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Carlsbad Field Office
OCD Hobbs

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MAY 07 2018
RECEIVED

Form 3160-3
(March 2012)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

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

APPLICATION FOR PERMIT TO DRILL OR REENTER

5. Lease Serial No.: NMLC0065375A

6. If Indian, Allotee or Tribe Name:

1a. Type of work: ☑ DRILL ☐ REENTER

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

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

8. Lease Name and Well No.: LEA UNIT 64H (309802)

2. Name of Operator: LEGACY RESERVES OPERATING LP (240974)

9. API Well No.: 30-025- 44735

3a. Address: 303 West Wall St., Ste 1800 Midland TX 7970

3b. Phone No. *(include area code)*: (432)689-5287

10. Field and Pool, or Exploratory: LEA; BS SOUTH (37580)
~~WC-025 G-08 S203606D;~~
BS

4. Location of Well *(Report location clearly and in accordance with any State requirements.*)*

At surface: NWSE / 2270 FSL / 2619 FEL / LAT 32.5576144 / LONG -103.496537

At proposed prod. zone: NENW / 330 FNL / 2210 FWL / LAT 32.579491 / LONG -103.4979909

11. Sec., T. R. M. or Blk. and Survey or Area: SEC 19 / T20S / R35E / NMP

14. Distance in miles and direction from nearest town or post office*: 26 miles

12. County or Parish: LEA

13. State: NM

15. Distance from proposed* location to nearest property or lease line, ft. (Also to nearest drig. unit line, if any): 2619 feet

16. No. of acres in lease: 239.77

17. Spacing Unit dedicated to this well: 240

18. Distance from proposed location* to nearest well, drilling, completed, applied for, on this lease, ft.: 50 feet

19. Proposed Depth: 9800 feet / 17643 feet

20. BLM/BIA Bond No. on file: FED: NMB001015

21. Elevations (Show whether DF, KDB, RT, GL, etc.): 3689 feet

22. Approximate date work will start*: 03/30/2018

23. Estimated duration: 45 days

24. Attachments

The following, completed in accordance with the requirements of Onshore Oil and Gas Order No.1, must be attached to this form:

1. Well plat certified by a registered surveyor.
2. A Drilling Plan.
3. A Surface Use Plan (if the location is on National Forest System Lands, the SUPO must be filed with the appropriate Forest Service Office).
4. Bond to cover the operations unless covered by an existing bond on file (see Item 20 above).
5. Operator certification
6. Such other site specific information and/or plans as may be required by the BLM.

25. Signature	Name *(Printed/Typed)*	Date
(Electronic Submission)	Blayne Housh / Ph: (405)286-9326	01/31/2018
Title: Permitting Specialist		

Approved by *(Signature)*	Name *(Printed/Typed)*	Date
(Electronic Submission)	Cody Layton / Ph: (575)234-5959	04/16/2018
Title: Supervisor Multiple Resources	Office: CARLSBAD	

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

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

(Continued on page 2)

*(Instructions on page 2)

GCP Rec 05/07/18

APPROVED WITH CONDITIONS

Approval Date: 04/16/2018

KZ
05/09/18
MUST APPLY FOR DHC

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)

Additional Operator Remarks

Location of Well

1. 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: -103.497431 (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: -103.4979909 (TVD: 9800 feet, MD: 17643 feet)

BLM Point of Contact

Name: Priscilla Perez

Title: Legal Instruments Examiner

Phone: 5752345934

Email: pperez@blm.gov

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.

AFMSS

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

Application Data Report

04/23/2018

APD ID: 10400026682 **Submission Date:** 01/31/2018

Operator Name: LEGACY RESERVES OPERATING LP

Well Name: LEA UNIT **Well Number:** 64H

Well Type: OIL WELL **Well Work Type:** Drill

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 **Title:** Permitting Specialist

Federal/Indian APD: FED **Is the first lease penetrated for production Federal or Indian?** FED

Lease number: NMLC0065375A **Lease Acres:** 239.77

Surface access agreement in place? **Allotted?** **Reservation:**

Agreement in place? NO **Federal or Indian agreement:**

Agreement number:

Agreement name:

Keep application confidential? YES

Permitting Agent? YES **APD Operator:** LEGACY RESERVES OPERATING LP

Operator letter of designation: signed_Lea_Unit_64H_DOA_20180130125931.pdf

Operator Info

Operator Organization Name: LEGACY RESERVES OPERATING LP

Operator Address: 303 West Wall St., Ste 1800 **Zip:** 79701

Operator PO Box:

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

Operator Name: LEGACY RESERVES OPERATING LP

Well Name: LEA UNIT **Well Number:** 64H

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 UNIT **Number:** 62H

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

Well plat: UPDATED_LEA_UNIT_64H_C_102_PLAT_SIGNED_05_10_17_20180130071246.pdf

Agency_Lease_Plat_20180131135942.pdf

Well work start Date: 03/30/2018 **Duration:** 45 DAYS

Section 3 - Well Location Table

Survey Type: RECTANGULAR

Describe Survey Type:

Datum: NAD83 **Vertical Datum:** NAVD88

Survey number:

