEATED					
	Total	Section C - TUBING SPOOL					11,265.68
Section	n Summ	ary:					
	Total	Section A - CASING HEAD ASSY					4,274.16
	Total	Section B - CASING SPOOL ASSY				10	0,161.74
	Total	Section C - TUBING SPOOL				1	1,265.68
Price S	Summary	y :	Total	l Price :			701 50 USD
							5,701.58 USD
			Total Quotation	I Frice :		2.	5,701.58 USD
****	*****	****					
		DELIVERY: TBA					
EX-W	ORKS C	AMERON ODESSA, TX				,	

AFTER RECEIPT OF ORDER; SUBJECT TO PRIOR SALE

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CAMERON DIVISION RESERVES THE RIGHT TO ISSUE A REVISED QUOTATION SHOULD THERE BE ANY DEVIATION OR ADDITIONS TO THIS QUOTATION.

DELIVERIES OFFERED HEREIN ARE BASED UPON MATERIAL AVAILABILITY AND MANUFACTURING CAPACITY AT TIME OF QUOTATION.

CAMERON DIVISION'S TERMS AND CONDITIONS OF SALE FORM A PART OF THIS QUOTATION AND SHALL APPLY TO ANY CONTRACT OF SALE.

PRICES QUOTED HEREIN ARE FIRM THROUGH DELIVERY IF ORDER IS PLACED WITHIN THE VALIDITY PERIOD OF THIS QUOTATION.

QUALIFICATION OF CAMERON WELD PROCEDURES INCLUDES HARDNESS TESTING OF THE WELD, BASE METAL AND HEAT-AFFECTED ZONE (HAZ) USING THE ROCKWELL B AND C SCALES. THIS IS CONSISTENT WITH OUR LONG ESTABLISHED AND SUCCESSFUL PAST PRACTICE. IT IS ALSO CONSISTENT WITH PREVIOUS EDITIONS OF NACE MR0175 AND WITH THE LATEST EDITION PROVIDED THAT THIS TESTING METHOD IS ACCEPTED BY THE BUYER.

CAMERON WILL CONTINUE TO USE ROCKWELL B AND C SCALES IN LIEU OF OTHER METHODS NOW LISTED IN NACE MR0175 / ISO 15156. BY ITS PURCHASE OF THESE PRODUCTS, THE BUYER ACKNOWLEDGES THE FOREGOING AND GIVES ITS CONSENT TO THE USE OF ROCKWELL B AND C HARDNESS TESTING FOR QUALIFICATION OF WELD PROCEDURES.



Page Document number 6 of 6 :US10/HT11/1489470-A

# TERMS AND CONDITIONS

1 CONTRACT ACCEPTANCE: Any written or oral purchase order received from Buyer by Seller shall be construed as a written acceptance of Seller's offer to sell and shall be filled in accendance with the terms and conditioned of selle set forth brein. SELLER's ACCEPTANCE FOR THIS ROBERTS EXPERSIVE (CONTRINCED ON BUYER'S ASSENT TO THE TERMS CONTANED HEREIN. The terms and conditiones of Seller's proposal (if any) and acknowledgement shall prevail filter in y conducing of different terms in Boyr's order unless Buyer notifies Seller in writing of its objection thereon what filters (15) days from receipt of Seller's acknowledgement. Bayer's standard terms of purchase will be considered or object to sup provision in conflic herewith whether consumed on Buyer's purchase order or otherwise shall not be construed as a waiver of the provisions hereof nor as an acceptance thereof.

2 QUOTATIONS AND PRICES Any product service capability or manufacturing capability which may be available the time quotation is made is subject to provide the Price quoted are subject to change without noise. The price in effect the time of shipment including any escalation formula will apply, nucless a vial quotation ere written agreement to contrary, visits between Bayer and Selter. All prices above nue to US dollars and are FOB. Seller's shipping point Se-reserves the right to place a service charge on past due accounts at the highest nue permitted by law. Any documentation pertaining to traceability requirements for new materials or products or documentation material by law. Any documentation processes must be idemified by the Bayer at the tume of quotation (if any) or at the time of order placement. cia lle be

3 TAVES. Any tax or other charge imposed by law on the sale or production of goods be paid by the Buer, unless the law specifically provides that such payment must be a shall reimburse. Select for such payment as part of the purchase price. Custom dutes, o other comparable charges will be borne by Bayer. ds or the performance of services shall made by Seller, in which case Buyer consular fees, insurance charges and

4 SHIPPING SCHEDULE AND DELIVERY. Shipment schedules are given as accurately as conductors permit and even effort will be made to make shipments as schedule. Seller vill not be responsible for deviations in meeting shipping schedule. The provide the schedule of the s

6 CANCELLATIONS AND RETURNS Parchase orders once placed by Bayer and accepted by Seller can be canceld only with Seller's writter oncollinated upon terms which will serv Seller from loss. No products may be returned for readilor adjustment willow written permission from Seller's office and/orized to issue such permission.
7 WARKANTES Contractor warrants that pools of its manufacture shall be free from defects in materials and workinauship for a period of one (1) year all the bage placed in aervice or eighteen (18) month from deficies in materials and the case of products or parts using to its product or parts using the service and within the pressure range for which the goods were manufactured in the case of products or parts only pools are used in the service and within the pressure range for which the goods were manufactured in the case of products or parts objects on parts dees no correctly this halle be for Canazacor's tability shall be limited to be extend of a contractor's integrate dees no correctly and warraw in the event half. Company, fashing the product or appear dees no correctly at the service of and defect and if a contractor is now held, of contractor and work warraw in the part of products or prove and the contractor is the product or appeared defect and if a contractor's independ and expects what preverses and inputs or product. FO is the contractor is the defective part operate of products in a material or company fashing the window there is proved. FO allowed the product or parts the defective part of products or product for products or product to its for advective part of and of the defective part of products and the window there is material or company fashing of any damage or struct the induced in the product or product of products or product of products with how be terms in any wing proved fibe structure. (10) products where the

L'or technical information regai ecting field installations and/or t charge, shall be advisory only field

ed in accordance if regulations and e with of Il applicable if the United

8 ENGINEERING AND SERVICE Lipon request Saller will provide engineering and/or to its products and their uses and if feasible, will provide personnel to assist Buy or in effecting service. Any such information, service or assistance so provided whether with or without chary 9 LABOR STANDARDS. Saller hereby certifies that these produces the produced in a requirements of Section 6.7 and 10 of the Fait Liboo Standards Act as amended and of regula Statist Department of Labor issued under Section 14 thereof 10 INSPECTION: Unless otherwise agreed in writing, final inspection and acceptance of pro-plant or other shipping or receiving point designated by Saller and shall be conclusive exe Boyer's representatives any support at the Saller's plant or shipping point during working be mainter as will not interfere with operations. nd acceptance of 11 be conclusive 11 during working of products must be n e except as regards ng hours prior to shi e made at Seller's rds latent defects shipment in such

11 DELIVERY AND ACCEPTANCE: Delivery shall be in a provided in the event Bayer is unable to ascept delivery upon with such requirements. Bayer agrees that (i) take and risk of or (ii) Bayer will make payments within thim; days after date of delivery is made in accordance with such requirements. accordance with the requirements in the Purchase Contract in completion of the manufacture of the Goods in accordance ownership shall past to Bayter on dote of Seller's trinoite, and if such invoice. Seller shall retain custodial risk of loss until

12. EXPORT COMPLIANCE. The Baser shall provide the Seller with relevant end-use, end-user and country of end-use information with respect to the goods, services, software or technology to be supplied becauder (collectively). Items is Based on and in relance on usik information the Seller will supply such herm incompliance with applicable trade and change in a collace, end-user of the United Sates of America. The Seller suitains and the Boyer acknowledges that an entrance made and existents in whether in the of the U.S. or other country, of end-use gravity, with all trade and customs that, whether it the of the U.S. or other country. The Baser appears in particular that in shall not use and shall not permit any third parts to the subth counter. Seller shall notif, Bayer appears the trade of the United Sates of America. The Seller subtrace appears the particular that in shall not use and shall not permit any third parts to the subth counter. Seller shall notif, Bayer appears the trade of the U.S. which in the cert of the U.S. or other counters which could be design.
13. TRANSPORTATION CHARGES, ALLOWANCES, CLAMIS, All press as FO B. Seller's plan or other design of hisping point. No fright is allowed unless stude in Seller's quantion or an written counters that all or a portion of transportation. Blover diversed in Seller's plans or other designated biopping point. No fright is allowed unless stude in Seller's quantion or a written counters that all or a portion of transportation. Blover allowed is the super or observation. Seller states that all or a portion of transportation allowed in the trans of shallower previously appearable to be blover. Blover actives appeare in a print index in appendix to a super and to shape the transportation. The support point is allowed to the super blove the support of transportation. Seller states and on the supervised by the design from the Seller's particle blove access the right to charge either to be deducted from the selling papere i depend price or scients includes

regardless of who pays shipping costs. Seller endences to pack or prepare all shipments so that they will not break, rust or destribute in transit, but does not guarantee against such durage. Unless requested in writing by the Bayer, no shipments are invared by Seller against durage or loss in transit. Seller will plote insurance as marking by the Bayer, no shipment Buy er's writen instructions but in such cases. Seller acts only as againt between the insurance company and the Bayer and assumets no lability whatsoever. Any claims for shipping loss, becadage or durage (okyone or concealed) are Bayer and assumets no lability whatsoever. Any claims for shipping loss, becadage or durage (okyone or concealed) are Bayer and assumets no lability whatsoever. Any claims for shipping loss, becadage or durage (okyone or concealed) are Bayer assumets no lability and should be made to the currier All claims regarding shorage must be made within thirty. (20) days from receiptior of shipment and must be accompanied by the packing labe(s) covering the shipment 14 INDENINFICATION AND LIMITATION OF LIABILITY.

A INDEMNIFICATION: Buyer Group means Buyer, its parent (if any), subsidiaries, affiaires, to-owners, co-ventur partners and any entity with whom Buyer has an economic interest with respect to the Work heading Buyer's customer its and their respective reployees, prevonnel, directive, to moved sevanits, representatives, agents, constactors subcontrasteror (respectively, and of any tier of level and who are not included within the Scher Group). Solier Group Seller, its parent of any, subsidiaries, affiliates, co-owners and its and their respective Employees, personal, directive officers, borrowed e-music, representatives agents, co-owners and its and their respective Employees, personal, direct officers borrowed e-music representatives agents, co-owners and its and their respective Employees, personal, direct officers on included within the Buyer Group). Negligence means sole, joint or concurrent, active, passive, gross or will minimized.

(1) Seller shall release, defend, save, indemnif, (collective). Indemnif, all Claims, demands, losses, damages and causes of action of whatever / damage to the property of the members of the Seller Group even if such of the members of Bay er Group. ) and hold Buyer Group Hannless from and against kind or nature (collectively Claims), for loss of or t Claims arise from or attributable to the Negligence

(2) Seller shall Indemnify and h (ies) to members of the Seller ( Buyer Group. hold Buyer Group harmless Group even if such Claims s from e from or unst all Claums v attributable t ns for the to the N the death(s) c Negligence of or or personal injury

(3) Buyer shall Indemnify and hold Seller Group harmless from and against a (including the Work) of the members of the Buyer Group even if such Chains the members of Seller Group st all Claims for loss ims arise from or attr s of or dama tributable to nage to the property to the Negligence of

(4) Buyer shall Indemnify and hold Seller Group harmless (ies) to members of the Buyer Group even if such Claims Seller Group. s from and against all Claims from or attributable t to the N the death(s) of 2 Negligence of of or personal injury f the members of

(5) Buyer (on its own behalf and on behalf of Buyer Group) and Seller (on its own behalf indemnify and hold each other humbers from and against are, and all Chains asserted, a within party. For the deathsy of or personal injury (ics) to such a third party, as well as it property of such a hind party. A third party is a person entity nod included in Buyer Group Buyer and Seller thorize response of any of more thorized personal singury to each other with respective of their response of the for respective days of the for the personal singury party party and to this Article 14 (A) (5) shall be limited to their respective degree of Negligen alf and on behalf of Seller Group) ed against them by or on behalf of as lots (ts) of or damage(s) to the wap or Seller Group It is agreed by ms asserted against them by a third gence.

(6) Notwithstanding any other provision contained in this Agreement. Bayer shall Indemnify and hold the members Selter Geopharmkess from and against all Chans (including clean-up costs and loss (es) of oil, gass of hydrocarboes) arisis from pollution, containmation, damping or spilling of any substance and even if arising out of or attributable to Negligence of the members of the Selter Group. sing

B INDEMNITY FOR CONSEQUENTIAL DAMAGES UNDER NOCIRCUNSTANCES SHALL SELLER BE LIABLE FOR ANY SPECIAL CONSEQUENTIAL INCIDENTAL EXEMPLARY OR PUNITIVE DAMAGES (addicated) CONSEQUENTIAL AS DEFINED BY THE LAWS COVERNING THIS PURCHASE DOBLER NOR FOR ANY LOS OF ANTICIPATED PROFITS. LOSS OF BUSINESS OPPORTUNITY. LOSS OF USE OF EQUIVALENT OR OF ANY INSTALLATION. SYSTEM OR FACILITY INTO WHICH SELLERS EQUIVALENT ANY BE LOCATED OR AT WHICH MENDERS OF THE SELLER GROUP MANY BE FERFORMING WORK AND BUFFER AGREES TO TODENNYTY AND HOLD SELLER GROUP MARKILESS FROM AND AGAINST ANY CLAIMS. FOR SUCH CONSEQUENTIAL DAMAGES EVEN IF ARSING OUT OF OR ATTRIBUTABLE TO THE NEGLIGENCE OF THE MEMBERS OF THE SELLER GROUP.

C LIMITATION OF LIABILITY EXCEPT AS OTHERWISE EXPRESSLY LIMITED IN THIS AGREEMENT IT IS THE EXPRESS INTENTION OF THE PARTIES HEREID THAT ALL INDEMNITY OBLICATIONS AND/OR LIABILITIES IEREBY ASSUMED BY THE PARTIES SHALL BE (I) SUPPORTED BY INSERVANCE. (ii) WITHOUT INTE, (iii) AND WITHOUT REGARD DITHE CAUSE OR CAUSES THEROF, INCLUDING, BUT NOT INTERDUCTIONS UNTERVIEWED AND WITHOUT REGARD DITHE CAUSE OR CAUSES THEROF, INCLUDING, BUT NOT INTERDUCTIONS UNSERVACION CONDITIONS (WHETHER SUCH CONDITIONS DE PATEENT OR LATERAT). THE UNSERVACIONENTINESS OF ANY ARCEAFT, BERACH OF DRY ESSELS AND OR WARKANTY (EXPRESS OR INFLIED), BERACH OF CONTRACT, BERACH OF DRY INTERVIEWED AND LAW OR OPERATIONES OF ANY ARCEAFT, BERACH OF BUTY (STATUDAY, CONTRACTUAL COMMON LAW OR FACILITIES OF APPURTENANCES OF ANY PARTY INFORMATION OR WARKANTY (EXPRESS OR OPERATIONS IS PREEXISTING AND ON LATENT, MARY OR OTHERWISE), THE LOADING OR UNADADING OF PERSONS OR CARGO, TORT, OR THE REGULGENCE OR FAILT OF ANY PARTY AS DEFINED AT THE BEGUNNING OF THIS ARCTEL HI, OR NYO THER THEORY OF LICAL LIABULITY Self-Is board responsibility of the any claims, damages, losses or liability artising out of or related to its performance of this contrast or the products or services covered bereamder shall not exceed the purchase proc

15. MODIFICATION, RESCISSION & WAIVER. The terms herein may not be medified or rescinded nor any of provisions waived unless such medification, rescussion or varier is universe upon the performance of any set is a state of the industry. Texas and conditions of the contract or the failure of Scher to resci any on or or more industry by an authorized stall not be contract with error state of the contract or the failure of Scher to resci any of its rights hereinder shall not be contract with error state of the contract or the failure of Scher to exercise any of its rights hereinder shall not be contract with error state of the contract or the failure of Scher to exercise any of its rights inder Scher hereit with the errors and conditions. All drefs much and the accepted to any uncreased periods of the contract or funce performance of the contract or funce of Scher to right to instant terms and conditions. All drefs much be accepted to any uncreased period of the contract or funce of the period and continues of all provisions hereit is an authorized according to the merical laws of the period and continues of resca. Any dopunes hich arise under this agreement shall be vented in the District four of Harris County. The or in the Southern District of Texas. c) of its ovice of f any of instruct ist upon of these c parties vs of the vs of the

REV08/06

Intl Cor



Inter	& Spec	rest Hose cialty, Inc.	
General Inform	NAME AND ADDRESS OF TAXABLE PARTY.	atic Test Certificate Hose Speci	the second s
Customer	HOBBS	Hose Assembly Type	Rotary/Vibrator
MWH Sales Representative	CHARLES ASH	Certification	API 7K/FSL LEVEL
Date Assembled	2/19/2017	Hose Grade	D
Location Assembled	OKC	Hose Working Pressure	5000
Sales Order #	318810	Hose Lot # and Date Code	10958-08/13
Customer Purchase Order #	356945	Hose I.D. (Inches)	3.5"
Assembly Serial # (Pick Ticket #)	384842	Hose O.D. (Inches)	5.45"
Hose Assembly Length	20FT	Armor (yes/no)	NO
End A	ere ere	End	B
Stem (Part and Revision #)	R3.5X64WB	Stem (Part and Revision #)	R3.5X64WB
Stem (Heat #)	13105653	Stem (Heat #)	13105653
Ferrule (Part and Revision #)	RF3.5X5330	Ferrule (Part and Revision #)	RF3.5X5330
Ferrule (Heat #)	34038185	Ferrule (Heat #)	3403818
Connection . Flange Hammer Union Part	4-1/16 5K	Connection (Part #)	4-1/16 5K
Connection (Heat #)		Connection (Heat #)	
Nut (Part #)		Nut (Part #)	_
Nut (Heat #)		Nut (Heat #)	
Dies Used	5.62"	Dies Used	5.53"
and the second second second second	Hydrostatic Te	est Requirements	
Test Pressure (psi)	7,500	Hose assembly was teste	
Test Pressure Hold Time (minutes)	10 1/2	tempera	A

MHSI-008 Rev. 0.0 Proprietary

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		VV	
		est Hose tialty, Inc.	
	Certificate	of Conformity	r + r + r + r
Customer: HOBBS		Customer P.O.# 356945	
Sales Order # 318810		Date Assembled: 2/19/2017	
	Specif	ications	
Hose Assembly Type:	Rotary/Vibrator	Rig #	
Assembly Serial #	384842	Hose Lot # and Date Code	10958-08/13
Hose Working Pressure (psi)	5000	Test Pressure (psi)	7500
Hose Assembly Description:		TRH56D-645KH-645KH-20.00	' FT
	a material supplied for	or the referenced purchase orde	r to be true according
o the requirements of the purch upplier: Aidwest Hose & Specialty, Inc. 1312 S I-35 Service Rd	hase order and currer	nt industry standards.	
o the requirements of the purch upplier: Aidwest Hose & Specialty, Inc.	hase order and currer	it industry standards.	
o the requirements of the purch upplier: Aidwest Hose & Specialty, Inc. 1312 S I-35 Service Rd Oklahoma City, OK 73129 Tomments:	hase order and currer	it industry standards.	
o the requirements of the purch upplier: Aidwest Hose & Specialty, Inc. 1312 S I-35 Service Rd Oklahoma City, OK 73129	hase order and currer	nt industry standards.	

MHSI-009 Rev.0.0 Proprietary









QUOTATION

Ship To:

USA

LEGACY RESERVES LP

303 W WALL STE 1400

MIDLAND TX 79701-5126

Surface System
Surface System Cameron Intl Corp
CAM SURFACE SYS HQ - HOUSTON HQ
CAMERON
3505 W SAM HOUSTON PKWY NORTH
HOUSTON TX 77043
USA

Document number	:US10/HT11/1489470-A
Page 1 of 6	
Date Issued	:MAY 09 2017
Payment Terms	: Net 30 Days
Terms and conditions	:As Attached/Included
Freight Terms	:FOB Ship Pt-PPD/Add-No Pro
0	EX-WORKS - ODESSA, TX

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Sold to : 22039905 LEGACY RESERVES LP P.O. Box 10848 MIDLAND TX 79702 USA

	Customer Ref
Outside Sales Contact:	David Treece/432-337-5475
Inside Sales Contact:	Joycelyn M. FAILLA/713-469-7221

Email: joycelyn.failla@c-a-m.com Email: david.treece@c-a-m.com

22039905

<b>Customer Reference</b>	:	CONVENTIONAL
Valid From	:	MAY 08 2017
Valid To	:	JUN 09 2017
Project Reference	:	

WE APPRECIATE THE OPPORTUNITY OF SUBMITTING THIS QUOTATION FOR YOUR REQUIREMENT. SHOULD YOU REQUIRE ANY ADDITIONAL INFORMATION, PLEASE DO NOT HESITATE TO CONTACT US.

#### **CONVENTIONAL 3-STRING**

CASING PROGRAM: 13-3/8" X 9-5/8" X 5-1/2"

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Item	Material Number Description	Extended Weight	Qty	UM	Unit Net Price USD	Extended Price USD
	Section A - CASING HEAD ASSY	==				
20	2161182-02-01 ASSY, CSG HEAD, IC-2-BP 13-5/8" API 3M X 13-3/8" SOW W/TWO 2" LPO'S API 6A 20TH ED., PSL-1; T/C P,U; M/C AA,DD-NL; PR-2 (PREPPED FOR STANDARD 'CR' LANDING B/	652 lb ASE)	1	EA	2,807.66	2,807.66
30	2057661-02-01 ASSY; TYPE 'CR' LANDING BASE FOR 13-5/8 FLG., 24 IN OD. BASE PLATE 850,000 LBS CAPACITY (MATL 36,000 YIELD)	257 lb	1	EA	1,297.66	1,297.66
40	021013-12 NIPPLE, API 2 IN LP, 6.00 IN LG SEAMLESS 5L GR B, 9.03 LB	4 lb	1	EA	24.33	24.33
50	2168084-10-31 VALVE, BALL, FLOATING, 2 IN (50 MM) X 1-1/2 IN (40 MM), B136-CS-43-CS FIGURE NUMBER, THREADED END (FXF), WKM, 3100 3000 PSI (206 BAR) MOP, 2719 PSI (187 BAR) MOP AT MAX TEMP, CARBON STEEL E	,	1	EA	102.89	102.89



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Item	Material Number Description	Extended Weight	Qty	UM	Unit Net Price USD	Extended Price USD
	CARBON STEEL/CHR PLATED BALL, CARB STEEL/ZINC PLATED STEM, ACETAL PLAS SEAT, WRENCH WITH LOCK DEVICE LESS API 607, B16.34, -20 F (-29 C) - +220 F (+104 C), ADJUSTABLE STEM PACKING	TIC				
0	007481-01 Bull Plug, 2" LP, Tapped 1/2" NPT, 3.75" Long.	3 lb	1	EA	27.34	27.34
70	2738068-02 Fitting, vent straight 1/2 npt Safty vent, 4140 nace / Zn pl Tungsten carbide Ball, 10,000 psi Max	0 kg	I	EA	14.28	14.28
	Total Section A - CASING HEAD ASSY					4,274.16
	Section B - CASING SPOOL ASSY	===				
00	702001-57-02 RING GASKET, API TYPE R-57 LOW C STL OR SOFT IRON -PLATED /API 6A PSL 4, API MONOGRAM, REQUIRED	3 lb	1	EA	24.70	24.70
10	621650-03 ASSY: STUD & NUTS, 1.375 X 10.750" Long (B7 & 2H)	130 lb	20	EA	15.65	313.00
20	Y15000-23300001 CASING HANGER, IC-2, 13-5/8" X 9-5/8", API 6A 20TH ED., TEMP CLASS S, MATL CLASS AA,DD-NL, PSL 3, PR 2, GROUP 3. (-20F TO 150F MAX) (CARBOXYLATED NITRILE 70/80 DURO)	44 kg	1	EA	2,538.05	2,538.05
30	2216433-03-01 ASSY, SPOOL, TYPE 'IC-2-BP', 13-5/8 API 3K BTM X 11 API 5K FLGD TOP, W/TWO 2-1/16 API 5K SIDE STD'D OUTLETS W/2-1/16 API VR, TWO TYPE 'N' TIEDOWN SCREWS,W/'NX' BTM PREP, API 6A; 20TH ED; T/C U; M/C DD-NL; PSL 1; PR-2 (4130 MATERIAL)	1,446 lb	1	EA	4,769.22	4,769.22
40	640518-10 'NX' BUSHING, 13-5/8 NOM X 9-5/8	16 lb	1	EA	1,454.59	1,454.59



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tem	Material Number Description	Extended Weight	Qty	UM	Unit Net Price USD	Extended Price USD
	OD CSG, STD OR NACE SERVICE					
50	2222164-02-01 VALVE REMOVAL PLUG, 2-1/16" 10K MAX W W/1-1/2" VEE TUBING THD, API 6A 20TH ED/ISO 10423, MATL CLASS DD-NL	l lb /P,	1	EA	74.93	74.93
60	2737400-01-01 ASSEMBLY, AOP COMMERCIAL GATE VALV 2-1/16 API 5,000 FLG X FLG, EXPANDING GATE, 6A 20TH EDITION, TEMP CLASS P+U, MATERIAL CLASS AA, PSL 1, PR 1	175 lb /E,	2	EA	746.80	746.80
70	142362-01-03-02 FLANGE, COMPANION, 2-1/16" API 5000 X 2" API LP THREAD, API 6A 20TH EDITION, T/C: U, M/C: DD-NL, PSL 2	24 kg	2	EA	78.64	157.28
80	007481-01 Bull Plug, 2" LP, TAPPED 1/2" NPT, 3.75" Long.	3 lb	1	EA	27.34	27.34
90	2738068-02 Fitting, vent straight 1/2 NPT Safty vent, 4140 Nace / ZN PL Tungsten carbide Ball, 10,000 PSI Max	0 kg	1	EA	14.28	14.28
00	702001-24-02 RING GASKET, API TYPE R-24, LOW C STL OR SOFT IRON, PLATED, API 6A PSL 4, API MONOGRAM	2 lb	3	EA	5.13	15.39
10	Y51201-20220301 STUD W/TWO NUTS, 7/8" X 6" LG, B7/2H, PLATED	12 lb	8	EA	3.27	26.16
	Total Section B - CASING SPOOL ASSY					10,161.74
	Section C - TUBING SPOOL					
40	702001-54-02 RING GASKET, API TYPE R-54, LOW C STL OR SOFT IRON, PLATED, API 6A PSL 4, API MONOGRAM	5 lb	1	EA	28.19	28.19



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Item	Material Number Description	Extended Weight	Qty	UM	Unit Net Price USD	Extended Price USD
250	621650-14 ASSY, STUD & NUTS, 1.875 X 14.750" Long (B7 & 2H)	180 lb	12	EA	35.18	422.16
260	Y15001-21002901 CASING HANGER, IC",-2, 11" X 5-1/2 API 6A 20TH ED, M/C AA, T/C S, PSL-3, PR2, GROUP-3/2	115 lb	1	EA	973.43	973.43
270	2309361-01-02 ASSY, SPOOL, TBG HEAD, TYPE 'C', 11 API 5K FLG BTM X 7-1/16 API 10K FLG TOP; W/ TWO 1-13/16 API 10K STD'D OUTLETS; W/ 1-13/16 API VR PREP; W/'NX' BTM PREP; API 6A 20TH ED; T/C: U; M/C: DD-NL; PSL-2, PR-2. (4130 LAS MATERIAL)	1,350 lb	1	EA	4,774.41	4,774.41
280	2348293-01-01 ASSY 11 X 5-1/2 'NT' BUSHING W/ DBL 'T'SEALS AND DBL 'S' SEALS, W/ INTERGRA BIT GUIDE (FOR STANDARD AND NACE SERVICE)	57 lb	1	EA	942.17	942.17
290	141510-41-95-02 ASSEMBLY, FLS MANUAL GATE VALVE, 1-13/16 API 10,000 FLG, ISO 10423 AND API 6A 20TH EDITION, TEMP CLASS P+U, MATERIALS CLASS EE-1.5, PSL 2, PR 2	500 lb	2	EA	1,927.05	3,854.10
300	142359-01-03-02 FLANGE, COMPANION, 1-13/16 API 10,000 WITH 2" API LINE PIPE, 5000 PSI WP API 6A 20TH EDITION, TEMP CLASS U, MATL CLASS DD-NL, PSL 2	40 lb	2	EA	78.86	157.72
310	007481-01 Bull Plug, 2" LP, Tapped 1/2" NPT, 3.75" Long.	3 lb	1	EA	27.34	27.34
320	2738068-02 Fitting, vent straight 1/2 npt Safty vent, 4140 nace / Zn pl Tungsten carbide ball, 10,000 psi Max	0 kg	1	EA	14.28	14.28
330	702003-15-12 RING GASKET, API TYPE BX-151, LOW C STL, PLATED, API 6A PSL 4, API Monogram.	1 lb	4	EA	2.89	11.56



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Item	Material Number Description	Extended Weight	Qty	UM	Unit Net Price USD	Extended Price USD		
340	Y51201-20120201 STUD W/TWO NUTS, 3/4"-10 X 5-1/4" LG, A193 B7 STUD/A194 2H HVY HEX NUT, ZINC PLATED	16 lb	16	EA	3.77	60.32		
	Total Section C - TUBING SPOOL					11,265.68		
Section	n Summary:							
	TotalSection A - CASING HEAD ASSYTotalSection B - CASING SPOOL ASSYTotalSection C - TUBING SPOOL				10	4,274.16 0,161.74 1,265.68		
Price S	Summary :		Total Price : Total Quotation Price :			25,701.58 USD 25,701.58 USD		
ESTIN EX-W	**************************************	JE			,			

AFTER RECEIPT OF ORL

CAMERON DIVISION RESERVES THE RIGHT TO ISSUE A REVISED QUOTATION SHOULD THERE BE ANY DEVIATION OR ADDITIONS TO THIS QUOTATION.

DELIVERIES OFFERED HEREIN ARE BASED UPON MATERIAL AVAILABILITY AND MANUFACTURING CAPACITY AT TIME OF QUOTATION.

CAMERON DIVISION'S TERMS AND CONDITIONS OF SALE FORM A PART OF THIS QUOTATION AND SHALL APPLY TO ANY CONTRACT OF SALE.

PRICES QUOTED HEREIN ARE FIRM THROUGH DELIVERY IF ORDER IS PLACED WITHIN THE VALIDITY PERIOD OF THIS QUOTATION.

QUALIFICATION OF CAMERON WELD PROCEDURES INCLUDES HARDNESS TESTING OF THE WELD, BASE METAL AND HEAT-AFFECTED ZONE (HAZ) USING THE ROCKWELL B AND C SCALES. THIS IS CONSISTENT WITH OUR LONG ESTABLISHED AND SUCCESSFUL PAST PRACTICE. IT IS ALSO CONSISTENT WITH PREVIOUS EDITIONS OF NACE MR0175 AND WITH THE LATEST EDITION PROVIDED THAT THIS TESTING METHOD IS ACCEPTED BY THE BUYER.

CAMERON WILL CONTINUE TO USE ROCKWELL B AND C SCALES IN LIEU OF OTHER METHODS NOW LISTED IN NACE MR0175 / ISO 15156. BY ITS PURCHASE OF THESE PRODUCTS, THE BUYER ACKNOWLEDGES THE FOREGOING AND GIVES ITS CONSENT TO THE USE OF ROCKWELL B AND C HARDNESS TESTING FOR QUALIFICATION OF WELD PROCEDURES.



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# TERMS AND CONDITIONS

1 CONTRACT ACCEPTANCE: Any written or oral purchase order received from Buyer by Seller shall be construed as written acceptance of Seller's offer to sell and shall be filled in acceptance with the terms and conditions of sale set for 16 fill terms. SELLER SACCEPTANCE OF THIS ORGER IS EXPRESEXY CONSIDIONED ON BUYERS ASSENT TO fill TERMS CONTAINED HEREIN. The terms and conditions of Seller's proposal (if any) and acknowledgement shall period or use any conflicting of the objection sherein visual or out any conflicting of different terms and conditions of Seller's standard terms of purchases will not be considered at counteroffer to Seller's terms and conditions of seller's term of purchases will not be considered at counteroffer to Seller's terms and conditions of seller. Buyer's bandard terms of purchases will not be considered at counteroffer to Seller's terms and conditions of seller. The failure of Seller's bandard terms of purchases will not be considered at counteroffer to Seller's terms and conditions of seller. The failure of Seller to object to any porvision in conflict herewid an acceptance thereof nor an acceptance thereof. 8 5

QUOTATIONS AND PRICES. Any product, service capability or manufacturing capability which may be available at etimes a quotation is made is subject to prore sale. Praces quoted are subject to change without motice. The prote in official etimes of shipment including any exclusion formula will apply, understa a valid quotation or written agreement to the murary exists between Bayer and Selfer. All preces shown are in U.S. dollarst and are F.O.B. Selfer's shipping point. Selfer stores the right to place a service charge on past due accounts at the highest rate permitted by haw. Any occumentation training to traceability, requirements for raw materials or products or documentation required for any routicner special excesses must be identified by the Bayer at the tume of quotation (if any) or at the tume of order placement.

3 TAVES. Any tax or other charge imposed by law on the sale or production of goods toe paid by the Buyer, unless the law specifically provides that such payment must be shall reinburss Selfer for such payment as part of the purchase price. Custom dutes, other comparable charges will be borne by Buyer. Is or the performance of services shall made by Seller. in which case Buyer consular fees, insurance charges and

4. SHIPPING SCHEDULE AND DELIVERY. Shipnent schedules are given as accurately as condutions permit and even effort will be trade to make shipness as scheduled. Selfer will not be responsible for deviations in metricing shipping schedules, whether due to Arst of Cod, orders bearing priority mungs established pursuant to have deviations in the shipping schedule, whether due to Arst of Cod, orders bearing priority mungs established pursuant to have difference with workness to all have shorings. For, Bood, shorings or their gravonable control whether of sum strate and whether gravity and the strategies of schedules are shipping schedules. The solution of the solution of any other causes beyond. Selfer's reasonable control whether of sum since and whether gravity and an annex the shipping schedules or the registro for the solution schere in production becauses and shall have the right to generate the product of the prior or sums and a manuer than base or subcontract. Bud base the right to generate the right to the right to generate the right of the furthis commong its existence is always producer, standards or the subcontract. Bud base the right to generate the right of the furthis common scenary. In no event shall Selfer be lable for an societ shipping schedule, are based on Selfer having all required information and a finne schere shall. Selfer the right of generates will be calcitated from the core shipping schedules or since shipping schedules are based on Selfer having all required information and a finne schere shipping schedule (if any yound or order placement in order from Bayer's neglector science or the need of placement in order from Bayer's head its emerable in your and whether and no schere having all required information and a fine source must be deduced (if any yound be checked in the schere allocation requires the order of the schere source in order from Bayer's schedules (if any yound be checked in the schere allocation filling and schere according).

5 TERMS OF PAYMENT Terms Seller's order acknowledgment 0 B are 30 days from date 0 dh 25 stated in the quotation

6 CANCELLATIONS AND RETURNS. Purchase orders once only with Seller's written consent and upon terms which will save adjustment without written permission from Seller's office authorie placed by e Seller from rized to issue m Buyer and accepted by 3 m loss. No products may bue such permission. be returned be canceled for credit or

7 WARAATIES. Contractor warrants that pools of its manufacture shall be free from defects in materials and workmanashig for a period of one (1) year after being placed in service or regioner. (5) months from deficient, which they poster and produces or parts not whelly of Contractor's number in the product or regioner. (5) months from the event of its resovery from the manufacture of such products or parts desired in surrains. In this layers, we material was and the operational wear are not overed by this warrain. In the event that Company factorers a defect in the contractor's insight, or Contractor's product or survival to the product or regular replacement due to operational wear are notovered by this warrain. In the event that Company factorers a defect in the product or regular period specified above. Company shall as Contractor's request shall replace to ensure of such defect in the product or regular or product. FO B to Contractor's disputed plant or service location. Company shall as Contractor's requests what plant or emplace the regular to post of the product or service in defect in the responsible for any south effect in the responsible for (i) failures of the defective piez of additional or the sub-oft defection of the defective piez of the start of the ordered in such defective piez of the defective piez of the defective piez of the start of the defective piez of the start of the ordered in such accords in such addition of the defective piez of the defective piez of the start of the start of the defective piez of the start of the ordered in such accords indice ordered by any one contractor's indigenents to a fact of the start of

8 ENGINEERING AND SERVICE: Upon request. Seller will provide engineering and its products and their uses and, if feasible, will provide personnel to assist Bayer in effe-service. Any such information, service or assistance so provided, whether with or without service. for technical information regarding sting field installations and/or field charge, shall be advisory only

products were produced in accordance s Act as amended and of regulations and e with orders of 1 applicable f the United

9 LABOR STANDARDS Seller hereby certifies that these requirements of Section 6, 7 and 12 of the Fair Labor Standards States Department of Labor issued under Section 14 thereof

10. I plant Buye 10. INSPECTION. Unless otherwise a fant or other shipping or receiving p buyer's representatives may inspect at hanner as will not interfere with operat e agreed in writing. final inspection and g point designated by Seller and shall at the Seller's plant or shipping point i d acceptance of products must be made at be conclusive except as regards latent -during working hours prior to shipment at Seller's t defects t in such

11 DELIVERY AND ACCEPTANCE: Delivers shall be in accordance with provided in the event Bayer is unable to accept delivery upon completion of u with such requirements. Bayer agrees that (i) the and risk of ownership shall p with bayer will make powments within thirty days after date of such invoice delivery is made in accordance with such requirements ith the require of the manufac Il pass to Buye Seller shall i internents in the Purchase Contract ifacture of the Goods in accordance uper on date of Seller's invoice, and all retain custodial risk of loss until