	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
SHL Leg #1	2270	FSL	2619	FEL	20S	35E	19	Aliquot NWSE	32.5576144	-103.496537	LEA	NEW MEXICO	NEW MEXICO	F	FEE	3689	0	0
KOP Leg #1	2270	FSL	2619	FEL	20S	35E	19	Aliquot NWSE	32.5576144	-103.496537	LEA	NEW MEXICO	NEW MEXICO	F	FEE	-5561	9250	9250
PPP Leg #1	2508	FNL	2387	FWL	20S	35E	19	Aliquot SWNE	32.55897	-103.497431	LEA	NEW MEXICO	NEW MEXICO	S	STATE	-6111	10127	9800

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	2328	FWL	20S	35E	18	Aliquot SESW	32.565861	-103.497622	LEA	NEW MEXICO	NEW MEXICO	F	NMLC0065375A	-6111	12694	9800
PPP Leg #1	1329	FNL	2234	FWL	20S	35E	18	Aliquot NENW	32.576747	-103.497923	LEA	NEW MEXICO	NEW MEXICO	F	NMLC0065375A	-6111	16655	9800
PPP Leg #1	2641	FSL	2266	FWL	20S	35E	18	Aliquot SENW	32.573118	-103.497823	LEA	NEW MEXICO	NEW MEXICO	F	NMLC0066147D	-6111	15335	9800
EXIT Leg #1	330	FNL	2210	FWL	20S	35E	18	Aliquot NENW	32.579491	-103.497909	LEA	NEW MEXICO	NEW MEXICO	F	NMLC0065375A	-6111	17643	9800
BHL Leg #1	330	FNL	2210	FWL	20S	35E	18	Aliquot NENW	32.579491	-103.497909	LEA	NEW MEXICO	NEW MEXICO	F	NMLC0065375A	-6111	17643	9800

LEGACY
RESERVES
303 W. Wall, Suite 1800 - Midland, Texas 79701
(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.

APD ID: 10400026682 **Submission Date:** 01/31/2018

Operator Name: LEGACY RESERVES OPERATING LP

Well Name: LEA UNIT **Well Number:** 64H

Well Type: OIL WELL **Well Work Type:** Drill

Highlighted data reflects the most recent changes

Show Final Text

Section 1 - Geologic Formations

Formation ID	Formation Name	Elevation	True Vertical Depth	Measured Depth	Lithologies	Mineral Resources	Producing Formation
1	MANZANITA	3663	0	0		USEABLE WATER	No
2	RUSTLER	1982	1680	1680		NONE	No
3	TOP SALT	1942	1720	1720	SALT	NONE	No
4	BOTTOM SALT	513	3150	3150	SALT	NONE	No
5	CAPITAN REEF	513	3150	3150		NONE	No
6	SAN ANDRES	-1047	4710	4710		NONE	No
7	DELAWARE SAND	-2004	5666	5666	SANDSTONE	NATURAL GAS,OIL	No
8	BONE SPRING LIME	-4542	8205	8205	LIMESTONE	NATURAL GAS,OIL	No
9	AVALON SAND	-5097	8760	8760	SANDSTONE	NATURAL GAS,OIL	No
10	BONE SPRING 1ST	-5838	9501	9510		NATURAL GAS,OIL	Yes

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:

Operator Name: LEGACY RESERVES OPERATING LP

Well Name: LEA UNIT **Well Number:** 64H

McVay_4_Choke_Manifold_Diagram_20180130090426.pdf

McVay_4_BOP_Schematic_20180130090433.pdf

Cameron_Conventional_3_String_Wellhead_Schematic_20180130090440.pdf

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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 section
Testing 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

Section 3 - Casing

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	INTERMEDIATE	12.25	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	INTERMEDIATE	12.25	9.625	NEW	API	N	3901	5600	3901	5600	-212	-1911	1699	HCK-55	40	LTC	1.45	1.27	DRY	4.23	DRY	4.23

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	PRODUCTION	8.75	5.5	NEW	API	N	0	17643	0	9800	3689	-13954	17643	P-110	20	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

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 lbs/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 lbs/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 lbs/sack LCM-1 +0.125 lbs/sk cello flake+ 0.005 lbs/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 lbs/sack LCM-1 +0.125 lbs/sk cello flake + 0.005 lbs/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

Operator Name: LEGACY RESERVES OPERATING LP

Well Name: LEA UNIT **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 (lbs/gal)	Max Weight (lbs/gal)	Density (lbs/cu ft)	Gel Strength (lbs/100 sqft)	PH	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	17643	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:

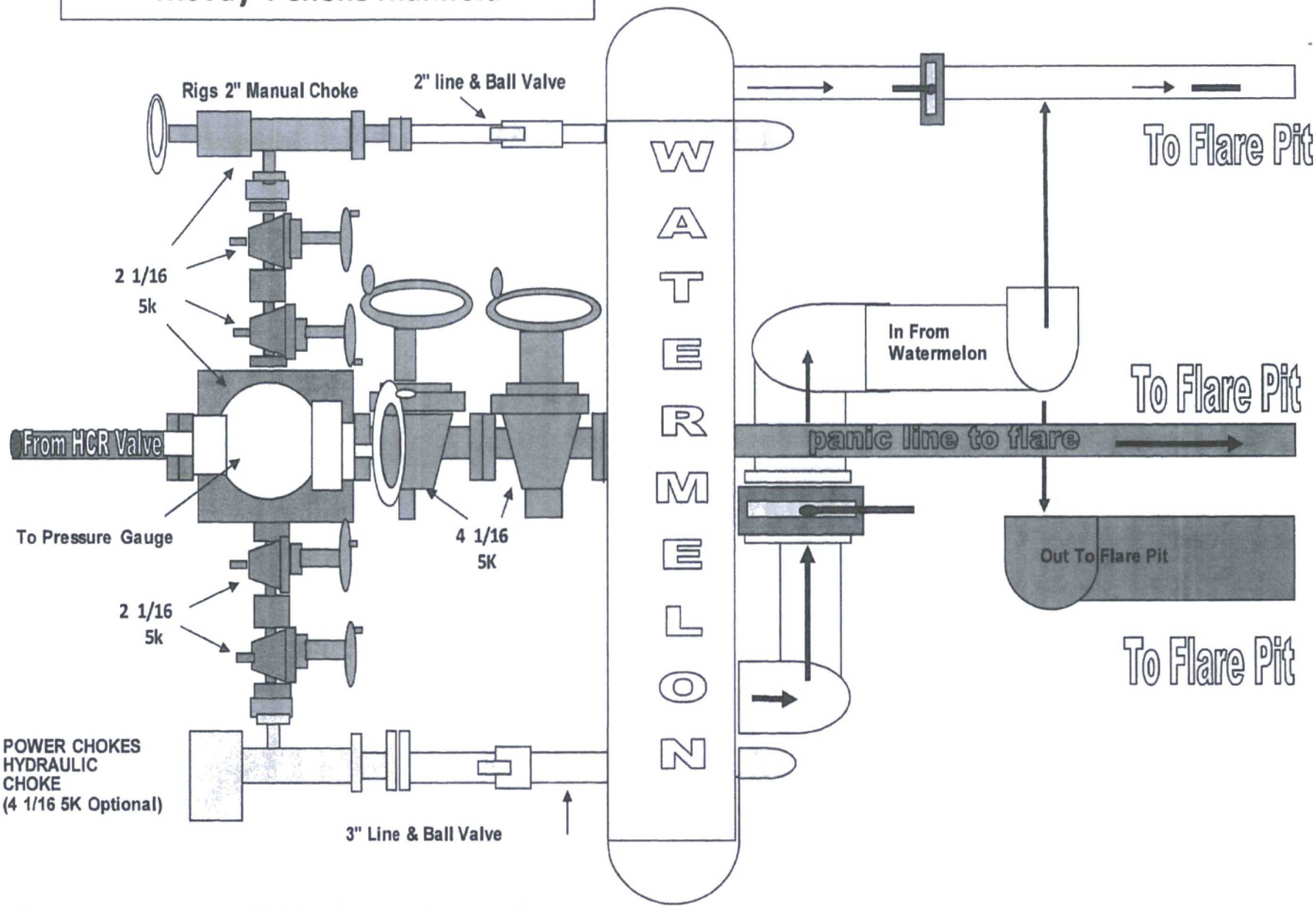
Other proposed operations facets attachment:

Lea_Unit_64H_Drilling_Plan_20180130084052.pdf
Lea_Unit__64H_GasCapturePlan_20180130084105.pdf

Other Variance attachment:

Flex_Hose_Specs_20180130134524.pdf

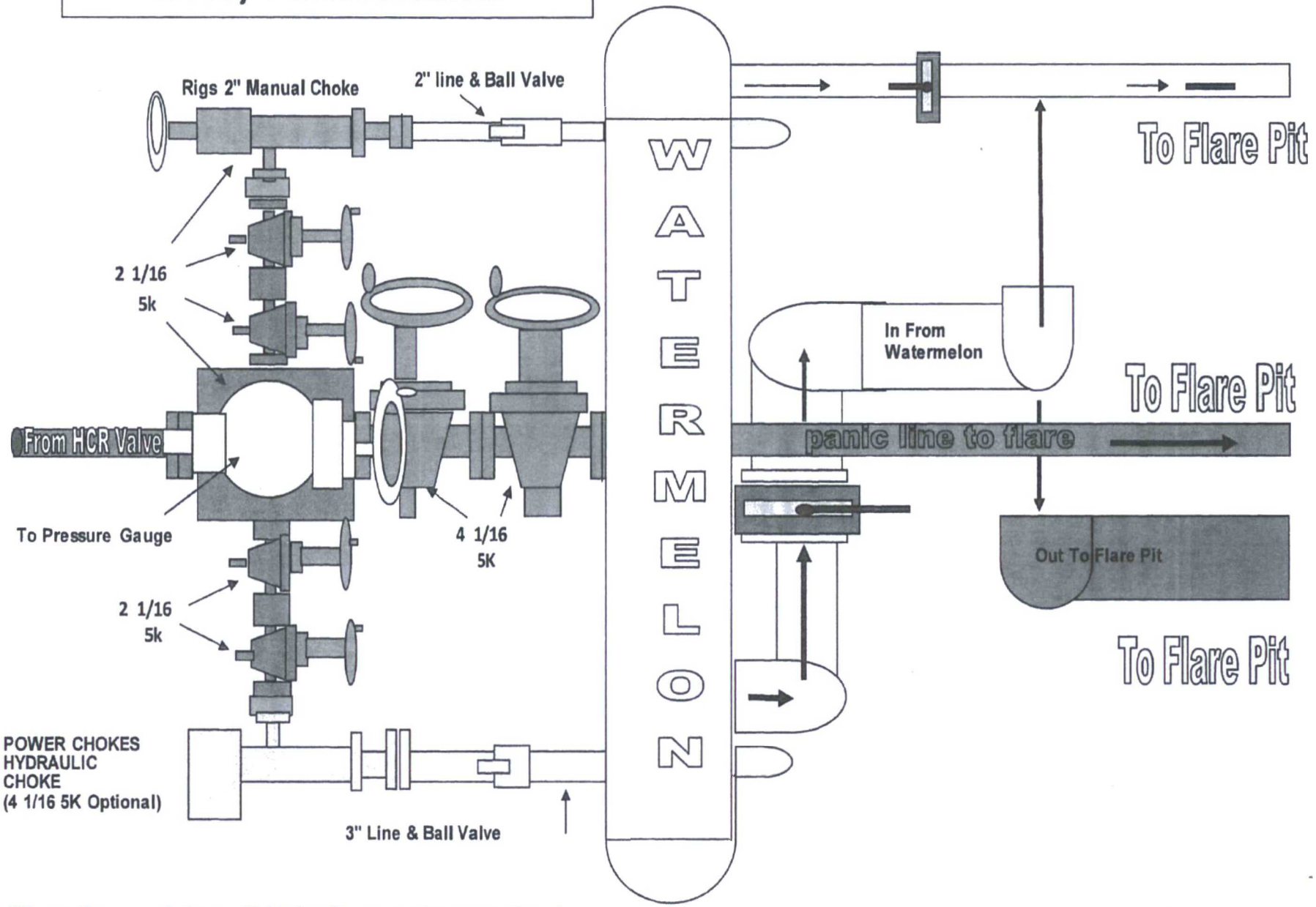
McVay 4 Choke Manifold



*We use the same choke manifolds for all aspects of our operations & all are rated to 10K;

* All connections downstream from BOP thru chokes Are Flanged, All connections downstream from chokes are Flanged .