12 EXPORT COMPLIANCE: The Buyer shall provide the Safler with relevant end-use: end-user and country of end-use information with respect to the goods, services, software or technology, to be supplied berunder (collearned). The end of the supplied berunder (collearned) and an end-user or non-unit of the United Sates of America. The Safer cautions and the Boyer scalework with applicable trade and endotes and endotes and endoted sates of America. The Safer cautions and the Boyer scalework is not being or the United Sates of America. The Safer cautions and the Boyer scalework is an endoted by applicable trade and endotes law, whether it bes of the U.S. the Pariers shall could be and endotes law, whether it bes of the U.S. which in the event of useh conflict. Safer for any such laws which conflict with gover comply with all trade the laws of the U.S. which in the event of useh conflict. Safer will applicable trade and endotes law, whether it bes conflict. Safer will applicable trade and endotes and will not be event of useh conflict. Safer will applicable trade and endotes and the U.S. which in the event of useh conflict. Safer will be the safer will be applied by the safe state of the U.S. which in the event of useh conflict. Safer will be the safe and endotes the safe state to the safer will be applied by the safe state of the trade of

13. TRANSPORTATION CHARGES. ALLOWANCES, CLAIMS. All proces are FO B. Seller's plant or other designated shipping point. No freight is allowed unless stued in Seller's quotation (if any) or in a written contrast tabut that all or a portion between Seller and Buyer at the time of shipping. If Seller's quotation (if any) or in a written contrast tabut all or a portion between Seller and Buyer at the time of shipping. If Seller's quotation (if any) or in a written contrast tabut all or a portion territy in allowed. all proces are FO B. Seller's plant or other designated shipping point with most economical memory and the ship in the manuer it deems most economical. Added costs due to special routing requested by Beller to be docted from the seller to the Buyer Urder no circumsnances is any freight allowance which is absorbed by Seller to be docted from the Seller's warehouse. Evel restructs the right or a burger strange train warehouses freight subson, or otherwise table mode in the moder to unsupport any shall be mode in the docted from the Seller's warehouse. Seller servers to right to charge the portion for high train memory warehouse. Freight subson, or otherwise table or portion for the Seller's warehouse. Seller's servers in right to bay upon delivery to the carrier.

regardless of who pays shipping costs. Seller endeavors to pack or prepare all shipments so that they will not break, rust or deteriorate in transif, but does not guarantee against such durings. Unless requested in writing by the Bayer, no shipments are insured by Seller against durings or loss in transit. Seller will place insurance as rearly as possible macconduce va-buyer's written instructions but in such case. Seller acts only as agent between the insurance company and the Bayer and assumets ion lability whatsoever. Any claims for shipping loss, breakage or durings (obvious or concealed) are Bayer and assumets ion lability whatsoever. Any claims for shipping loss, breakage or durings (obvious or concealed) are Bayer and responsibility and should be made to the currier. All claims regarding shorages must be made within thirty (30) days from receipt of shipment and must be accompanied by the packing lat(s) covering the shipment 14 INDEMNIFICATION AND LIMITATION OF LIABILITY:

A INDEMNIFICATION: Bayer Group means Bayer, its parent (if any), subsidiarits, affiliates, co-envners, co-rentures, partners and any entity with whom Bayer has an economic neterst with respect to the Work including Buyer's customer and its and their respective employees, prosonel, directory, officers, betweed servanist, trypesenalities, agents, contractors as subcontractors (respective) and of nus tier of level and who are not included within the Sher employees, personnel, directors, Soller, its parent (if any), subsidiaries, affiliates, conversions and and their respective employees, personnel, directors, Soller, its parent (if any), subsidiaries, affiliates, conversions and and their respective employees, personnel directors, Soller, its parent (if any), subsidiaries, agents, conversions and subcontractors (respectively, and of any tier or level and who are not included within the Bayer Group). Negligence means sole, joint or concurrent, active, passive, gross or willful misconduct

(1) Seller all claims, damage to of the mean shall release, defend, save, indemnifi (collectively. Indemnifi, ) and hold Buyer Group Harmless from and against demands. Iosses, damages and causes of action of whatever kind or nature (collectively. Claims.). for loss of or Use property of the members of the Seller Group even if such Claims arise from or attributable to the Negligence there of Buyer Group.

(2) Seller shall Indemnify and hold Buyer Group harmless (ies) to members of the Seller Group even if such Claims Buyer Group. from and against all Claims for the death(s) of or personal injury arise from or attributable to the Negligence of the members of

(3) Buyer shall indemnify and hold Seller Group harmless from and against all Claims f (including the Work) of the members of the Buyer Group even if such Claims arise from the members of Seller Group for loss of or damage to the property m or attributable to the Negligence of

(4) Buyer shall Indemnify and hold Seller Group harmless (ies) to members of the Buyer Group even if such Claims Seller Group s from n and against a t all Claims tuributable to to the Negligence of E Pe members of

(5) Buyer (on its own behalf and on behalf of Buyer Group) and Seller (on its own behalf and on behalf of Seller Group) shall indemnify and hold each other harmbest from and against area by a croar behalf of any third party for the death(s) of cr presental injur (ice) to such a third party, as well as loss (es) of cr dimange(s) to (es) to such a third party. Such a behalf and the death(s) of cr dimange(s) to (es) to such a third party for the death(s) of cr dimange(s) to the party in the death(s) of cr dimange(s) to the death(s) of cr dimange(s) to the death(s) of extended in Buyer Group Seller Group). It is agreed by Buyer and Seller that is respective dwn of indimanty, as which respective dwn of indimanty is userbackers with respective dagainst them by a third party pursuant to this Article 14 (A) (5) shall be limited to beir respective degree of Negligence.

(6) Notwithstanding any other p Seller Group harmless from and a from pollution, contamination, d Neghgence of the members of the other provision contained in this Agreement. Buyer shall Indemnify and nurd against all Claims (including clean-up costs and toss (es) of Oil, gas or tion, dumping or spilling of any substance and even if arising out of s of the Seller Group d hold the members or hydrocarbons) arisi f or attributable to t ing

B INDENNITY FOR CONSEQUENTIAL DAMAGES UNDER NOCIRCUNSTANCES SHALL SELLER BE LIABLE FOR ANY SPECIAL CONSEQUENTIAL INCIDENTIAL EXEMPLARY OR PUNITIVE DAMAGES (colorance) CONSEQUENTIAL IN SOFFICED BY THE LAWS COVERNION THIS PURCHASE ORDER INOR FOR ANY LOSS OF ANTCHATED PROFILS LOSS OF BUSINESS OPPORTUNITY. LOSS OF USE OF EQUIPMENT OR OF ANY INSTALLATION, SYSTEM OR FACILITY INTO WHICH SELLER'S EQUIPMENT MAY BE LOCATED OR AT WHICH MENBERS OF THE SELLER GROUP MARY BE PERFORMING WORK AND BUYER AGREES TO NUDENNITY. AND HOLD SELLER GROUP MARY LESS FROM AND AGAINST ANY CLAMIS FOR SUCH CONSEQUENTIAL DAMAGES EVEN IF ARSING OUT OF OR ATTRIBUTABLE TO THE NEGLIGENCE OF THE MEMBERS OF THE SELLER GROUP.

C LIMITATION OF LIABILITY EXCEPT AS OTHERWISE EXPRESSLY LIMITED IN THIS AGREEMENT IT IS THE EXPRESS INTENTION OF THE PARTIES HERETO THAT ALL INDEMNITY OBLICATIONS ANDOR THE EXPRESS INTENTION OF THE PARTIES SHALL BE (a) SUPPORTED BY INSURANCE, (a) WITHOT LIABILITES INFREMY ASSUMED BY THE PARTIES SHALL BE (a) SUPPORTED BY INSURANCE, (a) WITHOT INT, (ii) AND WITHOUT RECARD TO THE CAUSE OR CAUSES THEREOF, INCLUDING BUT NOT LIMITED INARIMORTHINESS OF ANY VESSEL OR VESSELS (WHETHER OR NOT PRENISTING). THE UNARIMORTHINESS OF ANY VESSEL OR VESSELS (WHETHER OR NOT PRENISTING). THE UNARIMORTHINESS OF ANY VESSEL OR VESSELS (WHETHER OR NOT PRENISTING). THE UNARIMORTHINESS OF ANY VESSEL OR VESSELS (WHETHER OR NOT PRENISTING). THE UNARIMORTHINESS OF ANY MERCAT. BREACH OF DUTY (STATUTORY CORFLACTIVA. COMMON LAW OR INPLED), BREACH OF CONTRACT, BREACH OF DUTY (STATUTORY CORFLACTIVA. COMMON LAW OR INPLED), BREACH OF CONTRACT, CONDITION OR WURTHER OR NOT PRENISTING). THE UNARIANTY EXPRESSION INPLED, BREACH OF CONTRACT, BREACH OF DUTY (STATUTORY CONFLACTIVA. COMMON LAW OR INPLED), BREACH OF CONTRACT, BREACH OF DUTY (STATUTORY CONFLACTIVA. COMMON LAW OR FACULITIES ON APPURTED AND AND ANT PARTY UNDER ANY CODE LAW OR WHETTHER OR NOT SAND OF FERSIONS OR CARGO TORT, OR THE NECLICIESCE OR FAULT OF ANY PARTY (AS DEFINING ON UNLADING OF DERINGNOS OR CARGO TORT, OR THE NECLICIESCE OR FAULT OF ANY PARTY (AS DEFINED AT THE BEGINNING OF THIS ARTICLE 14 OR ANY OTHER THE DORY OF LEGAL UNBLITT. SCIEDED AT BEGINNING OF THIS ARTICLE 14 OR ANY OTHER THE THE OR ANY PARTY (AS DEFINED AT THE BEGINNING OF THIS ARTICLE 14 OR ANY OTHER THE TO REAL OF the contrast or the products or services covered benumber shall not exceed the purchase proc

15 MODIFICATION, RESCISSION & WAIVER. The terms herein may not be modified or rescinded nor any of its provisions waived unless such modification, rescussion or waiver is in writing and signed by an authorized employee of Seller at its office in Houston. Treas: Failure of Seller to instant any one or more instances upon the performance of any of the terms and conditions of the contract or the failure of Seller to exercise any of its rights hereinder shall not affect Seller's right to insist are strict performance and compliance vith regard to any unccented periods of failer of failer provided to any unccented periods of this contract or failer splits to insist any and conditions. All orders must be accepted by an authorized employee of Seller The rights on the dust terms and conditions. All orders must be accepted by an authorized employee of Seller The rights on the dust set term and construction and effect of all provisions hereof shall be apverned by and construct or that are for the Saule of Tesas. Am disputes which arise under this agreement shall be venued in the District Court of Harris County. Tesas or in the Southern District of Tesas.

REV08/06

Surface Co	asing							•	٩
Size	Grade	#/ft	Collapse	Burst (Internal Yield)	Tensile	Coupling	Length	Dry Weight	Mud Weight
								98,100	
13.375"	J-55	54.5	1130 psi	2730 psi	514 kips	STC	1800'	lbs	8.5 ppg

Collapse:  $DF_c = 1.25$ 

**Base Assumptions** 

- Complete internal evacuation of the casing, utilizing a collapse force equivalent to the mud gradient (0.44 psi/ft) in which the casing will be ran.
- Cementing operations in which, utilizes a collapse force equivalent to the gradient of the planned cement slurry (0.77 psi/ft) and an internal force equivalent to the fresh water displacement fluid (0.433 psi/ft).

Collapse Calculations: Collapse Rating / Collapse Force

Complete Evacuation: 1,130psi / [(0.44psi/ft)(1,800')] = **1.42** 

Cementing Operations: 1,130psi / [(0.77psi/ft – 0.433psi/ft)(1800')] = **1.86** 

Burst:  $DF_B = 1.25$ 

Base Assumption

• Casing pressure test as per Onshore Oil and Gas Order No. 2 (0.22 psi/ft or 1500 psi), utilizing an external force equivalent to the mud gradient (0.44 psi/ft) in which the casing will be ran.

Burst Calculations: Internal Yield Rating / Internal Force

Casing Pressure Test: 2,730psi / [(1500psi)-(0.44 psi/ft)(1,800')] = **3.86** 

#### Tensile: $DF_T = 1.6$

**Base Assumption** 

• A downward force of 100,000 lb. overpull is applied at the base of the casing along with the weight and not considering the effects of buoyancy.

Tensile Calculations: Joint Strength / Axial Load

*Overpull:* 514 kips / (100,000 lbs. + 98,100 lbs.) = **2.59** 

# Intermediate Casing

	Burst							Dry	
Size	Grade	#/ft	Collapse	(Internal Yield)	Tensile	Coupling	Length	Weight	Mud Weight
9.625"	J-55	40	2570 psi	3950 psi	520 kips	LTC	4000'	160,000 lb	10.0 ppg
9.625"	HCK-55	40	4230 psi	3950 psi	694 kips	LTC	1600'	64,000 lb	10.0 ppg

#### Collapse: $DF_c = 1.25$

**Base Assumptions** 

- Complete internal evacuation of the casing, utilizing a collapse force equivalent to the mud gradient (0.52 psi/ft) in which the casing will be ran.
- Cementing operations in which, utilizes a collapse force equivalent to the gradient of the planned cement slurry (0.77 psi/ft) and an internal back-up force equivalent to the fresh water displacement fluid (0.433 psi/ft).

Collapse Calculations: Collapse Rating / Collapse Force

Complete Evacuation: J-55: 2570psi / [(0.52psi/ft)(4,000')] = **1.25** HCK-55: 4230psi / [(0.52psi/ft)(5,600')] = **1.45** 

Cementing Operations: J-55: 2570psi / [(0.77psi/ft - 0.433psi/ft)(4000')] = **1.91** HCK-55: 4230psi / [(0.77psi/ft - 0.433psi/ft)(5600')] = **2.24** 

#### Burst: $DF_B = 1.25$

**Base Assumption** 

- Casing pressure test as per Onshore Oil and Gas Order No. 2 (0.22 psi/ft or 1500 psi), utilizing an internal force equivalent to the displacement fluid of 8.6 ppg and external force equivalent to 8.4 ppg.
- Gas kick at the casing shoe, in which a 0.7 psi/ft shoe test is assumed, and 0.2 psi/ft gas gradient is assumed.

Burst Calculations: Internal Yield Rating / Burst Force

Casing Pressure Test: J-55: 3950psi / [(1500psi +1789 psi) - (1747psi)] = **2.56** HCK-55: 3950psi / [(1500psi +2504 psi) - (2446psi)] = **2.54** Gas Kick:

J-55: 3950psi / [(0.7psi/ft)(5600')-(0.2psi/ft)(5600')] = **1.41** HCK-55: 3950psi / [(0.7psi/ft)(5600')-(0.2psi/ft)(4000')] = **1.27** 

# Tensile: $DF_T = 1.6$

**Base Assumption** 

• A downward force of 100,000 lb. overpull is applied at the base of the casing along with the weight of the string and not considering the effects of buoyancy.

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Tensile Calculations: Joint Strength / Axial Load

Overpull: J-55: 520 kips / (100,000 lbs. + 224,00 lbs.) = **1.6** HCK-55: 694 kips / (100,000 lbs. + 64,100 lbs.) = **4.23** 

# **Production Casing**

Burst							Dry		
Size	Grade	#/ft	Collapse	(Internal Yield)	Tensile	Coupling	Length	Weight	Mud Weight
5.5"	P-110	20	11080 psi	12360 psi	641 kips	BTC	18,300'	366,000 lb	9.1 ppg

#### Collapse: $DF_c = 1.25$

**Base Assumptions** 

- Cementing operations in which utilizes a collapse force equivalent to the gradient of the planned cement slurry (0.77 psi/ft) and an internal back-up force equivalent to the fresh water displacement fluid (0.433 psi/ft).
- Production operations in which the pipe is completely evacuated with an external force equivalent to the pore pressure gradient (0.52 psi/ft).

Collapse Calculations: Collapse Rating / Collapse Force

Cementing Operations: 11,080psi / [(0.66psi/ft-0.433 psi/ft)(10,500'TVD)] = **3.13** 

Production Operations: 11080psi / (10,500' TVD)(0.52psi/ft) = **2.03** 

#### Burst: $DF_B = 1.25$

**Base Assumption** 

- Frac pressure utilizing an internal force of 9500 psi along with a frac fluid gradient equivalent to 0.468 psi/ft and an external force equal to the minimum fluid gradient (0.433 psi/ft) in which the casing will be ran.
- Production operations in which the casing is completely filled with a gas equivalent gradient of 0.2 psi/ft and an external force equivalent to pore pressure of 0.5 psi/ft.

Burst Calculations: Internal Yield Rating / Burst Force

*Frac Pressure:* 12,360psi / [(9500 psi)+ (0.468 – 0.433psi/ft)(10,500'TVD)] = **1.28** 

Production Operations: 12,360psi / [(0.5 psi/ft – 0.2 psi/ft)(10,500'TVD)] = **3.92** 

#### Tensile: $DF_T = 1.6$

**Base Assumption** 

• A downward force of 100,000 lb. overpull is applied at the base of the casing along with the weight of the string and considering the effects of buoyancy (factor =0.86).

Tensile Calculations: Joint Strength / Axial Load

Overpull: 641,000 lbs /[(100,000 lbs.) + (366,000 lbs.)(0.86)] = **1.6** 

Surface C	asing							*	
				Burst				Dry	Mud
Size	Grade	#/ft	Collapse	(Internal Yield)	Tensile	Coupling	Length	Weight	Weight
								98,100	
13.375"	J-55	54.5	1130 psi	2730 psi	514 kips	STC	1800'	lbs	8.5 ppg

#### Collapse: $DF_c = 1.25$

**Base Assumptions** 

- Complete internal evacuation of the casing, utilizing a collapse force equivalent to the mud gradient (0.44 psi/ft) in which the casing will be ran.
- Cementing operations in which, utilizes a collapse force equivalent to the gradient of the planned cement slurry (0.77 psi/ft) and an internal force equivalent to the fresh water displacement fluid (0.433 psi/ft).

Collapse Calculations: Collapse Rating / Collapse Force

Complete Evacuation: 1,130psi / [(0.44psi/ft)(1,800')] = **1.42** 

Cementing Operations: 1,130psi / [(0.77psi/ft – 0.433psi/ft)(1800')] = **1.86** 

#### Burst: $DF_B = 1.25$

#### **Base Assumption**

• Casing pressure test as per Onshore Oil and Gas Order No. 2 (0.22 psi/ft or 1500 psi), utilizing an external force equivalent to the mud gradient (0.44 psi/ft) in which the casing will be ran.

Burst Calculations: Internal Yield Rating / Internal Force

Casing Pressure Test: 2,730psi / [(1500psi)-(0.44 psi/ft)(1,800')] = **3.86** 

#### Tensile: $DF_T = 1.6$

**Base Assumption** 

 A downward force of 100,000 lb. overpull is applied at the base of the casing along with the weight and not considering the effects of buoyancy.