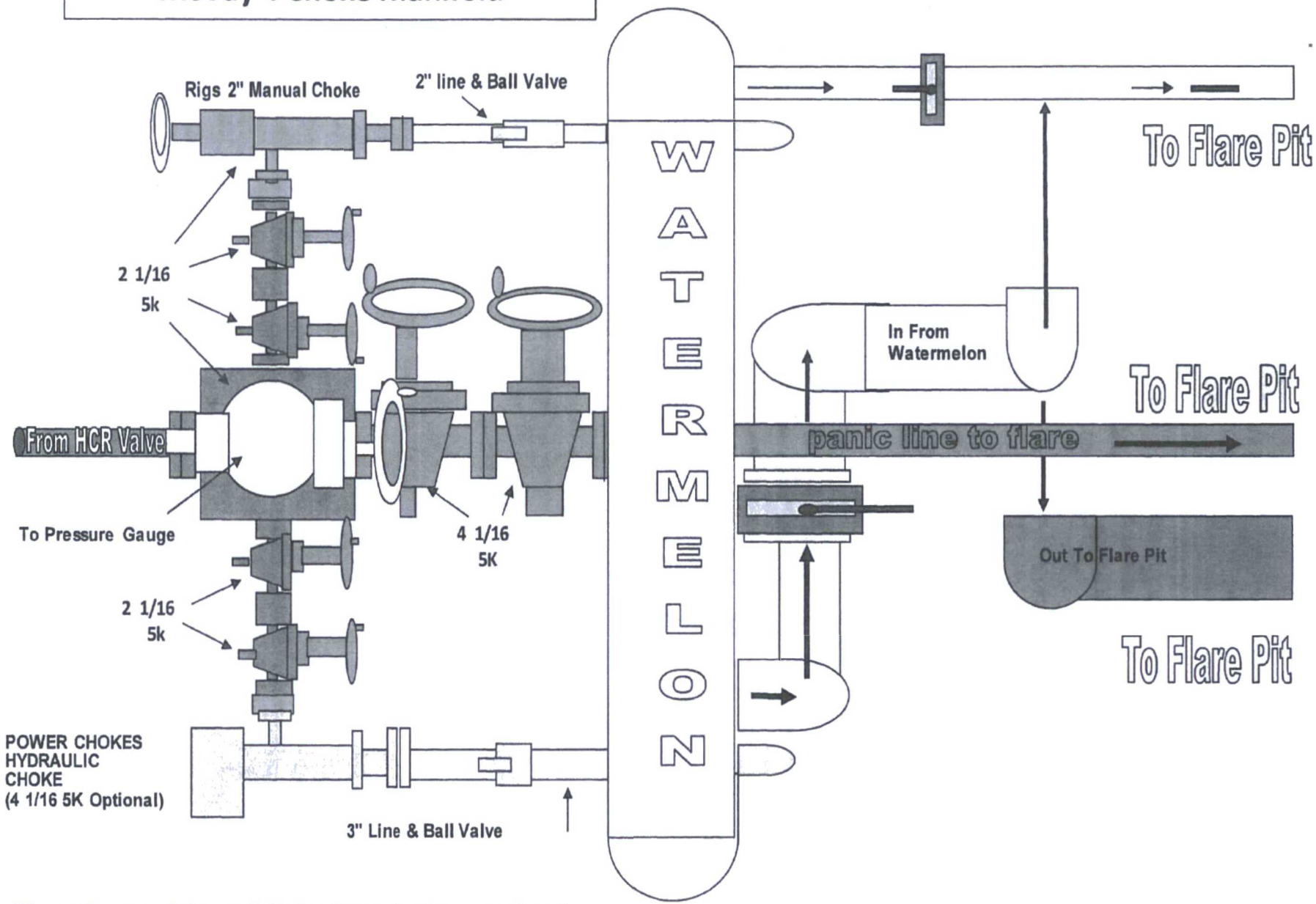
McVay 4 Choke Manifold



*We use the same choke manifolds for all aspects of our operations & all are rated to 10K;

* All connections downstream from BOP thru chokes Are Flanged, All connections downstream from chokes are Flanged .

McVay 4 Choke Manifold



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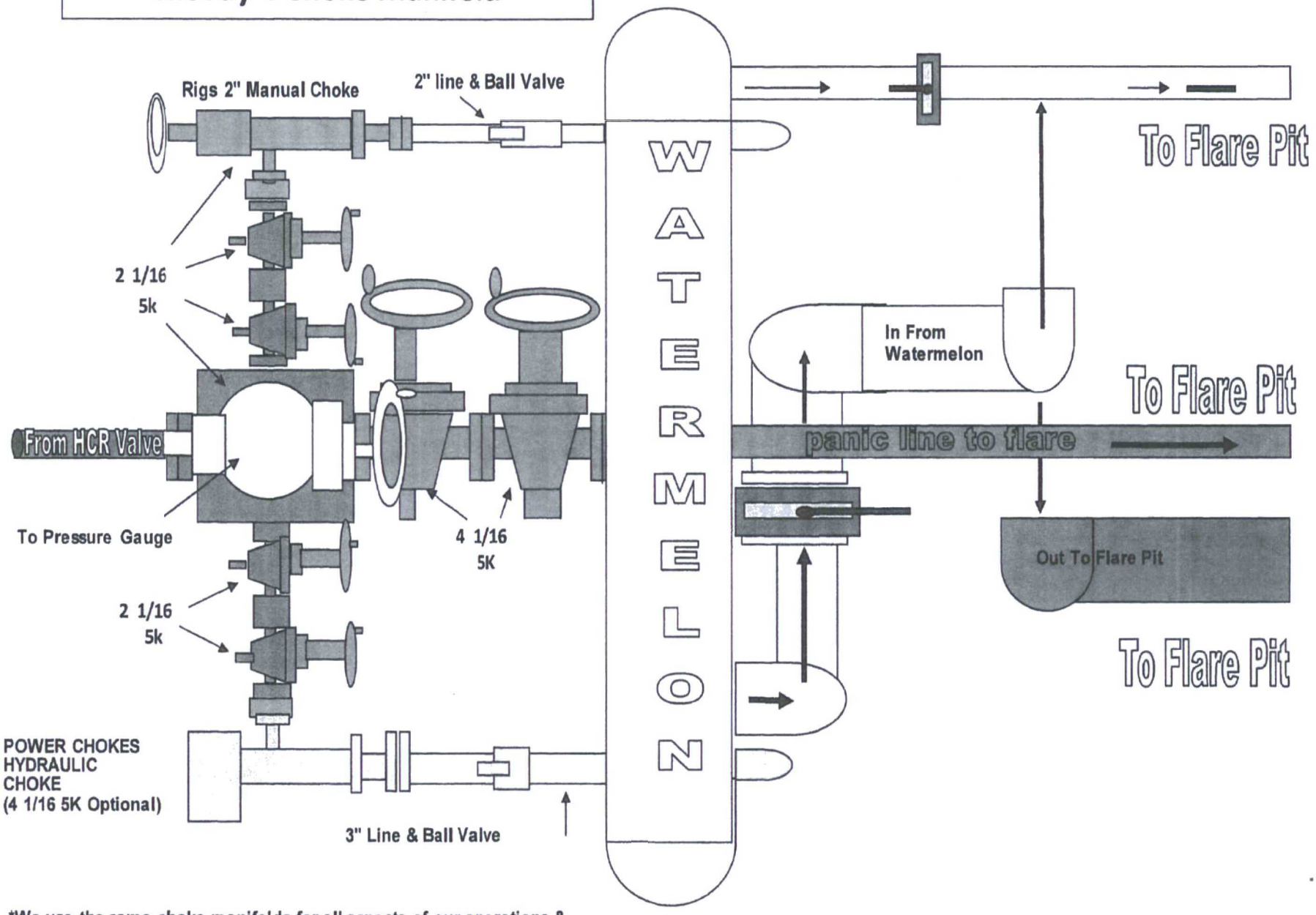
McVay 4 Choke Manifold