Tensile Calculations: Joint Strength / Axial Load

*Overpull:* 514 kips / (100,000 lbs. + 98,100 lbs.) = **2.59** 

# Intermediate Casing

				Burst				Dry	
Size	Grade	#/ft	Collapse	(Internal Yield)	Tensile	Coupling	Length	Weight	Mud Weight
9.625"	J-55	40	2570 psi	3950 psi	520 kips	LTC	4000'	160,000 lb	10.0 ppg
9.625"	HCK-55	40	4230 psi	3950 psi	694 kips	LTC	1600'	64,000 lb	10.0 ppg

#### Collapse: $DF_c = 1.25$

Base Assumptions

- Complete internal evacuation of the casing, utilizing a collapse force equivalent to the mud gradient (0.52 psi/ft) in which the casing will be ran.
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Collapse Calculations: Collapse Rating / Collapse Force

Complete Evacuation: J-55: 2570psi / [(0.52psi/ft)(4,000')] = **1.25** HCK-55: 4230psi / [(0.52psi/ft)(5,600')] = **1.45** 

Cementing Operations: J-55: 2570psi / [(0.77psi/ft - 0.433psi/ft)(4000')] = **1.91** HCK-55: 4230psi / [(0.77psi/ft - 0.433psi/ft)(5600')] = **2.24** 

#### Burst: $DF_B = 1.25$

Base Assumption

- Casing pressure test as per Onshore Oil and Gas Order No. 2 (0.22 psi/ft or 1500 psi), utilizing an internal force equivalent to the displacement fluid of 8.6 ppg and external force equivalent to 8.4 ppg.
- Gas kick at the casing shoe, in which a 0.7 psi/ft shoe test is assumed, and 0.2 psi/ft gas gradient is assumed.

Burst Calculations: Internal Yield Rating / Burst Force

Casing Pressure Test: J-55: 3950psi / [(1500psi +1789 psi) - (1747psi)] = **2.56** HCK-55: 3950psi / [(1500psi +2504 psi) - (2446psi)] = **2.54** Gas Kick:

J-55: 3950psi / [(0.7psi/ft)(5600')-(0.2psi/ft)(5600')] = **1.41** HCK-55: 3950psi / [(0.7psi/ft)(5600')-(0.2psi/ft)(4000')] = **1.27** 

# Tensile: $DF_T = 1.6$

Base Assumption

• A downward force of 100,000 lb. overpull is applied at the base of the casing along with the weight of the string and not considering the effects of buoyancy.

Tensile Calculations: Joint Strength / Axial Load

Overpull: J-55: 520 kips / (100,000 lbs. + 224,00 lbs.) = **1.6** HCK-55: 694 kips / (100,000 lbs. + 64,100 lbs.) = **4.23** 

# **Production Casing**

				Burst		Dry			
Size	Grade	#/ft	Collapse	(Internal Yield)	Tensile	Coupling	Length	Weight	Mud Weight
5.5"	P-110	20	11080 psi	12360 psi	641 kips	BTC	18,300'	366,000 lb	9.1 ppg

#### Collapse: $DF_c = 1.25$

**Base Assumptions** 

- Cementing operations in which utilizes a collapse force equivalent to the gradient of the planned cement slurry (0.77 psi/ft) and an internal back-up force equivalent to the fresh water displacement fluid (0.433 psi/ft).
- Production operations in which the pipe is completely evacuated with an external force equivalent to the pore pressure gradient (0.52 psi/ft).

Collapse Calculations: Collapse Rating / Collapse Force

Cementing Operations: 11,080psi / [(0.66psi/ft-0.433 psi/ft)(10,500'TVD)] = **3.13** 

Production Operations: 11080psi / (10,500' TVD)(0.52psi/ft) = **2.03** 

#### Burst: $DF_B = 1.25$

**Base Assumption** 

- Frac pressure utilizing an internal force of 9500 psi along with a frac fluid gradient equivalent to 0.468 psi/ft and an external force equal to the minimum fluid gradient (0.433 psi/ft) in which the casing will be ran.
- Production operations in which the casing is completely filled with a gas equivalent gradient of 0.2 psi/ft and an external force equivalent to pore pressure of 0.5 psi/ft.

Burst Calculations: Internal Yield Rating / Burst Force

Frac Pressure: 12,360psi / [(9500 psi)+ (0.468 – 0.433psi/ft)(10,500'TVD)] = **1.28** 

Production Operations: 12,360psi / [(0.5 psi/ft – 0.2 psi/ft)(10,500'TVD)] = **3.92** 

#### Tensile: $DF_T = 1.6$

**Base Assumption** 

• A downward force of 100,000 lb. overpull is applied at the base of the casing along with the weight of the string and considering the effects of buoyancy (factor =0.86).

Tensile Calculations: Joint Strength / Axial Load

Overpull: 641,000 lbs /[(100,000 lbs.) + (366,000 lbs.)(0.86)] = **1.6** 

<u>Surface C</u>	asing							,	
				Burst				Dry	Mud
Size	Grade	#/ft	Collapse	(Internal Yield)	Tensile	Coupling	Length	Weight	Weight
								98,100	
13.375"	J-55	54.5	1130 psi	2730 psi	514 kips	STC	1800'	lbs	8.5 ppg

Collapse:  $DF_c = 1.25$ 

**Base Assumptions** 

- Complete internal evacuation of the casing, utilizing a collapse force equivalent to the mud gradient (0.44 psi/ft) in which the casing will be ran.
- Cementing operations in which, utilizes a collapse force equivalent to the gradient of the planned cement slurry (0.77 psi/ft) and an internal force equivalent to the fresh water displacement fluid (0.433 psi/ft).

Collapse Calculations: Collapse Rating / Collapse Force

Complete Evacuation: 1,130psi / [(0.44psi/ft)(1,800')] = **1.42** 

Cementing Operations: 1,130psi / [(0.77psi/ft – 0.433psi/ft)(1800')] = **1.86** 

Burst:  $DF_B = 1.25$ 

#### **Base Assumption**

• Casing pressure test as per Onshore Oil and Gas Order No. 2 (0.22 psi/ft or 1500 psi), utilizing an external force equivalent to the mud gradient (0.44 psi/ft) in which the casing will be ran.

Burst Calculations: Internal Yield Rating / Internal Force

Casing Pressure Test: 2,730psi / [(1500psi)-(0.44 psi/ft)(1,800')] = **3.86** 

#### Tensile: $DF_T = 1.6$

**Base Assumption** 

• A downward force of 100,000 lb. overpull is applied at the base of the casing along with the weight and not considering the effects of buoyancy.

Tensile Calculations: Joint Strength / Axial Load

*Overpull:* 514 kips / (100,000 lbs. + 98,100 lbs.) = **2.59** 

# Intermediate Casing

				Burst				Dry	
Size	Grade	#/ft	Collapse	(Internal Yield)	Tensile	Coupling	Length	Weight	Mud Weight
9.625"	J-55	40	2570 psi	3950 psi	520 kips	LTC	4000'	160,000 lb	10.0 ppg
9.625"	НСК-55	40	4230 psi	3950 psi	694 kips	LTC	1600'	64,000 lb	10.0 ppg

#### Collapse: $DF_c = 1.25$

**Base Assumptions** 

- Complete internal evacuation of the casing, utilizing a collapse force equivalent to the mud gradient (0.52 psi/ft) in which the casing will be ran.
- Cementing operations in which, utilizes a collapse force equivalent to the gradient of the planned cement slurry (0.77 psi/ft) and an internal back-up force equivalent to the fresh water displacement fluid (0.433 psi/ft).

Collapse Calculations: Collapse Rating / Collapse Force

Complete Evacuation: J-55: 2570psi / [(0.52psi/ft)(4,000')] = **1.25** HCK-55: 4230psi / [(0.52psi/ft)(5,600')] = **1.45** 

Cementing Operations: J-55: 2570psi / [(0.77psi/ft - 0.433psi/ft)(4000')] = **1.91** HCK-55: 4230psi / [(0.77psi/ft - 0.433psi/ft)(5600')] = **2.24** 

#### Burst: $DF_B = 1.25$

Base Assumption

- Casing pressure test as per Onshore Oil and Gas Order No. 2 (0.22 psi/ft or 1500 psi), utilizing an internal force equivalent to the displacement fluid of 8.6 ppg and external force equivalent to 8.4 ppg.
- Gas kick at the casing shoe, in which a 0.7 psi/ft shoe test is assumed, and 0.2 psi/ft gas gradient is assumed.

Burst Calculations: Internal Yield Rating / Burst Force

```
Casing Pressure Test:

J-55: 3950psi / [(1500psi +1789 psi) - (1747psi)] = 2.56

HCK-55: 3950psi / [(1500psi +2504 psi) - (2446psi)] = 2.54

Gas Kick:

J-55: 3950psi / [(0.7psi/ft)(5600')-(0.2psi/ft)(5600')] = 1.41

HCK-55: 3950psi / [(0.7psi/ft)(5600')-(0.2psi/ft)(4000')] = 1.27
```

#### Tensile: $DF_T = 1.6$

**Base Assumption** 

• A downward force of 100,000 lb. overpull is applied at the base of the casing along with the weight of the string and not considering the effects of buoyancy.

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Tensile Calculations: Joint Strength / Axial Load

Overpull: J-55: 520 kips / (100,000 lbs. + 224,00 lbs.) = **1.6** HCK-55: 694 kips / (100,000 lbs. + 64,100 lbs.) = **4.23** 

# **Production Casing**

				Burst	Dry					
Size	Grade	#/ft	Collapse	(Internal Yield)	Tensile	Coupling	Length	Weight	Mud Weight	
5.5"	P-110	20	11080 psi	12360 psi	641 kips	BTC	18,300'	366,000 lb	9.1 ppg	

#### Collapse: $DF_c = 1.25$

**Base Assumptions** 

- Cementing operations in which utilizes a collapse force equivalent to the gradient of the planned cement slurry (0.77 psi/ft) and an internal back-up force equivalent to the fresh water displacement fluid (0.433 psi/ft).
- Production operations in which the pipe is completely evacuated with an external force equivalent to the pore pressure gradient (0.52 psi/ft).

Collapse Calculations: Collapse Rating / Collapse Force

Cementing Operations: 11,080psi / [(0.66psi/ft-0.433 psi/ft)(10,500'TVD)] = **3.13** 

Production Operations: 11080psi / (10,500' TVD)(0.52psi/ft) = **2.03** 

#### Burst: $DF_B = 1.25$

#### **Base Assumption**

- Frac pressure utilizing an internal force of 9500 psi along with a frac fluid gradient equivalent to 0.468 psi/ft and an external force equal to the minimum fluid gradient (0.433 psi/ft) in which the casing will be ran.
- Production operations in which the casing is completely filled with a gas equivalent gradient of 0.2 psi/ft and an external force equivalent to pore pressure of 0.5 psi/ft.

Burst Calculations: Internal Yield Rating / Burst Force

*Frac Pressure:* 12,360psi / [(9500 psi)+ (0.468 – 0.433psi/ft)(10,500'TVD)] = **1.28** 

Production Operations: 12,360psi / [(0.5 psi/ft – 0.2 psi/ft)(10,500'TVD)] = **3.92** 

#### Tensile: $DF_T = 1.6$

**Base Assumption** 

• A downward force of 100,000 lb. overpull is applied at the base of the casing along with the weight of the string and considering the effects of buoyancy (factor =0.86).

Tensile Calculations: Joint Strength / Axial Load

Overpull: 641,000 lbs /[(100,000 lbs.) + (366,000 lbs.)(0.86)] = **1.6** 

Surface Casing											
	Size	Grade	#/ft	Collapse	Burst (Internal Yield)	Tensile	Coupling	Length	Dry Weight	Mud Weight	
-					(				98,100		
	13.375"	J-55	54.5	1130 psi	2730 psi	514 kips	STC	1800'	lbs	8.5 ppg	

Collapse:  $DF_c = 1.25$ 

**Base Assumptions** 

- Complete internal evacuation of the casing, utilizing a collapse force equivalent to the mud gradient (0.44 psi/ft) in which the casing will be ran.
- Cementing operations in which, utilizes a collapse force equivalent to the gradient of the planned cement slurry (0.77 psi/ft) and an internal force equivalent to the fresh water displacement fluid (0.433 psi/ft).

Collapse Calculations: Collapse Rating / Collapse Force

Complete Evacuation: 1,130psi / [(0.44psi/ft)(1,800')] = **1.42** 

Cementing Operations: 1,130psi / [(0.77psi/ft – 0.433psi/ft)(1800')] = **1.86** 

Burst:  $DF_B = 1.25$ 

Base Assumption

• Casing pressure test as per Onshore Oil and Gas Order No. 2 (0.22 psi/ft or 1500 psi), utilizing an external force equivalent to the mud gradient (0.44 psi/ft) in which the casing will be ran.

Burst Calculations: Internal Yield Rating / Internal Force

Casing Pressure Test: 2,730psi / [(1500psi)-(0.44 psi/ft)(1,800')] = **3.86** 

#### Tensile: $DF_T = 1.6$

**Base Assumption** 

 A downward force of 100,000 lb. overpull is applied at the base of the casing along with the weight and not considering the effects of buoyancy.

Tensile Calculations: Joint Strength / Axial Load

*Overpull:* 514 kips / (100,000 lbs. + 98,100 lbs.) = **2.59** 

# Intermediate Casing

				Burst		Dry				
Size	Grade	#/ft	Collapse	(Internal Yield)	Tensile	Coupling	Length	Weight	Mud Weight	
9.625"	J-55	40	2570 psi	3950 psi	520 kips	LTC	4000'	160,000 lb	10.0 ppg	
9.625"	НСК-55	40	4230 psi	3950 psi	694 kips	LTC	1600'	64,000 lb	10.0 ppg	

#### Collapse: $DF_c = 1.25$

**Base Assumptions** 

- Complete internal evacuation of the casing, utilizing a collapse force equivalent to the mud gradient (0.52 psi/ft) in which the casing will be ran.
- Cementing operations in which, utilizes a collapse force equivalent to the gradient of the planned cement slurry (0.77 psi/ft) and an internal back-up force equivalent to the fresh water displacement fluid (0.433 psi/ft).

Collapse Calculations: Collapse Rating / Collapse Force

Complete Evacuation: J-55: 2570psi / [(0.52psi/ft)(4,000')] = **1.25** HCK-55: 4230psi / [(0.52psi/ft)(5,600')] = **1.45** 

Cementing Operations: J-55: 2570psi / [(0.77psi/ft - 0.433psi/ft)(4000')] = **1.91** HCK-55: 4230psi / [(0.77psi/ft - 0.433psi/ft)(5600')] = **2.24** 

#### Burst: $DF_B = 1.25$

Base Assumption

- Casing pressure test as per Onshore Oil and Gas Order No. 2 (0.22 psi/ft or 1500 psi), utilizing an internal force equivalent to the displacement fluid of 8.6 ppg and external force equivalent to 8.4 ppg.
- Gas kick at the casing shoe, in which a 0.7 psi/ft shoe test is assumed, and 0.2 psi/ft gas gradient is assumed.

Burst Calculations: Internal Yield Rating / Burst Force

```
Casing Pressure Test:

J-55: 3950psi / [(1500psi +1789 psi) - (1747psi)] = 2.56

HCK-55: 3950psi / [(1500psi +2504 psi) - (2446psi)] = 2.54

Gas Kick:

J-55: 3950psi / [(0.7psi/ft)(5600')-(0.2psi/ft)(5600')] = 1.41

HCK-55: 3950psi / [(0.7psi/ft)(5600')-(0.2psi/ft)(4000')] = 1.27
```

# Tensile: $DF_T = 1.6$

Base Assumption

• A downward force of 100,000 lb. overpull is applied at the base of the casing along with the weight of the string and not considering the effects of buoyancy.

Tensile Calculations: Joint Strength / Axial Load

Overpull: J-55: 520 kips / (100,000 lbs. + 224,00 lbs.) = **1.6** HCK-55: 694 kips / (100,000 lbs. + 64,100 lbs.) = **4.23** 

# **Production Casing**

	Burst							Dry				
Size	Grade	#/ft	Collapse	(Internal Yield)	Tensile	Coupling	Length	Weight	Mud Weight			
5.5"	P-110	20	11080 psi	12360 psi	641 kips	BTC	18,300'	366,000 lb	9.1 ppg			

#### Collapse: $DF_c = 1.25$

**Base Assumptions** 

- Cementing operations in which utilizes a collapse force equivalent to the gradient of the planned cement slurry (0.77 psi/ft) and an internal back-up force equivalent to the fresh water displacement fluid (0.433 psi/ft).
- Production operations in which the pipe is completely evacuated with an external force equivalent to the pore pressure gradient (0.52 psi/ft).

Collapse Calculations: Collapse Rating / Collapse Force

Cementing Operations: 11,080psi / [(0.66psi/ft-0.433 psi/ft)(10,500'TVD)] = **3.13** 

Production Operations: 11080psi / (10,500' TVD)(0.52psi/ft) = **2.03** 

#### Burst: $DF_B = 1.25$

**Base Assumption** 

- Frac pressure utilizing an internal force of 9500 psi along with a frac fluid gradient equivalent to 0.468 psi/ft and an external force equal to the minimum fluid gradient (0.433 psi/ft) in which the casing will be ran.
- Production operations in which the casing is completely filled with a gas equivalent gradient of 0.2 psi/ft and an external force equivalent to pore pressure of 0.5 psi/ft.

Burst Calculations: Internal Yield Rating / Burst Force

*Frac Pressure:* 12,360psi / [(9500 psi)+ (0.468 – 0.433psi/ft)(10,500'TVD)] = **1.28** 

Production Operations: 12,360psi / [(0.5 psi/ft – 0.2 psi/ft)(10,500'TVD)] = **3.92** 

#### Tensile: $DF_T = 1.6$

Base Assumption

• A downward force of 100,000 lb. overpull is applied at the base of the casing along with the weight of the string and considering the effects of buoyancy (factor =0.86).

Tensile Calculations: Joint Strength / Axial Load

Overpull: 641,000 lbs /[(100,000 lbs.) + (366,000 lbs.)(0.86)] = **1.6** 

Surface C									
				Burst				Dry	Mud
Size	Grade	#/ft	Collapse	(Internal Yield)	Tensile	Coupling	Length	Weight	Weight
								98,100	
13.375"	J-55	54.5	1130 psi	2730 psi	514 kips	STC	1800'	lbs	8.5 ppg

#### Collapse: $DF_c = 1.25$

**Base Assumptions** 

- Complete internal evacuation of the casing, utilizing a collapse force equivalent to the mud gradient (0.44 psi/ft) in which the casing will be ran.
- Cementing operations in which, utilizes a collapse force equivalent to the gradient of the planned cement slurry (0.77 psi/ft) and an internal force equivalent to the fresh water displacement fluid (0.433 psi/ft).

Collapse Calculations: Collapse Rating / Collapse Force

Complete Evacuation: 1,130psi / [(0.44psi/ft)(1,800')] = **1.42** 

Cementing Operations: 1,130psi / [(0.77psi/ft – 0.433psi/ft)(1800')] = **1.86** 

Burst:  $DF_B = 1.25$ 

#### Base Assumption

• Casing pressure test as per Onshore Oil and Gas Order No. 2 (0.22 psi/ft or 1500 psi), utilizing an external force equivalent to the mud gradient (0.44 psi/ft) in which the casing will be ran.

Burst Calculations: Internal Yield Rating / Internal Force

Casing Pressure Test: 2,730psi / [(1500psi)-(0.44 psi/ft)(1,800')] = **3.86** 

#### Tensile: $DF_T = 1.6$

#### **Base Assumption**

• A downward force of 100,000 lb. overpull is applied at the base of the casing along with the weight and not considering the effects of buoyancy.

Tensile Calculations: Joint Strength / Axial Load

*Overpull:* 514 kips / (100,000 lbs. + 98,100 lbs.) = **2.59** 

# Intermediate Casing

				Burst				Dry	
Size	Grade	#/ft	Collapse	(Internal Yield)	Tensile	Coupling	Length	Weight	Mud Weight
9.625"	J-55	40	2570 psi	3950 psi	520 kips	LTC	4000'	160,000 lb	10.0 ppg
9.625"	HCK-55	40	4230 psi	3950 psi	694 kips	LTC	1600'	64,000 lb	10.0 ppg

#### Collapse: $DF_c = 1.25$

**Base Assumptions** 

- Complete internal evacuation of the casing, utilizing a collapse force equivalent to the mud gradient (0.52 psi/ft) in which the casing will be ran.
- Cementing operations in which, utilizes a collapse force equivalent to the gradient of the planned cement slurry (0.77 psi/ft) and an internal back-up force equivalent to the fresh water displacement fluid (0.433 psi/ft).

Collapse Calculations: Collapse Rating / Collapse Force

Complete Evacuation: J-55: 2570psi / [(0.52psi/ft)(4,000')] = **1.25** HCK-55: 4230psi / [(0.52psi/ft)(5,600')] = **1.45** 

Cementing Operations: J-55: 2570psi / [(0.77psi/ft - 0.433psi/ft)(4000')] = **1.91** HCK-55: 4230psi / [(0.77psi/ft - 0.433psi/ft)(5600')] = **2.24** 

#### Burst: $DF_B = 1.25$

**Base Assumption** 

- Casing pressure test as per Onshore Oil and Gas Order No. 2 (0.22 psi/ft or 1500 psi), utilizing an internal force equivalent to the displacement fluid of 8.6 ppg and external force equivalent to 8.4 ppg.
- Gas kick at the casing shoe, in which a 0.7 psi/ft shoe test is assumed, and 0.2 psi/ft gas gradient is assumed.

Burst Calculations: Internal Yield Rating / Burst Force

Casing Pressure Test: J-55: 3950psi / [(1500psi +1789 psi) - (1747psi)] = **2.56** HCK-55: 3950psi / [(1500psi +2504 psi) - (2446psi)] = **2.54** Gas Kick:

J-55: 3950psi / [(0.7psi/ft)(5600')-(0.2psi/ft)(5600')] = **1.41** HCK-55: 3950psi / [(0.7psi/ft)(5600')-(0.2psi/ft)(4000')] = **1.27**
Base Assumption

• A downward force of 100,000 lb. overpull is applied at the base of the casing along with the weight of the string and not considering the effects of buoyancy.

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Tensile Calculations: Joint Strength / Axial Load

# **Production Casing**

				Burst		Dry				
Size	Grade	#/ft	Collapse	(Internal Yield)	Tensile	Coupling	Length	Weight	Mud Weight	
5.5"	P-110	20	11080 psi	12360 psi	641 kips	BTC	18,300'	366,000 lb	9.1 ppg	

### Collapse: $DF_c = 1.25$

**Base Assumptions** 

- Cementing operations in which utilizes a collapse force equivalent to the gradient of the planned cement slurry (0.77 psi/ft) and an internal back-up force equivalent to the fresh water displacement fluid (0.433 psi/ft).
- Production operations in which the pipe is completely evacuated with an external force equivalent to the pore pressure gradient (0.52 psi/ft).

Collapse Calculations: Collapse Rating / Collapse Force

Cementing Operations: 11,080psi / [(0.66psi/ft-0.433 psi/ft)(10,500'TVD)] = **3.13** 

Production Operations: 11080psi / (10,500' TVD)(0.52psi/ft) = **2.03** 

### Burst: $DF_B = 1.25$

**Base Assumption** 

- Frac pressure utilizing an internal force of 9500 psi along with a frac fluid gradient equivalent to 0.468 psi/ft and an external force equal to the minimum fluid gradient (0.433 psi/ft) in which the casing will be ran.
- Production operations in which the casing is completely filled with a gas equivalent gradient of 0.2 psi/ft and an external force equivalent to pore pressure of 0.5 psi/ft.

Burst Calculations: Internal Yield Rating / Burst Force

*Frac Pressure:* 12,360psi / [(9500 psi)+ (0.468 – 0.433psi/ft)(10,500'TVD)] = **1.28** 

Production Operations: 12,360psi / [(0.5 psi/ft - 0.2 psi/ft)(10,500'TVD)] = **3.92** 

### Tensile: $DF_T = 1.6$

Base Assumption

• A downward force of 100,000 lb. overpull is applied at the base of the casing along with the weight of the string and considering the effects of buoyancy (factor =0.86).

Tensile Calculations: Joint Strength / Axial Load

Overpull: 641,000 lbs /[(100,000 lbs.) + (366,000 lbs.)(0.86)] = **1.6** 

# DRILLING PLAN LEA UNIT 63H LEGACY RESERVES OPERATING LP SHL: Unit K, Section 19 BHL: Unit C, Section 18 T20S-R35E, Lea County, New Mexico

To satisfy requirements of Onshore Oil and Gas Order No. 1, Legacy Reserves Operating LP submits the following for your consideration:

- I.
   Location:
   SHL:
   2270' FSL & 2610' FWL, Sec.19, T20S-R35E (First Take: 2310 FNL & 1750 FWL)

   BHL:
   330' FNL & 1750' FWL, Sec. 18, T20S-R35E (Last Take)
- 2. *Elevations:* 3,689' GL

3.	Geological Name of Surface Formation:	Quaternary alluvium deposits	
4.	Drilling Tools and Associated Equipment:	Rotary drilling rig using fluid as a means for removal of solid cuttings from the well.	

5. *Proposed Drilling Depth:* 18,314' MD 10,500' TVD

#### 6. Estimated Tops of Geological Markers:

Rustler	1,680'	Delaware	5,666'
Top Salt	1,720'	Bone Spring Lime	8,205'
Bottom Salt	3,150'	Avalon	8,760'
Top of Capitan Reef	3,150'	1 <sup>st</sup> . Bone Spring	9,501'
Capitan Reef Bottom	4,710'	2 <sup>nd</sup> . Bone Spring	10,034'
San Andres	4,710'		

#### 7. Possible mineral bearing formations:

Primary: Bone Spring (oil); Secondary: Delaware (oil), Avalon (oil), fresh water (~125')

#### 8. Proposed Mud System:

Depth	Mud Wt.	Visc	Fluid Loss	Type Mud
0' to 1800'	8.4-8.9	30-32	NC	Fresh water gel spud mud
1800' to 5600'	9.8-10	28-29	NC	Brine water
5600' to 10,500'	8.4-8.6	28-29	NC	Fresh water/brine, use hi-viscosity
				Weeps to clean hole
10,500' to 18,314'	8.9-9.1	28-29	18-20	Fresh water/brine
C (() ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) ) )		1		

Sufficient mud materials will be kept on location at all times in order to combat lost circulation or unexpected kicks. A Pason PVT system will be rigged up prior to spudding this well. A volume monitoring system that measures, calculates and displays readings from the mud system on the rig to alert the rig crew of impending gas kicks and lost circulation. In order to effectively run open hole logs and casing, the mud viscosity and fluid loss properties may be adjusted.

### 9. Proposed Drilling Plan:

Set surface and intermediate casing and cement to surface. Drill 8-3/4" to ~10,500', Kick off and drill 8-3/4" hole to TD of ~18,314'. Set 5-1/2" casing from surface to TD (~ 18,314'). Cement 5-1/2" production casing back to surface.

#### 10. Casing Information:

J-55
J-55
HCK-55
P-110

#### 11. Cementing Information:

Surface Casing (75% excess on lead & 75% excess on tail to design for cement top at surface):

Lead: 1100 sxs class C cement + 4% bwoc bentonite II + 2% bwoc Calcium Chloride + 0.25 lbs/sack Cello Flake + 0.005% bwoc Static Free + 0.005 gps FP-6L (13.50 ppg, 1.93 cfps, 9.71 gps wtr).

Tail: 200 sxs class C cement + 1.5% bwoc Calcium Chloride + 0.005 lbs/sack Static Free + 0.005 gps FP-6L (14.80 ppg, 1.34 cfps, 6.35 gps wtr).

### Intermediate Casing

In the event that circulation is lost (> 50%) while drilling the 12-1/4" intermediate hole in the Capitan Reef at +/-4000', we will plan to install a DV tool and external casing packer within 200' of the top depth where lost circulation occurred and will pump a two-stage cement job with the potential to add an additional DV tool for a three-stage cement job. If there is no lost circulation a single stage cementing procedure will be followed. Legacy plans to cement to surface regardless of whether a single stage, 2-stage or 3-stage procedure is implemented.

**No DV tool** (80% excess on lead & 80% excess on tail to design for cement top at surface)

Lead: 1400 sx (35:65) poz (fly ash) class C cement+ 4% bwoc bentonite II + 5% bwoc MPA-5 + 0.25% bwoc FL- 52 + 5 lbs/sack LCM-1 + 0.125 lbs/sk cello flake+ 0.005 lbs/sk defoamer + 0.005 gps FP-6L + 1.2% bwoc Sodium Metasilicate + 5% bwow Sodium Chloride (12.5 ppg, 2.13 cfps, 8.81 gps wtr)

Tail: 200 sx class C cement (14.80 ppg, 1.33 cfps, 6.35 gps wtr)

With (1) DV Tool (100% excess on lead & 100% excess on tail to design for cement top at surface)

Assuming DV tool set at 3950' but if the setting depth changes, cement volumes will be adjusted proportionately.

#### Stage 1

Lead: 400 sx (35:65) paz (fly ash) class C cement+ 4% bwoc Bentonite II+ 5% bwoc MPA-5 + 0,25% bwoc FL-52 + 5 lbs/sack LCM-1 + 0.125 lbs/sk cello flake+ 0.005 lbs/sk defoamer + 0.005 gps FP-6L + 1.2% bwoc Sodium Metasilicate + 5% bwow Sodium Chloride (12.5 ppg, 2.13 cfps, 8.81 gps wtr)

Tail: 200 sx class C cement (14.80 ppg, 1.33 cfps, 6.35 gps wtr)

#### Stage 2

Lead: 1100 sx (35:65) paz (fly ash) class C cement+ 4% bwoc bentonite II + 5% bwoc MPA-5 + 0,25% bwoc FL-52 + 5 lbs/sack LCM-1 + 0.125 lbs/sk Cello Flake+ 0.005 lbs/sk Static Free+ 0.005 gps FP-6L + 1.2% bwoc Sodium Metasilicate + 5% bwow Sodium Chloride (12.5 ppg, 2.13 cfps, 8.81 gps wtr)

Tail: 200 sx class C cement (14.80 ppg, 1.33 cfps, 6.35 gps wtr)

With (2) DV Tools (100% excess on lead & 100% excess on tail to design for cement top at surface)

Assuming one DV tool set at 3950' and one DV tool set at 1800' but if the setting depths change, cement volumes will be adjusted proportionately.

#### Stage 1

Lead: 400 sx (35:65) paz (fly ash) class C cement+ 4% bwoc Bentonite II+ 5% bwoc MPA-5 + 0,25% bwoc FL-52 + 5 lbs/sack LCM-1 + 0.125 lbs/sk cello flake+ 0.005 lbs/sk defoamer + 0.005 gps FP-6L + 1.2% bwoc Sodium Metasilicate + 5% bwow Sodium Chloride (12.5 ppg, 2.13 cfps, 8.81 gps wtr)

Tail: 200 sx class C cement (14.80 ppg, 1.33 cfps, 6.35 gps wtr)

#### Stage 2

Lead: 600 sx (35:65) paz (fly ash) class C cement+ 4% bwoc bentonite II + 5% bwoc MPA-5 + 0,25% bwoc FL-52 + 5 lbs/sack LCM-1 + 0.125 lbs/sk Cello Flake+ 0.005 lbs/sk Static Free+ 0.005 gps FP-6L + 1.2% bwoc Sodium Metasilicate + 5% bwow Sodium Chloride (12.5 ppg, 2.13 cfps, 8.81 gps wtr)

<u>Tail:</u> 200 sx class C cement (14.80 ppg, 1.33 cfps, 6.35 gps wtr)

#### Stage 3

Lead: 600 sx (35:65) paz (fly ash) class C cement+ 4% bwoc bentonite II + 5% bwoc MPA-5 + 0,25% bwoc FL-52 + 5 lbs/sack LCM-1 + 0.125 lbs/sk Cello Flake+ 0.005 lbs/sk Static Free+ 0.005 gps FP-6L + 1.2% bwoc Sodium Metasilicate + 5% bwow Sodium Chloride (12.5 ppg, 2.13 cfps, 8.81 gps wtr)

Tail: 200 sx class C cement (14.80 ppg, 1.33 cfps, 6.35 gps wtr)

#### **Production Casing** (80% excess on lead & 20% excess on tail to design for cement top at surface):

- Lead: 1600 sxs (50:50) poz (fly ash) class H cement + 10% bwoc bentonite II + 5% bwow sodium chloride + 5 pps LCM-1 + 0.005 lbs/sk Static Free + 0.005 gps FP-6L (11.90 ppg, 2.38 cf/sx, 13.22 gps wtr).
- Tail:
   1700 sxs Class H (15:61:11) poz (fly ash): class H cement: CSE-2 + 4% bwow sodium chloride + 3 pps LCM-1 + 0.6% bwoc FL-25 + 0.005 gps FP-6L + 0.005% bwoc Static Free (13.20 ppg, 1.62 cf/sx, 9.45 gps wtr).

#### 12. Pressure Control Eqpt/BOP:

Legacy Reserves plans to use a 13-5/8" 5000-psi working pressure BOP system consisting of a double ram BOP with one ram being pipe and one ram being blind, a 5000-psi annular type preventer, a 5000-psi choke manifold and 80 gallon accumulator with floor, five remote operating stations and an auxiliary power system. A rotating head will be utilized as needed. A drill string safety valve in the open position will be available on the rig floor. A mud gas separator will be available for use if needed.

A 3M BOP will be used to drill from the surface casing shoe (~1800') to the intermediate casing shoe (~5600'). The BOP will be a 5M system, however the "A" section wellhead will be a 3M wellhead (see attached BOP Diagram).

The BOP unit will be hydraulically operated. The BOP will be operated at least once per day while drilling and the blind rams will be operated when out of hole during trips. No abnormal pressure or temperature is expected while drilling.

The BOPs will be tested by an independent service company to 250 psi low and 5000 psi high.

#### 13. Testing, Logging, and Coring Program:

- A. Mud logging program: 2 man unit from approximately after setting intermediate casing.
- B. No open hole logs, DST's or cores are planned.

#### 14. Potential Hazards

No abnormal pressures or temperatures are expected during the drilling of this well. If H2S is encountered the operator will comply with provisions of Onshore Order 6. Since there will be an H2S Safety package on location, attached is an "H2S Drilling Operations Plan". Adequate flare lines will be installed on the mud/gas separator so gas may be flared safely. All personnel will be familiar with all aspects of safe operations of equipment being used. Lost circulation may occur and a cement contingency plan is included in this plan along with mud materials to be kept on location at all times in order to combat lost circulation or unexpected kicks. Estimated BHP: 4620 psi, estimated BHT: 162°F.

#### 15. Road and Location

Road and location construction will begin after BLM approval of the APD. Drilling is expected to take 30-35 days and an additional 10 days for the completion.

#### 16. Additional Requirements of Project:

Completion: The targeted Bone Spring pay zone will be perforated and stimulated in multiple stages using acid and hydraulic fracturing treatments. Fresh water used in the drilling and completion of this well will be transferred from off-site via temporary flowlines and stored in frac tanks on the location.

# Surface Casing

				Burst				Dry	Mud
Size	Grade	#/ft	Collapse	(Internal Yield)	Tensile	Coupling	Length	Weight	Weight
								98,100	
13.375"	J-55	54.5	1130 psi	2730 psi	514 kips	STC	1800'	lbs	8.5 ppg

Collapse:  $DF_c = 1.25$ 

**Base Assumptions** 

- Complete internal evacuation of the casing, utilizing a collapse force equivalent to the mud gradient (0.44 psi/ft) in which the casing will be ran.
- Cementing operations in which, utilizes a collapse force equivalent to the gradient of the planned cement slurry (0.77 psi/ft) and an internal force equivalent to the fresh water displacement fluid (0.433 psi/ft).

Collapse Calculations: Collapse Rating / Collapse Force

Complete Evacuation: 1,130psi / [(0.44psi/ft)(1,800')] = **1.42** 

Cementing Operations: 1,130psi / [(0.77psi/ft - 0.433psi/ft)(1800')] = **1.86** 

# Burst: $DF_B = 1.25$

#### Base Assumption

• Casing pressure test as per Onshore Oil and Gas Order No. 2 (0.22 psi/ft or 1500 psi), utilizing an external force equivalent to the mud gradient (0.44 psi/ft) in which the casing will be ran.

Burst Calculations: Internal Yield Rating / Internal Force

Casing Pressure Test: 2,730psi / [(1500psi)-(0.44 psi/ft)(1,800')] = **3.86** 

### Tensile: $DF_T = 1.6$

#### **Base Assumption**

• A downward force of 100,000 lb. overpull is applied at the base of the casing along with the weight and not considering the effects of buoyancy.

Tensile Calculations: Joint Strength / Axial Load

*Overpull:* 514 kips / (100,000 lbs. + 98,100 lbs.) = **2.59** 

# Intermediate Casing

				Burst				Dry	
Size	Grade	#/ft	Collapse	(Internal Yield)	Tensile	Coupling	Length	Weight	Mud Weight
9.625"	J-55	40	2570 psi	3950 psi	520 kips	LTC	4000'	160,000 lb	10.0 ppg
9.625"	HCK-55	40	4230 psi	3950 psi	694 kips	LTC	1600'	64,000 lb	10.0 ppg

### Collapse: $DF_c = 1.25$

**Base Assumptions** 

- Complete internal evacuation of the casing, utilizing a collapse force equivalent to the mud gradient (0.52 psi/ft) in which the casing will be ran.
- Cementing operations in which, utilizes a collapse force equivalent to the gradient of the planned cement slurry (0.77 psi/ft) and an internal back-up force equivalent to the fresh water displacement fluid (0.433 psi/ft).

Collapse Calculations: Collapse Rating / Collapse Force

Complete Evacuation: J-55: 2570psi / [(0.52psi/ft)(4,000')] = **1.25** HCK-55: 4230psi / [(0.52psi/ft)(5,600')] = **1.45** 

Cementing Operations: J-55: 2570psi / [(0.77psi/ft - 0.433psi/ft)(4000')] = **1.91** HCK-55: 4230psi / [(0.77psi/ft - 0.433psi/ft)(5600')] = **2.24** 

### Burst: $DF_B = 1.25$

**Base Assumption** 

- Casing pressure test as per Onshore Oil and Gas Order No. 2 (0.22 psi/ft or 1500 psi), utilizing an internal force equivalent to the displacement fluid of 8.6 ppg and external force equivalent to 8.4 ppg.
- Gas kick at the casing shoe, in which a 0.7 psi/ft shoe test is assumed, and 0.2 psi/ft gas gradient is assumed.