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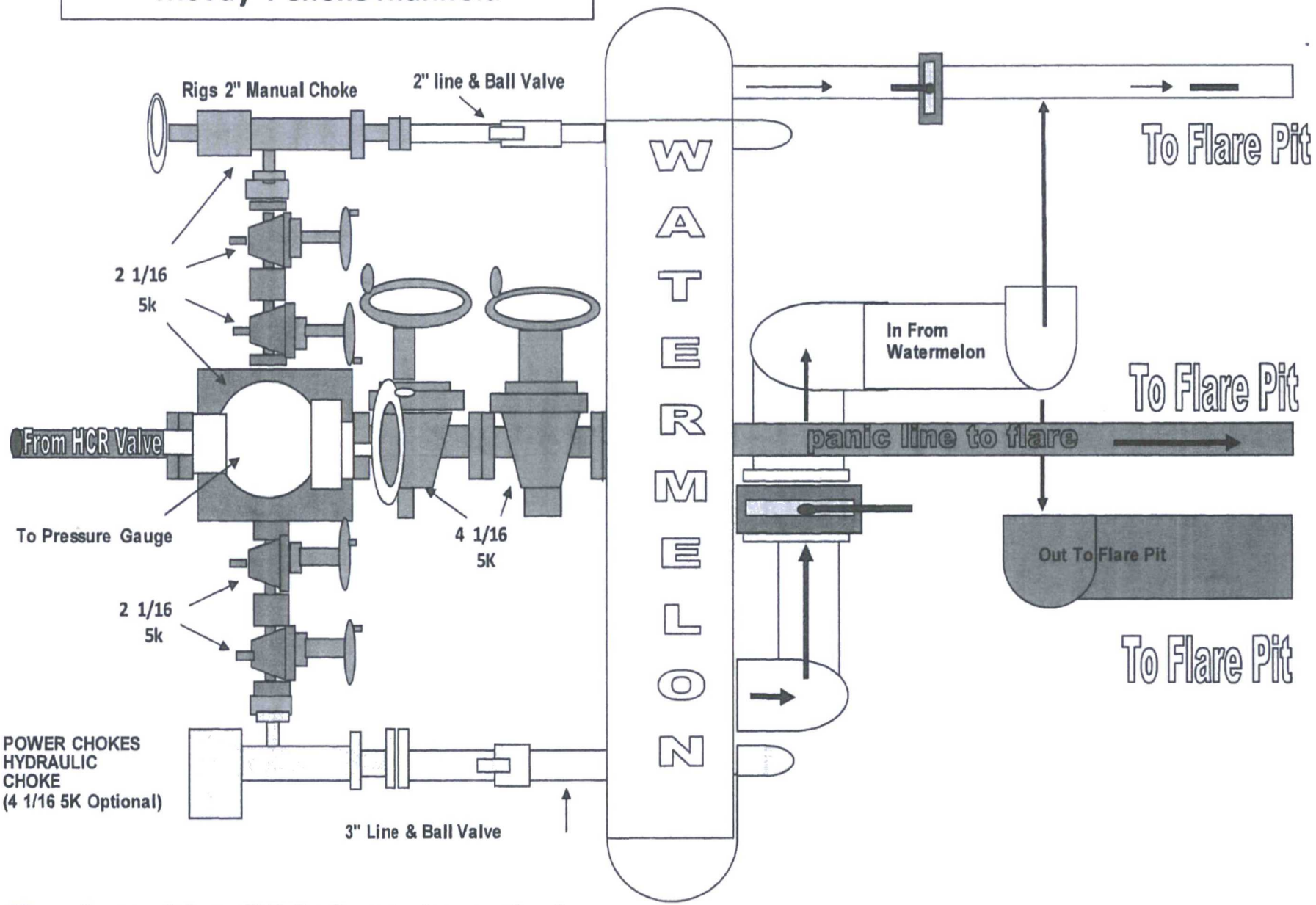
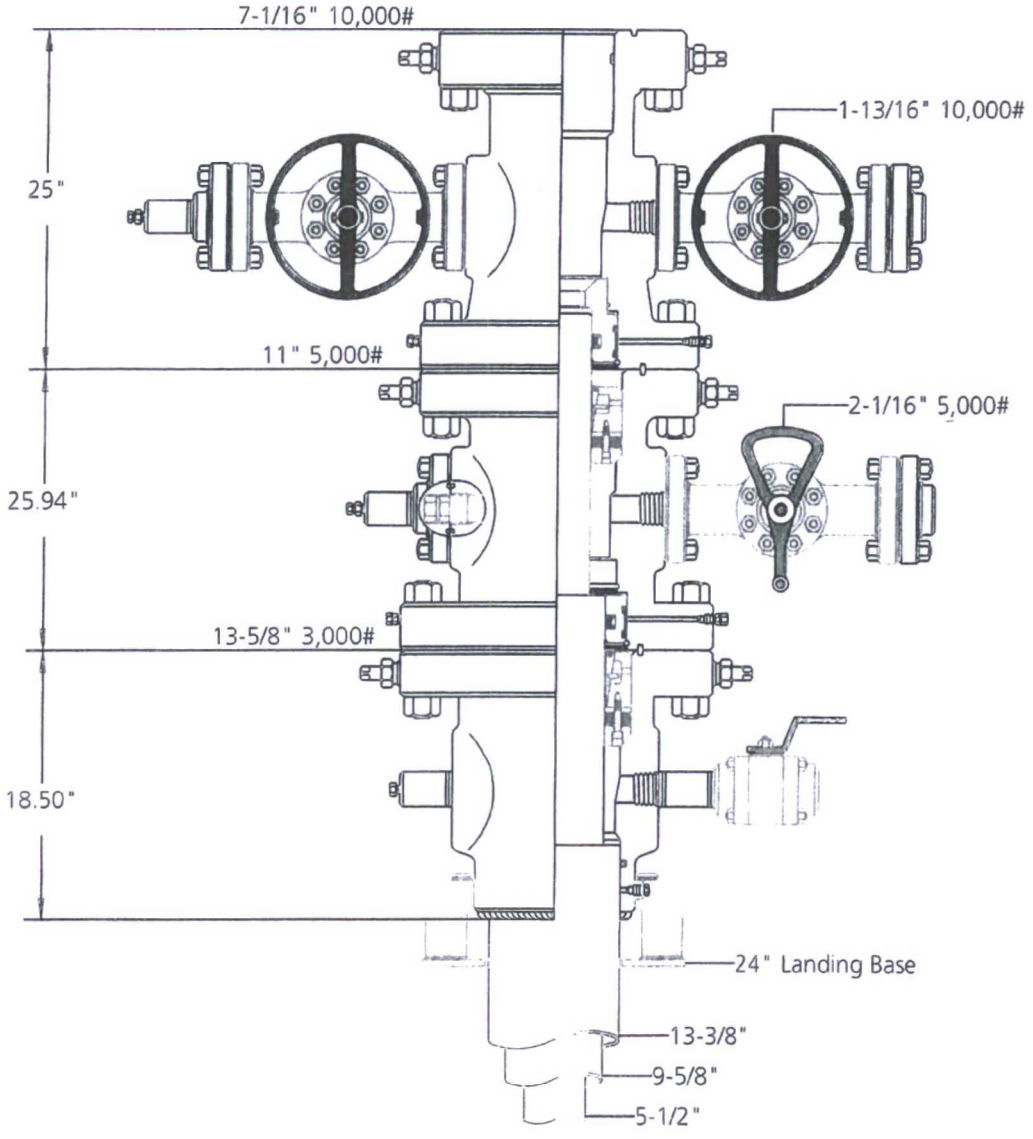
McVay 4 Choke Manifold