Burst Calculations: Internal Yield Rating / Burst Force

```
Casing Pressure Test:

J-55: 3950psi / [(1500psi +1789 psi) - (1747psi)] = 2.56

HCK-55: 3950psi / [(1500psi +2504 psi) - (2446psi)] = 2.54

Gas Kick:

J-55: 3950psi / [(0.7psi/ft)(5600')-(0.2psi/ft)(5600')] = 1.41

HCK-55: 3950psi / [(0.7psi/ft)(5600')-(0.2psi/ft)(4000')] = 1.27
```

**Base Assumption** 

• A downward force of 100,000 lb. overpull is applied at the base of the casing along with the weight of the string and not considering the effects of buoyancy.

Tensile Calculations: Joint Strength / Axial Load

# **Production Casing**

	Burst							Dry				
Size	Grade	#/ft	Collapse	(Internal Yield)	Tensile	Coupling	Length	Weight	Mud Weight			
5.5"	P-110	20	11080 psi	12360 psi	641 kips	BTC	18,300'	366,000 lb	9.1 ppg			

### Collapse: $DF_c = 1.25$

**Base Assumptions** 

- Cementing operations in which utilizes a collapse force equivalent to the gradient of the planned cement slurry (0.77 psi/ft) and an internal back-up force equivalent to the fresh water displacement fluid (0.433 psi/ft).
- Production operations in which the pipe is completely evacuated with an external force equivalent to the pore pressure gradient (0.52 psi/ft).

Collapse Calculations: Collapse Rating / Collapse Force

Cementing Operations: 11,080psi / [(0.66psi/ft-0.433 psi/ft)(10,500'TVD)] = **3.13** 

Production Operations: 11080psi / (10,500' TVD)(0.52psi/ft) = **2.03** 

### Burst: $DF_B = 1.25$

**Base Assumption** 

- Frac pressure utilizing an internal force of 9500 psi along with a frac fluid gradient equivalent to 0.468 psi/ft and an external force equal to the minimum fluid gradient (0.433 psi/ft) in which the casing will be ran.
- Production operations in which the casing is completely filled with a gas equivalent gradient of 0.2 psi/ft and an external force equivalent to pore pressure of 0.5 psi/ft.

Burst Calculations: Internal Yield Rating / Burst Force

Frac Pressure: 12,360psi / [(9500 psi)+ (0.468 – 0.433psi/ft)(10,500'TVD)] = **1.28** 

Production Operations: 12,360psi / [(0.5 psi/ft - 0.2 psi/ft)(10,500'TVD)] = **3.92** 

### Tensile: $DF_T = 1.6$

Base Assumption

• A downward force of 100,000 lb. overpull is applied at the base of the casing along with the weight of the string and considering the effects of buoyancy (factor =0.86).

Tensile Calculations: Joint Strength / Axial Load

Overpull: 641,000 lbs /[(100,000 lbs.) + (366,000 lbs.)(0.86)] = **1.6** 

Surface Co	asing							•	*
				Burst				Dry	Mud
Size	Grade	#/ft	Collapse	(Internal Yield)	Tensile	Coupling	Length	Weight	Weight
								98,100	
13.375"	J-55	54.5	1130 psi	2730 psi	514 kips	STC	1800'	lbs	8.5 ppg

Collapse:  $DF_c = 1.25$ 

**Base Assumptions** 

- Complete internal evacuation of the casing, utilizing a collapse force equivalent to the mud gradient (0.44 psi/ft) in which the casing will be ran.
- Cementing operations in which, utilizes a collapse force equivalent to the gradient of the planned cement slurry (0.77 psi/ft) and an internal force equivalent to the fresh water displacement fluid (0.433 psi/ft).

Collapse Calculations: Collapse Rating / Collapse Force

Complete Evacuation: 1,130psi / [(0.44psi/ft)(1,800')] = **1.42** 

Cementing Operations: 1,130psi / [(0.77psi/ft – 0.433psi/ft)(1800')] = **1.86** 

Burst:  $DF_B = 1.25$ 

**Base Assumption** 

• Casing pressure test as per Onshore Oil and Gas Order No. 2 (0.22 psi/ft or 1500 psi), utilizing an external force equivalent to the mud gradient (0.44 psi/ft) in which the casing will be ran.

Burst Calculations: Internal Yield Rating / Internal Force

Casing Pressure Test: 2,730psi / [(1500psi)-(0.44 psi/ft)(1,800')] = **3.86** 

### Tensile: $DF_T = 1.6$

#### **Base Assumption**

• A downward force of 100,000 lb. overpull is applied at the base of the casing along with the weight and not considering the effects of buoyancy.

Tensile Calculations: Joint Strength / Axial Load

*Overpull:* 514 kips / (100,000 lbs. + 98,100 lbs.) = **2.59** 

# Intermediate Casing

				Burst				Dry	
Size	Grade	#/ft	Collapse	(Internal Yield)	Tensile	Coupling	Length	Weight	Mud Weight
9.625"	J-55	40	2570 psi	3950 psi	520 kips	LTC	4000'	160,000 lb	10.0 ppg
9.625"	НСК-55	40	4230 psi	3950 psi	694 kips	LTC	1600'	64,000 lb	10.0 ppg

### Collapse: $DF_c = 1.25$

**Base Assumptions** 

- Complete internal evacuation of the casing, utilizing a collapse force equivalent to the mud gradient (0.52 psi/ft) in which the casing will be ran.
- Cementing operations in which, utilizes a collapse force equivalent to the gradient of the planned cement slurry (0.77 psi/ft) and an internal back-up force equivalent to the fresh water displacement fluid (0.433 psi/ft).

Collapse Calculations: Collapse Rating / Collapse Force

Complete Evacuation: J-55: 2570psi / [(0.52psi/ft)(4,000')] = **1.25** HCK-55: 4230psi / [(0.52psi/ft)(5,600')] = **1.45** 

Cementing Operations: J-55: 2570psi / [(0.77psi/ft - 0.433psi/ft)(4000')] = **1.91** HCK-55: 4230psi / [(0.77psi/ft - 0.433psi/ft)(5600')] = **2.24** 

### Burst: $DF_B = 1.25$

**Base Assumption** 

- Casing pressure test as per Onshore Oil and Gas Order No. 2 (0.22 psi/ft or 1500 psi), utilizing an internal force equivalent to the displacement fluid of 8.6 ppg and external force equivalent to 8.4 ppg.
- Gas kick at the casing shoe, in which a 0.7 psi/ft shoe test is assumed, and 0.2 psi/ft gas gradient is assumed.

Burst Calculations: Internal Yield Rating / Burst Force

```
Casing Pressure Test:

J-55: 3950psi / [(1500psi +1789 psi) - (1747psi)] = 2.56

HCK-55: 3950psi / [(1500psi +2504 psi) - (2446psi)] = 2.54

Gas Kick:

J-55: 3950psi / [(0.7psi/ft)(5600')-(0.2psi/ft)(5600')] = 1.41

HCK-55: 3950psi / [(0.7psi/ft)(5600')-(0.2psi/ft)(4000')] = 1.27
```

**Base Assumption** 

• A downward force of 100,000 lb. overpull is applied at the base of the casing along with the weight of the string and not considering the effects of buoyancy.

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Tensile Calculations: Joint Strength / Axial Load

# **Production Casing**

					Dry				
Size	Grade	#/ft	Collapse	(Internal Yield)	Tensile	Coupling	Length	Weight	Mud Weight
5.5"	P-110	20	11080 psi	12360 psi	641 kips	BTC	18,300'	366,000 lb	9.1 ppg

### Collapse: $DF_c = 1.25$

**Base Assumptions** 

- Cementing operations in which utilizes a collapse force equivalent to the gradient of the planned cement slurry (0.77 psi/ft) and an internal back-up force equivalent to the fresh water displacement fluid (0.433 psi/ft).
- Production operations in which the pipe is completely evacuated with an external force equivalent to the pore pressure gradient (0.52 psi/ft).

Collapse Calculations: Collapse Rating / Collapse Force

Cementing Operations: 11,080psi / [(0.66psi/ft-0.433 psi/ft)(10,500'TVD)] = **3.13** 

Production Operations: 11080psi / (10,500' TVD)(0.52psi/ft) = **2.03** 

### Burst: $DF_B = 1.25$

**Base Assumption** 

- Frac pressure utilizing an internal force of 9500 psi along with a frac fluid gradient equivalent to 0.468 psi/ft and an external force equal to the minimum fluid gradient (0.433 psi/ft) in which the casing will be ran.
- Production operations in which the casing is completely filled with a gas equivalent gradient of 0.2 psi/ft and an external force equivalent to pore pressure of 0.5 psi/ft.

Burst Calculations: Internal Yield Rating / Burst Force

*Frac Pressure:* 12,360psi / [(9500 psi)+ (0.468 - 0.433psi/ft)(10,500'TVD)] = **1.28** 

Production Operations: 12,360psi / [(0.5 psi/ft - 0.2 psi/ft)(10,500'TVD)] = **3.92** 

### Tensile: $DF_T = 1.6$

Base Assumption

• A downward force of 100,000 lb. overpull is applied at the base of the casing along with the weight of the string and considering the effects of buoyancy (factor =0.86).

Tensile Calculations: Joint Strength / Axial Load

Overpull: 641,000 lbs /[(100,000 lbs.) + (366,000 lbs.)(0.86)] = **1.6** 

Surface C	<u>asing</u>								·
				Burst				Dry	Mud
Size	Grade	#/ft	Collapse	(Internal Yield)	Tensile	Coupling	Length	Weight	Weight
								98,100	
13.375"	J-55	54.5	1130 psi	2730 psi	514 kips	STC	1800'	lbs	8.5 ppg

Collapse:  $DF_c = 1.25$ 

**Base Assumptions** 

- Complete internal evacuation of the casing, utilizing a collapse force equivalent to the mud gradient (0.44 psi/ft) in which the casing will be ran.
- Cementing operations in which, utilizes a collapse force equivalent to the gradient of the planned cement slurry (0.77 psi/ft) and an internal force equivalent to the fresh water displacement fluid (0.433 psi/ft).

Collapse Calculations: Collapse Rating / Collapse Force

Complete Evacuation: 1,130psi / [(0.44psi/ft)(1,800')] = **1.42** 

Cementing Operations: 1,130psi / [(0.77psi/ft – 0.433psi/ft)(1800')] = **1.86** 

Burst:  $DF_B = 1.25$ 

Base Assumption

• Casing pressure test as per Onshore Oil and Gas Order No. 2 (0.22 psi/ft or 1500 psi), utilizing an external force equivalent to the mud gradient (0.44 psi/ft) in which the casing will be ran.

Burst Calculations: Internal Yield Rating / Internal Force

Casing Pressure Test: 2,730psi / [(1500psi)-(0.44 psi/ft)(1,800')] = **3.86** 

### Tensile: $DF_T = 1.6$

**Base Assumption** 

• A downward force of 100,000 lb. overpull is applied at the base of the casing along with the weight and not considering the effects of buoyancy.

Tensile Calculations: Joint Strength / Axial Load

*Overpull:* 514 kips / (100,000 lbs. + 98,100 lbs.) = **2.59** 

# Intermediate Casing

				Burst				Dry	
Size	Grade	#/ft	Collapse	(Internal Yield)	Tensile	Coupling	Length	Weight	Mud Weight
9.625"	J-55	40	2570 psi	3950 psi	520 kips	LTC	4000'	160,000 lb	10.0 ppg
9.625"	HCK-55	40	4230 psi	3950 psi	694 kips	LTC	1600'	64,000 lb	10.0 ppg

### Collapse: $DF_c = 1.25$

**Base Assumptions** 

- Complete internal evacuation of the casing, utilizing a collapse force equivalent to the mud gradient (0.52 psi/ft) in which the casing will be ran.
- Cementing operations in which, utilizes a collapse force equivalent to the gradient of the planned cement slurry (0.77 psi/ft) and an internal back-up force equivalent to the fresh water displacement fluid (0.433 psi/ft).

Collapse Calculations: Collapse Rating / Collapse Force

Complete Evacuation: J-55: 2570psi / [(0.52psi/ft)(4,000')] = **1.25** HCK-55: 4230psi / [(0.52psi/ft)(5,600')] = **1.45** 

Cementing Operations: J-55: 2570psi / [(0.77psi/ft - 0.433psi/ft)(4000')] = **1.91** HCK-55: 4230psi / [(0.77psi/ft - 0.433psi/ft)(5600')] = **2.24** 

### Burst: $DF_B = 1.25$

Base Assumption

- Casing pressure test as per Onshore Oil and Gas Order No. 2 (0.22 psi/ft or 1500 psi), utilizing an internal force equivalent to the displacement fluid of 8.6 ppg and external force equivalent to 8.4 ppg.
- Gas kick at the casing shoe, in which a 0.7 psi/ft shoe test is assumed, and 0.2 psi/ft gas gradient is assumed.

Burst Calculations: Internal Yield Rating / Burst Force

```
Casing Pressure Test:

J-55: 3950psi / [(1500psi +1789 psi) - (1747psi)] = 2.56

HCK-55: 3950psi / [(1500psi +2504 psi) - (2446psi)] = 2.54

Gas Kick:

J-55: 3950psi / [(0.7psi/ft)(5600')-(0.2psi/ft)(5600')] = 1.41

HCK-55: 3950psi / [(0.7psi/ft)(5600')-(0.2psi/ft)(4000')] = 1.27
```

**Base Assumption** 

• A downward force of 100,000 lb. overpull is applied at the base of the casing along with the weight of the string and not considering the effects of buoyancy.

Tensile Calculations: Joint Strength / Axial Load

# Production Casing

				Burst			Dry			
Size	Grade	#/ft	Collapse	(Internal Yield)	Tensile	Coupling	Length	Weight	Mud Weight	
5.5"	P-110	20	11080 psi	12360 psi	641 kips	BTC	18,300'	366,000 lb	9.1 ppg	

### Collapse: $DF_c = 1.25$

**Base Assumptions** 

- Cementing operations in which utilizes a collapse force equivalent to the gradient of the planned cement slurry (0.77 psi/ft) and an internal back-up force equivalent to the fresh water displacement fluid (0.433 psi/ft).
- Production operations in which the pipe is completely evacuated with an external force equivalent to the pore pressure gradient (0.52 psi/ft).

Collapse Calculations: Collapse Rating / Collapse Force

Cementing Operations: 11,080psi / [(0.66psi/ft-0.433 psi/ft)(10,500'TVD)] = **3.13** 

Production Operations: 11080psi / (10,500' TVD)(0.52psi/ft) = **2.03** 

### Burst: $DF_B = 1.25$

**Base Assumption** 

- Frac pressure utilizing an internal force of 9500 psi along with a frac fluid gradient equivalent to 0.468 psi/ft and an external force equal to the minimum fluid gradient (0.433 psi/ft) in which the casing will be ran.
- Production operations in which the casing is completely filled with a gas equivalent gradient of 0.2 psi/ft and an external force equivalent to pore pressure of 0.5 psi/ft.

Burst Calculations: Internal Yield Rating / Burst Force

*Frac Pressure:* 12,360psi / [(9500 psi)+ (0.468 – 0.433psi/ft)(10,500'TVD)] = **1.28** 

Production Operations: 12,360psi / [(0.5 psi/ft – 0.2 psi/ft)(10,500'TVD)] = **3.92** 

### Tensile: $DF_T = 1.6$

**Base Assumption** 

• A downward force of 100,000 lb. overpull is applied at the base of the casing along with the weight of the string and considering the effects of buoyancy (factor =0.86).

Tensile Calculations: Joint Strength / Axial Load

Overpull: 641,000 lbs /[(100,000 lbs.) + (366,000 lbs.)(0.86)] = **1.6** 

Surface C	asing								+
				Burst				Dry	Mud
Size	Grade	#/ft	Collapse	(Internal Yield)	Tensile	Coupling	Length	Weight	Weight
								98,100	
13.375"	J-55	54.5	1130 psi	2730 psi	514 kips	STC	1800'	lbs	8.5 ppg

Collapse:  $DF_c = 1.25$ 

**Base Assumptions** 

- Complete internal evacuation of the casing, utilizing a collapse force equivalent to the mud gradient (0.44 psi/ft) in which the casing will be ran.
- Cementing operations in which, utilizes a collapse force equivalent to the gradient of the planned cement slurry (0.77 psi/ft) and an internal force equivalent to the fresh water displacement fluid (0.433 psi/ft).

Collapse Calculations: Collapse Rating / Collapse Force

Complete Evacuation: 1,130psi / [(0.44psi/ft)(1,800')] = **1.42** 

Cementing Operations: 1,130psi / [(0.77psi/ft – 0.433psi/ft)(1800')] = **1.86** 

Burst:  $DF_B = 1.25$ 

Base Assumption

• Casing pressure test as per Onshore Oil and Gas Order No. 2 (0.22 psi/ft or 1500 psi), utilizing an external force equivalent to the mud gradient (0.44 psi/ft) in which the casing will be ran.

Burst Calculations: Internal Yield Rating / Internal Force

Casing Pressure Test: 2,730psi / [(1500psi)-(0.44 psi/ft)(1,800')] = **3.86** 

### Tensile: $DF_T = 1.6$

Base Assumption

• A downward force of 100,000 lb. overpull is applied at the base of the casing along with the weight and not considering the effects of buoyancy.

Tensile Calculations: Joint Strength / Axial Load

*Overpull:* 514 kips / (100,000 lbs. + 98,100 lbs.) = **2.59** 

# Intermediate Casing

				Burst				Dry	
Size	Grade	#/ft	Collapse	(Internal Yield)	Tensile	Coupling	Length	Weight	Mud Weight
9.625"	J-55	40	2570 psi	3950 psi	520 kips	LTC	4000'	160,000 lb	10.0 ppg
9.625"	HCK-55	40	4230 psi	3950 psi	694 kips	LTC	1600'	64,000 lb	10.0 ppg

### Collapse: $DF_c = 1.25$

**Base Assumptions** 

- Complete internal evacuation of the casing, utilizing a collapse force equivalent to the mud gradient (0.52 psi/ft) in which the casing will be ran.
- Cementing operations in which, utilizes a collapse force equivalent to the gradient of the planned cement slurry (0.77 psi/ft) and an internal back-up force equivalent to the fresh water displacement fluid (0.433 psi/ft).

Collapse Calculations: Collapse Rating / Collapse Force

Complete Evacuation: J-55: 2570psi / [(0.52psi/ft)(4,000')] = **1.25** HCK-55: 4230psi / [(0.52psi/ft)(5,600')] = **1.45** 

Cementing Operations: J-55: 2570psi / [(0.77psi/ft - 0.433psi/ft)(4000')] = **1.91** HCK-55: 4230psi / [(0.77psi/ft - 0.433psi/ft)(5600')] = **2.24** 

## Burst: $DF_B = 1.25$

**Base Assumption** 

- Casing pressure test as per Onshore Oil and Gas Order No. 2 (0.22 psi/ft or 1500 psi), utilizing an internal force equivalent to the displacement fluid of 8.6 ppg and external force equivalent to 8.4 ppg.
- Gas kick at the casing shoe, in which a 0.7 psi/ft shoe test is assumed, and 0.2 psi/ft gas gradient is assumed.

Burst Calculations: Internal Yield Rating / Burst Force

```
Casing Pressure Test:

J-55: 3950psi / [(1500psi +1789 psi) - (1747psi)] = 2.56

HCK-55: 3950psi / [(1500psi +2504 psi) - (2446psi)] = 2.54

Gas Kick:

J-55: 3950psi / [(0.7psi/ft)(5600')-(0.2psi/ft)(5600')] = 1.41

HCK-55: 3950psi / [(0.7psi/ft)(5600')-(0.2psi/ft)(4000')] = 1.27
```

**Base Assumption** 

• A downward force of 100,000 lb. overpull is applied at the base of the casing along with the weight of the string and not considering the effects of buoyancy.

Tensile Calculations: Joint Strength / Axial Load

# **Production Casing**

				Burst				Dry	
Size	Grade	#/ft	Collapse	(Internal Yield)	Tensile	Coupling	Length	Weight	Mud Weight
5.5"	P-110	20	11080 psi	12360 psi	641 kips	BTC	17,600'	352,000 lb	9.1 ppg

### Collapse: $DF_c = 1.25$

**Base Assumptions** 

- Cementing operations in which utilizes a collapse force equivalent to the gradient of the planned cement slurry (0.77 psi/ft) and an internal back-up force equivalent to the fresh water displacement fluid (0.433 psi/ft).
- Production operations in which the pipe is completely evacuated with an external force equivalent to the pore pressure gradient (0.52 psi/ft).

Collapse Calculations: Collapse Rating / Collapse Force

Cementing Operations: 11,080psi / [(0.66psi/ft-0.433 psi/ft)(9,800'TVD)] = **4.98** 

Production Operations: 11080psi / (9,800' TVD)(0.52psi/ft) = **2.17** 

### Burst: $DF_B = 1.25$

**Base Assumption** 

- Frac pressure utilizing an internal force of 9500 psi along with a frac fluid gradient equivalent to 0.468 psi/ft and an external force equal to the minimum fluid gradient (0.433 psi/ft) in which the casing will be ran.
- Production operations in which the casing is completely filled with a gas equivalent gradient of 0.2 psi/ft and an external force equivalent to pore pressure of 0.5 psi/ft.

Burst Calculations: Internal Yield Rating / Burst Force

Frac Pressure: 12,360psi / [(9500 psi)+ (0.468 – 0.433psi/ft)(9,800'TVD)] = **1.26** 

Production Operations: 12,360psi / [(0.5 psi/ft – 0.2 psi/ft)(9,800'TVD)] = **4.2** 

### Tensile: $DF_T = 1.6$

Base Assumption

• A downward force of 100,000 lb. overpull is applied at the base of the casing along with the weight of the string and considering the effects of buoyancy (factor =0.86).

Tensile Calculations: Joint Strength / Axial Load

Overpull: 641,000 lbs /[(100,000 lbs.) + (352,000 lbs.)(0.86)] = **1.6** 

Surface C	asing								*
Size	Grade	#/ft	Collapse	Burst (Internal Yield)	Tensile	Coupling	Length	Dry Weight	Mud Weight
								98,100	
13.375"	J-55	54.5	1130 psi	2730 psi	514 kips	STC	1800'	lbs	8.5 ppg

Collapse:  $DF_c = 1.25$ 

Base Assumptions

- Complete internal evacuation of the casing, utilizing a collapse force equivalent to the mud gradient (0.44 psi/ft) in which the casing will be ran.
- Cementing operations in which, utilizes a collapse force equivalent to the gradient of the planned cement slurry (0.77 psi/ft) and an internal force equivalent to the fresh water displacement fluid (0.433 psi/ft).

Collapse Calculations: Collapse Rating / Collapse Force

Complete Evacuation: 1,130psi / [(0.44psi/ft)(1,800')] = **1.42** 

Cementing Operations: 1,130psi / [(0.77psi/ft – 0.433psi/ft)(1800')] = **1.86** 

Burst:  $DF_B = 1.25$ 

Base Assumption

• Casing pressure test as per Onshore Oil and Gas Order No. 2 (0.22 psi/ft or 1500 psi), utilizing an external force equivalent to the mud gradient (0.44 psi/ft) in which the casing will be ran.

Burst Calculations: Internal Yield Rating / Internal Force

Casing Pressure Test: 2,730psi / [(1500psi)-(0.44 psi/ft)(1,800')] = **3.86** 

### Tensile: $DF_T = 1.6$

Base Assumption

• A downward force of 100,000 lb. overpull is applied at the base of the casing along with the weight and not considering the effects of buoyancy.

Tensile Calculations: Joint Strength / Axial Load

Overpull: 514 kips / (100,000 lbs. + 98,100 lbs.) = **2.59** 

# Intermediate Casing

				Burst				Dry	
Size	Grade	#/ft	Collapse	(Internal Yield)	Tensile	Coupling	Length	Weight	Mud Weight
9.625"	J-55	40	2570 psi	3950 psi	520 kips	LTC	4000'	160,000 lb	10.0 ppg
9.625"	HCK-55	40	4230 psi	3950 psi	694 kips	LTC	1600'	64,000 lb	10.0 ppg

# Collapse: $DF_c = 1.25$

**Base Assumptions** 

- Complete internal evacuation of the casing, utilizing a collapse force equivalent to the mud gradient (0.52 psi/ft) in which the casing will be ran.
- Cementing operations in which, utilizes a collapse force equivalent to the gradient of the planned cement slurry (0.77 psi/ft) and an internal back-up force equivalent to the fresh water displacement fluid (0.433 psi/ft).

Collapse Calculations: Collapse Rating / Collapse Force

Complete Evacuation: J-55: 2570psi / [(0.52psi/ft)(4,000')] = **1.25** HCK-55: 4230psi / [(0.52psi/ft)(5,600')] = **1.45** 

Cementing Operations: J-55: 2570psi / [(0.77psi/ft - 0.433psi/ft)(4000')] = **1.91** HCK-55: 4230psi / [(0.77psi/ft - 0.433psi/ft)(5600')] = **2.24** 

### Burst: $DF_B = 1.25$

**Base Assumption** 

- Casing pressure test as per Onshore Oil and Gas Order No. 2 (0.22 psi/ft or 1500 psi), utilizing an internal force equivalent to the displacement fluid of 8.6 ppg and external force equivalent to 8.4 ppg.
- Gas kick at the casing shoe, in which a 0.7 psi/ft shoe test is assumed, and 0.2 psi/ft gas gradient is assumed.

Burst Calculations: Internal Yield Rating / Burst Force

Casing Pressure Test: J-55: 3950psi / [(1500psi +1789 psi) - (1747psi)] = **2.56** HCK-55: 3950psi / [(1500psi +2504 psi) - (2446psi)] = **2.54** Gas Kick: J-55: 3950psi / [(0.7psi/ft)(5600')-(0.2psi/ft)(5600')] = **1.41** HCK-55: 3950psi / [(0.7psi/ft)(5600')-(0.2psi/ft)(4000')] = **1.27** 

**Base Assumption** 

• A downward force of 100,000 lb. overpull is applied at the base of the casing along with the weight of the string and not considering the effects of buoyancy.

4 4

Tensile Calculations: Joint Strength / Axial Load

# **Production Casing**

				Burst		Dry			
Size	Grade	#/ft	Collapse	(Internal Yield)	Tensile	Coupling	Length	Weight	Mud Weight
5.5"	P-110	20	11080 psi	12360 psi	641 kips	BTC	17,600'	352,000 lb	9.1 ppg

### Collapse: $DF_c = 1.25$

**Base Assumptions** 

- Cementing operations in which utilizes a collapse force equivalent to the gradient of the planned cement slurry (0.77 psi/ft) and an internal back-up force equivalent to the fresh water displacement fluid (0.433 psi/ft).
- Production operations in which the pipe is completely evacuated with an external force equivalent to the pore pressure gradient (0.52 psi/ft).

Collapse Calculations: Collapse Rating / Collapse Force

Cementing Operations: 11,080psi / [(0.66psi/ft-0.433 psi/ft)(9,800'TVD)] = **4.98** 

Production Operations: 11080psi / (9,800' TVD)(0.52psi/ft) = **2.17** 

#### Burst: $DF_B = 1.25$

**Base Assumption** 

- Frac pressure utilizing an internal force of 9500 psi along with a frac fluid gradient equivalent to 0.468 psi/ft and an external force equal to the minimum fluid gradient (0.433 psi/ft) in which the casing will be ran.
- Production operations in which the casing is completely filled with a gas equivalent gradient of 0.2 psi/ft and an external force equivalent to pore pressure of 0.5 psi/ft.

Burst Calculations: Internal Yield Rating / Burst Force

*Frac Pressure:* 12,360psi / [(9500 psi)+ (0.468 – 0.433psi/ft)(9,800'TVD)] = **1.26** 

Production Operations: 12,360psi / [(0.5 psi/ft – 0.2 psi/ft)(9,800'TVD)] = **4.2** 

### Tensile: $DF_T = 1.6$

Base Assumption

• A downward force of 100,000 lb. overpull is applied at the base of the casing along with the weight of the string and considering the effects of buoyancy (factor =0.86).

Tensile Calculations: Joint Strength / Axial Load

Overpull: 641,000 lbs /[(100,000 lbs.) + (352,000 lbs.)(0.86)] = **1.6** 

Surfa	ce Casing							•	•
				Burst				Dry	Mud
Size	e Grade	e #/ft	Collapse	(Internal Yield)	Tensile	Coupling	Length	Weight	Weight
								98,100	
13.37	'5" J-55	54.5	1130 psi	2730 psi	514 kips	STC	1800'	lbs	8.5 ppg

Collapse:  $DF_c = 1.25$ 

**Base Assumptions** 

- Complete internal evacuation of the casing, utilizing a collapse force equivalent to the mud gradient (0.44 psi/ft) in which the casing will be ran.
- Cementing operations in which, utilizes a collapse force equivalent to the gradient of the planned cement slurry (0.77 psi/ft) and an internal force equivalent to the fresh water displacement fluid (0.433 psi/ft).

Collapse Calculations: Collapse Rating / Collapse Force

Complete Evacuation: 1,130psi / [(0.44psi/ft)(1,800')] = **1.42** 

Cementing Operations: 1,130psi / [(0.77psi/ft – 0.433psi/ft)(1800')] = **1.86** 

Burst:  $DF_B = 1.25$ 

#### **Base Assumption**

• Casing pressure test as per Onshore Oil and Gas Order No. 2 (0.22 psi/ft or 1500 psi), utilizing an external force equivalent to the mud gradient (0.44 psi/ft) in which the casing will be ran.

Burst Calculations: Internal Yield Rating / Internal Force

Casing Pressure Test: 2,730psi / [(1500psi)-(0.44 psi/ft)(1,800')] = **3.86** 

### Tensile: $DF_T = 1.6$

**Base Assumption** 

• A downward force of 100,000 lb. overpull is applied at the base of the casing along with the weight and not considering the effects of buoyancy.

Tensile Calculations: Joint Strength / Axial Load

*Overpull:* 514 kips / (100,000 lbs. + 98,100 lbs.) = **2.59** 

# Intermediate Casing

				Burst				Dry	
Size	Grade	#/ft	Collapse	(Internal Yield)	Tensile	Coupling	Length	Weight	Mud Weight
9.625"	J-55	40	2570 psi	3950 psi	520 kips	LTC	4000'	160,000 lb	10.0 ppg
9.625"	HCK-55	40	4230 psi	3950 psi	694 kips	LTC	1600'	64,000 lb	10.0 ppg

### Collapse: $DF_c = 1.25$

**Base Assumptions** 

- Complete internal evacuation of the casing, utilizing a collapse force equivalent to the mud gradient (0.52 psi/ft) in which the casing will be ran.
- Cementing operations in which, utilizes a collapse force equivalent to the gradient of the planned cement slurry (0.77 psi/ft) and an internal back-up force equivalent to the fresh water displacement fluid (0.433 psi/ft).

Collapse Calculations: Collapse Rating / Collapse Force

Complete Evacuation: J-55: 2570psi / [(0.52psi/ft)(4,000')] = **1.25** HCK-55: 4230psi / [(0.52psi/ft)(5,600')] = **1.45** 

Cementing Operations: J-55: 2570psi / [(0.77psi/ft - 0.433psi/ft)(4000')] = **1.91** HCK-55: 4230psi / [(0.77psi/ft - 0.433psi/ft)(5600')] = **2.24** 

### Burst: $DF_B = 1.25$

**Base Assumption** 

- Casing pressure test as per Onshore Oil and Gas Order No. 2 (0.22 psi/ft or 1500 psi), utilizing an internal force equivalent to the displacement fluid of 8.6 ppg and external force equivalent to 8.4 ppg.
- Gas kick at the casing shoe, in which a 0.7 psi/ft shoe test is assumed, and 0.2 psi/ft gas gradient is assumed.

Burst Calculations: Internal Yield Rating / Burst Force

Casing Pressure Test: J-55: 3950psi / [(1500psi +1789 psi) - (1747psi)] = **2.56** HCK-55: 3950psi / [(1500psi +2504 psi) - (2446psi)] = **2.54** Gas Kick: J-55: 3950psi / [(0.7psi/ft)(5600')-(0.2psi/ft)(5600')] = **1.41** HCK-55: 3950psi / [(0.7psi/ft)(5600')-(0.2psi/ft)(4000')] = **1.27** 

**Base Assumption** 

• A downward force of 100,000 lb. overpull is applied at the base of the casing along with the weight of the string and not considering the effects of buoyancy.

Tensile Calculations: Joint Strength / Axial Load

				Burst				Dry	
Size	Grade	#/ft	Collapse	(Internal Yield)	Tensile	Coupling	Length	Weight	Mud Weight
5.5"	P-110	20	11080 psi	12360 psi	641 kips	BTC	17,600'	352,000 lb	9.1 ppg

1

### Collapse: $DF_c = 1.25$

**Base Assumptions** 

- Cementing operations in which utilizes a collapse force equivalent to the gradient of the planned cement slurry (0.77 psi/ft) and an internal back-up force equivalent to the fresh water displacement fluid (0.433 psi/ft).
- Production operations in which the pipe is completely evacuated with an external force equivalent to the pore pressure gradient (0.52 psi/ft).

Collapse Calculations: Collapse Rating / Collapse Force

Cementing Operations: 11,080psi / [(0.66psi/ft-0.433 psi/ft)(9,800'TVD)] = **4.98** 

Production Operations: 11080psi / (9,800' TVD)(0.52psi/ft) = **2.17** 

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Burst Calculations: Internal Yield Rating / Burst Force

Frac Pressure: 12,360psi / [(9500 psi)+ (0.468 – 0.433psi/ft)(9,800'TVD)] = **1.26** 

Production Operations: 12,360psi / [(0.5 psi/ft – 0.2 psi/ft)(9,800'TVD)] = **4.2** 

### Tensile: $DF_T = 1.6$

Base Assumption

• A downward force of 100,000 lb. overpull is applied at the base of the casing along with the weight of the string and considering the effects of buoyancy (factor =0.86).

Tensile Calculations: Joint Strength / Axial Load

Overpull: 641,000 lbs /[(100,000 lbs.) + (352,000 lbs.)(0.86)] = **1.6** 

Surface C	<u>asing</u>							•	•
Size	Grade	#/ft	Collapse	Burst (Internal Yield)	Tensile	Coupling	Length	Dry Weight	Mud Weight
								98,100	
13.375"	J-55	54.5	1130 psi	2730 psi	514 kips	STC	1800'	lbs	8.5 ppg

Collapse:  $DF_c = 1.25$ 

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Cementing Operations: 1,130psi / [(0.77psi/ft – 0.433psi/ft)(1800')] = **1.86** 

Burst:  $DF_B = 1.25$ 

**Base Assumption** 

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Burst Calculations: Internal Yield Rating / Internal Force

Casing Pressure Test: 2,730psi / [(1500psi)-(0.44 psi/ft)(1,800')] = **3.86** 

Tensile:  $DF_T = 1.6$ 

**Base Assumption** 

 A downward force of 100,000 lb. overpull is applied at the base of the casing along with the weight and not considering the effects of buoyancy.

Tensile Calculations: Joint Strength / Axial Load

*Overpull:* 514 kips / (100,000 lbs. + 98,100 lbs.) = **2.59** 

# Intermediate Casing

				Burst				Dry	
Size	Grade	#/ft	Collapse	(Internal Yield)	Tensile	Coupling	Length	Weight	Mud Weight
9.625"	J-55	40	2570 psi	3950 psi	520 kips	LTC	4000'	160,000 lb	10.0 ppg
9.625"	HCK-55	40	4230 psi	3950 psi	694 kips	LTC	1600'	64,000 lb	10.0 ppg

### Collapse: $DF_c = 1.25$

**Base Assumptions** 

- Complete internal evacuation of the casing, utilizing a collapse force equivalent to the mud gradient (0.52 psi/ft) in which the casing will be ran.
- Cementing operations in which, utilizes a collapse force equivalent to the gradient of the planned cement slurry (0.77 psi/ft) and an internal back-up force equivalent to the fresh water displacement fluid (0.433 psi/ft).

Collapse Calculations: Collapse Rating / Collapse Force

Complete Evacuation: J-55: 2570psi / [(0.52psi/ft)(4,000')] = **1.25** HCK-55: 4230psi / [(0.52psi/ft)(5,600')] = **1.45** 

Cementing Operations: J-55: 2570psi / [(0.77psi/ft - 0.433psi/ft)(4000')] = **1.91** HCK-55: 4230psi / [(0.77psi/ft - 0.433psi/ft)(5600')] = **2.24** 

### Burst: $DF_B = 1.25$

**Base Assumption** 

- Casing pressure test as per Onshore Oil and Gas Order No. 2 (0.22 psi/ft or 1500 psi), utilizing an internal force equivalent to the displacement fluid of 8.6 ppg and external force equivalent to 8.4 ppg.
- Gas kick at the casing shoe, in which a 0.7 psi/ft shoe test is assumed, and 0.2 psi/ft gas gradient is assumed.

Burst Calculations: Internal Yield Rating / Burst Force

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Casing Pressure Test:

J-55: 3950psi / [(1500psi +1789 psi) - (1747psi)] = 2.56

HCK-55: 3950psi / [(1500psi +2504 psi) - (2446psi)] = 2.54

Gas Kick:

J-55: 3950psi / [(0.7psi/ft)(5600')-(0.2psi/ft)(5600')] = 1.41

HCK-55: 3950psi / [(0.7psi/ft)(5600')-(0.2psi/ft)(4000')] = 1.27
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**Base Assumption** 

• A downward force of 100,000 lb. overpull is applied at the base of the casing along with the weight of the string and not considering the effects of buoyancy.