*We use the same choke manifolds for all aspects of our operations & all are rated to 10K;

* All connections downstream from BOP thru chokes Are Flanged, All connections downstream from chokes are Flanged .

Note: Dimensional information reflected on this drawing are estimated measurements only.



Legacy Reserves
Conventional 3- String

CAMERON

Name	Jeanette	Date	7-15-15	Working Pressure	#	1274616

CAMERON
A Schlumberger Company

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
EX-WORKS - ODESSA, TX

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

Ship To : 22039905
LEGACY RESERVES LP
303 W WALL STE 1400
MIDLAND TX 79701-5126
USA

Inside Sales Contact: Joycelyn M. FAILLA/713-469-7221 Email: joycelyn.failla@c-a-m.com
Outside Sales Contact: David Treece/432-337-5475 Email: david.treece@c-a-m.com

Customer Reference : 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"

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 BASE)	652 lb	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, 310C5, 3000 PSI (206 BAR) MOP, 2719 PSI (187 BAR) MOP AT MAX TEMP, CARBON STEEL BODY,	13 lb	1	EA	102.89	102.89

Item	Material Number Description	Extended Weight	Qty UM	Unit Net Price USD	Extended Price USD
	CARBON STEEL/CHR PLATED BALL, CARBON STEEL/ZINC PLATED STEM, ACETAL PLASTIC SEAT, WRENCH WITH LOCK DEVICE LESS LOCK, API 607, B16.34, -20 F (-29 C) - +220 F (+104 C), ADJUSTABLE STEM PACKING				
60	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				
100	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
110	621650-03 ASSY: STUD & NUTS, 1.375 X 10.750" LONG (B7 & 2H)	130 lb	20 EA	15.65	313.00
120	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
130	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
140	640518-10 'NX' BUSHING, 13-5/8 NOM X 9-5/8	16 lb	1 EA	1,454.59	1,454.59

Item	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 WP, W/1-1/2" VEE TUBING THD, API 6A 20TH ED/ISO 10423, MATL CLASS DD-NL	1 lb	1 EA	74.93	74.93
160	2737400-01-01 ASSEMBLY, AOP COMMERCIAL GATE VALVE, 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	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
180	007481-01 BULL PLUG, 2" LP, TAPPED 1/2" NPT, 3.75" LONG.	3 lb	1 EA	27.34	27.34
190	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

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/ INTERGRAL 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

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:

Total	Section A - CASING HEAD ASSY	4,274.16
Total	Section B - CASING SPOOL ASSY	10,161.74
Total	Section C - TUBING SPOOL	11,265.68

Price Summary :