Tensile Calculations: Joint Strength / Axial Load



	<b> N</b>	<b>W</b>		
Interr	& Spec	est Hose cialty, Inc. <b>atic Test Certificate</b>		
General Informa	and the second se	Hose Specifications		
Customer	HOBBS	Hose Assembly Type	Rotary/Vibrator	
MWH Sales Representative	CHARLES ASH	Certification	API 7K/FSL LEVEL2	
Date Assembled	2/19/2017	Hose Grade	D	
Location Assembled	OKC	Hose Working Pressure	5000	
Sales Order #	318810	Hose Lot # and Date Code	10958-08/13	
Customer Purchase Order #	356945	Hose I.D. (Inches)	3.5"	
Assembly Serial # (Pick Ticket #)	384842	Hose O.D. (Inches)	5.45"	
Hose Assembly Length	20FT	Armor (yes/no)	NO	
and the second of	Fit	tings	and the second second	
End A		End	3	
Stem (Part and Revision #)	R3.5X64WB	Stem (Part and Revision #)	R3.5X64WB	
Stem (Heat #)	13105653	Stem (Heat #)	13105653	
Ferrule (Part and Revision #)	RF3.5X5330	Ferrule (Part and Revision #)	RF3.5X5330	
Ferrule (Heat #)	34038185	Ferrule (Heat #)	3403818	
Connection . Flange Hammer Union Part	4-1/16 5K	Connection (Part #)	4-1/16 5K	
Connection (Heat #)		Connection (Heat #)		
Nut (Part #)		Nut (Part #)		
Nut (Heat #)		Nut (Heat #)		
Dies Used	5.62"	Dies Used	5.53"	
And the state of the second state of the	Hydrostatic Te	est Requirements		
Test Pressure (psi)	7,500	Hose assembly was tested	with ambient water	
Test Pressure Hold Time (minutes)	10 1/2	tempera	temperature.	
Date Tested	Teste	d By	Approved By	
	0	use Dis Jan	and their	

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	Midw & Spec	est Hose cialty, Inc.		
	Certificate	of Conformity		
Customer: HOBBS		Customer P.O.# 356945		
Sales Order # 318810		Date Assembled: 2/19/2017		
	Speci	fications		
Hose Assembly Type:	Rotary/Vibrator	Rig #		
Assembly Serial #	384842	Hose Lot # and Date Code	10958-08/13	
Hose Working Pressure (psi)	5000	Test Pressure (psi)	7500	
Hose Assembly Description:		TRH56D-645KH-645KH-20.00' FT		
o the requirements of the pure Supplier: Midwest Hose & Specialty, Inc 3312 S I-35 Service Rd Dklahoma City, OK 73129	chase order and curren	or the referenced purchase orde nt industry standards.	r to be true according	
o the requirements of the pure Supplier: Midwest Hose & Specialty, Inc 8312 S I-35 Service Rd	chase order and curren		r to be true according	
o the requirements of the pure Supplier: Midwest Hose & Specialty, Inc 8312 S I-35 Service Rd	chase order and curren		r to be true accordi	

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U.S. Department of the Interior BUREAU OF LAND MANAGEMENT

APD ID: 10400026682 Operator Name: LEGACY RESERVES OPERATING LP	Submission Date: 01/31/2018	Highlighted data reflects the most recent changes
Well Name: LEA UNIT	Well Number: 64H	Show Final Text
Well Type: OIL WELL	Well Work Type: Drill	

# Section 1 - Existing Roads

Will existing roads be used? YES Existing Road Map: Vicinity\_Plat\_20180130085535.pdf

Existing Road Purpose: ACCESS, FLUID TRANSPORT

ROW ID(s)

ID:

Do the existing roads need to be improved? NO

**Existing Road Improvement Description:** 

**Existing Road Improvement Attachment:** 

Section 2 - New or Reconstructed Access Roads

Will new roads be needed? NO

Section 3 - Location of Existing Wells

Existing Wells Map? YES

Attach Well map:

Lea\_Unit\_64H\_Proximity\_Exhibit\_01\_16\_17\_20180130084716.pdf

Row(s) Exist? YES

SUPO Data Report

04/23/2018

Well Name: LEA UNIT

Well Number: 64H

Existing Wells description:

# Section 4 - Location of Existing and/or Proposed Production Facilities

### Submit or defer a Proposed Production Facilities plan? DEFER

**Estimated Production Facilities description:** In the event the well is found productive, a 4" surface poly flowline (125 psi with oil/gas/water) will be laid along the existing roadway, for 4239.1' to the satellite battery located in the SW/4NW/4 of section 12, T. 20S, R. 34E. All permanent (six months or longer) aboveground structures constructed or intalled on location and not subject to safety requirements will be painted to BLM specifications.

## Section 5 - Location and Types of Water Supply

## Water Source Table

Water source use type: INTERMEDIATE/PRODUCTION CASING, STIMULATION, SURFACE CASING Describe type:

Source latitude:

Source datum:

Water source permit type: WATER WELL

Source land ownership: PRIVATE

Water source transport method: TRUCKING

Source transportation land ownership: FEDERAL

Water source volume (barrels): 18000

Source volume (gal): 756000

### Water source and transportation map:

Water\_Transportation\_Plat\_20180130085438.pdf

Water source comments:

New water well? NO

## New Water Well Info

Well latitude:	Well Longitude:	Well datum:
Well target aquifer:		
Est. depth to top of aquifer(ft):	Est thickness of aquifer:	
Aquifer comments:		
Aquifer documentation:		
Well depth (ft):	Well casing type:	

Water source type: GW WELL

Source longitude:

Source volume (acre-feet): 2.3200758

Well Name: LEA UNIT

Well Number: 64H

Well casing outside diameter (in.):	Well casing inside diameter (in.):
New water well casing?	Used casing source:
Drilling method:	Drill material:
Grout material:	Grout depth:
Casing length (ft.):	Casing top depth (ft.):
Well Production type:	Completion Method:
Water well additional information:	
State appropriation permit:	

Additional information attachment:

# Section 6 - Construction Materials

**Construction Materials description:** CONSTRUCTION MATERIALS: CALICHE WILL BE USED TO CONSTRUCT THISWELL PAD Any construction material that may be required for surfacing of the drill pad will be from a contractor having a permitted source of materials within the general area. No construction materials will be removed from Federal lands without prior approval from the appropriate surface management agency. See attached for source information. **Construction Materials source location attachment:** 

Construciton\_Material\_Plat\_20180130085422.pdf

## Section 7 - Methods for Handling Waste

Waste type: DRILLING

Waste content description: Drilling fluids (flowback, water, cuttings)

Amount of waste: 20000 barrels

Waste disposal frequency : Daily

Safe containment description: Drilling fluids will be contained in steel mud tanks.

Safe containmant attachment:

Waste disposal type: HAUL TO COMMERCIAL Disposal location ownership: PRIVATE FACILITY

Disposal type description:

Disposal location description: NMOCD approved disposal site in Halfway, NM.

# **Reserve Pit**

Reserve Pit being used? NO

Temporary disposal of produced water into reserve pit?

Reserve pit length (ft.) Reserve pit width (ft.)

Reserve pit depth (ft.)

Reserve pit volume (cu. yd.)

Is at least 50% of the reserve pit in cut?

Well Name: LEA UNIT

Well Number: 64H

### **Reserve pit liner**

Reserve pit liner specifications and installation description

## **Cuttings Area**

Cuttings Area being used? NO Are you storing cuttings on location? NO

Description of cuttings location

Cuttings area length (ft.)

Cuttings area depth (ft.)

Cuttings area width (ft.)

uttings area depth (ft.)

Cuttings area volume (cu. yd.)

Is at least 50% of the cuttings area in cut?

WCuttings area liner

Cuttings area liner specifications and installation description

## **Section 8 - Ancillary Facilities**

Are you requesting any Ancillary Facilities?: NO Ancillary Facilities attachment:

Comments:

Section 9 - Well Site Layout

### Well Site Layout Diagram:

Rig\_4\_Schematic\_20180123121930.pdf 64H\_Pad\_Plat\_20180130085350.pdf Comments:

# Section 10 - Plans for Surface Reclamation

Type of disturbance: New Surface Disturbance

Multiple Well Pad Name: LEA UNIT

Multiple Well Pad Number: 62H

### Recontouring attachment:

**Drainage/Erosion control construction:** To mitigate erosion and protect the natural drainage areas, erosion control methods (e.g. cut and fill ratios of 3:1) will be implemented during the construction and production phases of this project. The slopes of the well pad may be reserved or replanted per agreement with the landowner. Erosion mitigation such as silt fences and hay bales will be located as necessary around the well pad.

Well Name: LEA UNIT

#### Well Number: 64H

**Drainage/Erosion control reclamation:** • The original landform will be restored for all disturbed areas including well pads, production facilities, roads, pipelines, and utility corridors. • A self-sustaining, vigorous, diverse, native (or otherwise approved) plant community will be established on the site, with a density sufficient to control erosion and invasion by non-native plants and to re-establish wildlife habitat or forage production. At a minimum, the established plant community will consist of species included in the seed mix and/or desirable species occurring in the surrounding natural vegetation. • Erosion features are equal to or less than surrounding area and erosion control is sufficient so that water naturally infiltrates into the soil and gullying, headcutting, slumping, and deep or excessive rills (greater than 3 inches) are not observed. • The site will be free of State- or county-listed noxious weeds, oil field debris and equipment, and contaminated soil. Invasive and non-native weeds are controlled.

Well pad proposed disturbance	Well pad interim reclamation (acres): 0 Well pad long term disturbance		
(acres): 1.03 Road proposed disturbance (acres): 0		(acres): 1.03 Road long term disturbance (acres): 0	
Powerline proposed disturbance (acres): 0 Pipeline proposed disturbance	Powerline interim reclamation (acres): 0 Pipeline interim reclamation (acres): 0	(acres): 0	
(acres): 0 Other proposed disturbance (acres): 0		(acres): 0 Other long term disturbance (acres): 0	
Total proposed disturbance: 1.03	Total interim reclamation: 0	Total long term disturbance: 1.03	

**Reconstruction method:** Final reclamation to achieve restoration of the original landform and a natural vegetative community. The original landform will be restored for all disturbed areas including well pads, production facilities, roads, pipelines, and utility corridors.

**Topsoil redistribution:** Topsoil will be redistributed after the well pad has been returned to original contours, or as close as practical.

Soil treatment: No soil treatment will be needed.

Existing Vegetation at the well pad:

Existing Vegetation at the well pad attachment:

**Existing Vegetation Community at the road:** 

Existing Vegetation Community at the road attachment:

Existing Vegetation Community at the pipeline:

Existing Vegetation Community at the pipeline attachment:

Existing Vegetation Community at other disturbances:

Existing Vegetation Community at other disturbances attachment:

Non native seed used? NO

Non native seed description:

Seedling transplant description:

Will seedlings be transplanted for this project? NO

Operator Name: LEGACY RESERVES OPERATING LP Well Name: LEA UNIT

Well Number: 64H

Seedling transplant description attachment:

Will seed be harvested for use in site reclamation? NO Seed harvest description: Seed harvest description attachment:

## **Seed Management**

Seed Table	
Seed type:	Seed source:
Seed name:	
Source name:	Source address:
Source phone:	
Seed cultivar:	
Seed use location:	
PLS pounds per acre:	Proposed seeding season:

Seed	Summary	Total pounds/Acre:
Seed Type	Pounds/Acre	

Seed reclamation attachment:

<b>Operator Contact/Respons</b>	ible Official Contact Info
First Name:	Last Name:
Phone:	Email:
Seedbed prep:	
Seed BMP:	
Seed method:	

Existing invasive species? NO

Existing invasive species treatment description:

Existing invasive species treatment attachment:

Weed treatment plan description: Weeds will be mowed regularly to prevent them from becoming dominant within the project area
Weed treatment plan attachment:

Well Name: LEA UNIT

#### Well Number: 64H

**Monitoring plan description:** The project location will be periodically monitored by Legacy Reserves Operating, LP's staff that are responsible for infrastructure maintenance. **Monitoring plan attachment:** 

Success standards: Develop sufficient plant and root coverage to maximize erosion and sediment control.

Pit closure description: No pit will be utilized for this project.

Pit closure attachment:

# Section 11 - Surface Ownership

Disturbance type: WELL PAD

Describe:

Surface Owner: PRIVATE OWNERSHIP

Other surface owner description:

**BIA Local Office:** 

**BOR Local Office:** 

**COE Local Office:** 

DOD Local Office:

NPS Local Office:

State Local Office:

Military Local Office:

**USFWS** Local Office:

**Other Local Office:** 

**USFS Region:** 

USFS Forest/Grassland:

**USFS Ranger District:** 

Well Number: 64H

 Fee Owner: Smith & Sons, Inc.
 Fee Owner Address: Box 1046 Eunice, NM 88231

 Phone: (575)390-2642
 Email:

 Surface use plan certification: YES
 Surface use plan certification document:

 Signed\_Affidavit\_of\_notification\_20180131115717.pdf
 Surface access agreement or bond: Agreement

 Surface Access Agreement Need description: A Surface Use Agreement has been established
 Surface Access Bond BLM or Forest Service:

 BLM Surface Access Bond number:
 USFS Surface access bond number:

# Section 12 - Other Information

Right of Way needed? NO ROW Type(s): Use APD as ROW?

**ROW Applications** 

SUPO Additional Information:

### Use a previously conducted onsite? YES

**Previous Onsite information:** ON-SITE PERFORMED ON 8/16/15 RESULTED IN PROPOSED LOCATION BEING OK WHERE STAKED. IT WAS AGREED TO TURN THE LOCATION TO A V-DOOR EAST. IT WAS ALSO AGREED TO MOVE AND PLACE THE TOP SOIL TO THE NORTH, AND THE INTERIM RECLAMATION WILL BE THE NORTH, EAST, SOUTH, AND WEST PORTION OF THIS PAD. PRESENT AT ON-SITE: CRAIG SPARKMAN-LEGACY RESERVES OPERATING, L.P. TRISH BADBEAR-BLM CASSANDRA BROOKS-BLM CHRISTOPHER FREEMAN-CEHMM DOUG BURGER-LEGACY LAND & ENVIRONMENTAL SOLUTIONS KELLY POINDEXTER-WEST COMPANY OF MIDLAND-SURVEYORS

## **Other SUPO Attachment**

Lea\_64H\_APD\_Payment\_Receipt\_20180130085804.pdf

<ul> <li>Section 3 - Unlined Pits</li> </ul>	
Would you like to utilize Unlined Pit PWD options? NO	
Produced Water Disposal (PWD) Location:	
PWD surface owner:	PWD disturbance (acres):
Unlined pit PWD on or off channel:	
Unlined pit PWD discharge volume (bbl/day):	
Unlined pit specifications:	
Precipitated solids disposal:	
Decribe precipitated solids disposal:	
Precipitated solids disposal permit:	
Unlined pit precipitated solids disposal schedule:	
Unlined pit precipitated solids disposal schedule attachment:	
Unlined pit reclamation description:	
Unlined pit reclamation attachment:	
Unlined pit Monitor description:	
Unlined pit Monitor attachment:	
Do you propose to put the produced water to beneficial use?	
Beneficial use user confirmation:	
Estimated depth of the shallowest aquifer (feet):	
Does the produced water have an annual average Total Dissoluthat of the existing water to be protected?	ved Solids (TDS) concentration equal to or less than
TDS lab results:	
Geologic and hydrologic evidence:	
State authorization:	
Unlined Produced Water Pit Estimated percolation:	
Unlined pit: do you have a reclamation bond for the pit?	
Is the reclamation bond a rider under the BLM bond?	
Unlined pit bond number:	
Unlined pit bond amount:	
Additional bond information attachment:	
Section 4 - Injection	
Would you like to utilize Injection PWD options? NO	
Produced Water Disposal (PWD) Location:	
PWD surface owner:	PWD disturbance (acres):
Injection PWD discharge volume (bbl/day):	
Injection well mineral owner:	

Injection well type: Injection well number: Assigned injection well API number? Injection well new surface disturbance (acres): Minerals protection information: Mineral protection attachment: Underground Injection Control (UIC) Permit? UIC Permit attachment:

# Section 5 - Surface Discharge

Would you like to utilize Surface Discharge PWD options? NO

Produced Water Disposal (PWD) Location: PWD surface owner: Surface discharge PWD discharge volume (bbl/day): Surface Discharge NPDES Permit? Surface Discharge NPDES Permit attachment: Surface Discharge site facilities information: Surface discharge site facilities map:

## Section 6 - Other

Would you like to utilize Other PWD options? NO

Produced Water Disposal (PWD) Location: PWD surface owner: Other PWD discharge volume (bbl/day): Other PWD type description: Other PWD type attachment: Have other regulatory requirements been met? Other regulatory requirements attachment:

### Injection well name:

### Injection well API number:

**PWD** disturbance (acres):

**PWD disturbance (acres):** 



## **Bond Information**

Federal/Indian APD: FED

BLM Bond number: NMB001015

**BIA Bond number:** 

Do you have a reclamation bond? NO

Is the reclamation bond a rider under the BLM bond?

Is the reclamation bond BLM or Forest Service?

BLM reclamation bond number:

Forest Service reclamation bond number:

Forest Service reclamation bond attachment:

Reclamation bond number:

**Reclamation bond amount:** 

**Reclamation bond rider amount:** 

Additional reclamation bond information attachment:





Section 1 - General

Would you like to address long-term produced water disposal? NO

# Section 2 - Lined Pits

Would you like to utilize Lined Pit PWD options? NO Produced Water Disposal (PWD) Location: PWD surface owner: Lined pit PWD on or off channel: Lined pit PWD discharge volume (bbl/day): Lined pit specifications: Pit liner description: Pit liner manufacturers information: Precipitated solids disposal: Decribe precipitated solids disposal: Precipitated solids disposal permit: Lined pit precipitated solids disposal schedule: Lined pit precipitated solids disposal schedule attachment: Lined pit reclamation description: Lined pit reclamation attachment: Leak detection system description: Leak detection system attachment: Lined pit Monitor description: Lined pit Monitor attachment: Lined pit: do you have a reclamation bond for the pit? Is the reclamation bond a rider under the BLM bond? Lined pit bond number: Lined pit bond amount: Additional bond information attachment:

PWD disturbance (acres):

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United States Department of the Interior Bureau of Land Management CARLSBAD FIELD OFFICE		Receipt
620 E. GREENE CARLSBAD, NM 88220 -6292 Phone: (575) 234-5972	No:	3756257
Transaction #: 3862137 Date of Transaction: 02/03/2017		

Date of Transaction: 02/05/2017	
CUSTOMER:	
LEGACY RESERVES OPERATING LP 303 W WALL ST STE 1800 MIDLAND,TX 79701-5106 US	

LINE #	QTY	DESCRIPTION	REMARKS	UNIT PRICE	TOTAL
1		OIL & GAS / APPLICATION FOR PERMIT TO DRILL (APD) / APD FEE	LEA UNIT 64H	9610.00	9610.00
			TO	TAL: \$	9,610.00

PAYMENT INFORMATION				
1	AMOUNT:	9610.00	POSTMARKED:	02/02/2017
	TYPE:	CHECK	RECEIVED:	02/03/2017
	CHECK NO:	1128181		
	NAME:	LEGACY RESERVES OPERATING LP		
		303 W WALL ST STE 1800		
MIDLAND TX 79701-5106 US				

REMARKS	

This receipt was generated by the automated BLM Collections and Billing System and is a paper representation of a portion of the official electronic record contained therein.