Total Price :	**25,701.58 USD**
Total Quotation Price :	**25,701.58 USD**

****
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.

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 accordance with the terms and conditions of sale set forth herein. SELLER'S ACCEPTANCE OF THIS ORDER IS EXPRESSLY CONDITIONED ON BUYER'S ASSENT TO THE TERMS CONTAINED HEREIN. The terms and conditions of Seller's proposal (if any) and acknowledgement shall prevail over any conflicting or different terms in Buyer's order unless Buyer notifies Seller in writing of its objections thereto within fifteen (15) days from receipt of Seller's acknowledgement. Buyer's standard terms of purchase will not be considered a counteroffer to Seller's terms and conditions of sale. The failure of Seller to object to any provision in conflict herewith whether contained 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 at the time a quotation is made is subject to prior sale. Prices quoted are subject to change without notice. The price in effect at the time of shipment including any escalation formula will apply, unless a valid quotation or written agreement to the contrary exists between Buyer and Seller. All prices shown are in U.S. dollars and are F.O.B. Seller's shipping point. Seller reserves the right to place a service charge on past due accounts at the highest rate permitted by law. Any documentation pertaining to traceability requirements for raw materials or products or documentation required for any routine or special processes must be identified by the Buyer at the time of quotation (if any) or at the time of order placement.

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

4. SHIPPING SCHEDULE AND DELIVERY: Shipment schedules are given as accurately as conditions permit and every effort will be made to make shipments as scheduled. Seller will not be responsible for deviations in meeting shipping schedules nor for any losses or damages to Buyer (or any third party) occasioned by deviations in the shipping schedule, whether due to Acts of God, orders bearing priority ratings established pursuant to law, differences with workmen, local labor shortages, fire, flood, shortages or failure of raw materials, supplies, fuel, power or transportation, breakdown of equipment or any other causes beyond Seller's reasonable control, whether of similar or dissimilar nature than those enumerated. Seller shall have additional time within which to perform as may be reasonably necessary under the circumstances and shall have the right to apportion its production among its customers in such a manner as it may consider to be equitable. Seller reserves the right to furnish commercially equivalent or better substitutes for materials or to subcontract the Buyer's order or portions thereof as Seller deems necessary. In no event shall Seller be liable for any consequential damages resulting from failure or delay in shipment. If Buyer requires drawings, procedures, standards or similar material for approval, shipping schedules will be calculated from the time such approvals are received by Seller, since shipping schedules are based on Seller having all required information and a firm order from Buyer which is enterable into production. Any hold points, witness points or the need for inspection by Buyer's representatives must be identified by Buyer at the time of quotation (if any) and/or order placement in order that the effect on the prices or shipping schedules (if any) can be taken into account. Additional inspection or testing required by Buyer which affects normal production sequence will be considered as extending the shipping dates accordingly.

5. TERMS OF PAYMENT: Terms of payment are 30 days from date of invoice unless otherwise stated in the quotation or Seller's order acknowledgment.

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

7. WARRANTIES. Contractor warrants that goods of its manufacture shall be free from defects in materials and workmanship for a period of one (1) year after being placed in service or eighteen (18) months from delivery, whichever is earlier, when all such goods are used in the service and within the pressure range for which the goods were manufactured. In the case of products or parts not wholly of Contractor's manufacture, Contractor's liability shall be limited to the extent of its recovery from the manufacturer of such products or parts under its liability to Contractor. Parts subject to regular replacement due to operational wear are not covered by this warranty. In the event that Company discovers a defect in the manufactured goods within the warranty period specified above, Company shall notify Contractor of such defect and if in Contractor's sole judgment the product or repair does not conform or is found to be defective in material or workmanship, then, Company shall, at Contractor's request, return the part or product F.O.B. to Contractor's designated plant or service location. Contractor, at its option and expense, shall repair or replace the defective part or product, or repay to Company the full price paid by Company for such defective part, repair or product. Any repayment of purchase price shall be without interest. Company shall be responsible for any costs related to removal, transportation and re-installation of the defective part or goods. Contractor shall not be liable for any damages, claims, losses or expenses of Company resulting from such defects, recovery under general tort law or strict liability or for damages resulting from delays, loss of use, or other direct, indirect, incidental or consequential damages of any kind. Contractor will not be responsible for (i) failures of products which have been in any way tampered with or altered by anyone other than an authorized representative of Contractor, (ii) failures due to lack of compliance with recommended maintenance procedures, (iii) products which have been repaired or altered in such a way (in Contractor's judgment) as to affect the products adversely, or (iv) products requiring replacement due to normal wear and tear. EXCEPT FOR THE WARRANTIES EXPRESSLY STATED ABOVE, THERE ARE NO OTHER WARRANTIES AND NONE SHALL BE IMPLIED BY LAW INCLUDING THOSE OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

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

9. LABOR STANDARDS. Seller hereby certifies that these products were produced in accordance with all applicable requirements of Section 6, 7 and 12 of the Fair Labor Standards Act as amended and of regulations and orders of the United States Department of Labor issued under Section 14 thereof.

10. INSPECTION: Unless otherwise agreed in writing, final inspection and acceptance of products must be made at Seller's plant or other shipping or receiving point designated by Seller and shall be conclusive except as regards latent defects. Buyer's representatives may inspect at the Seller's plant or shipping point during working hours prior to shipment in such manner as will not interfere with operations.

11. DELIVERY AND ACCEPTANCE: Delivery shall be in accordance with the requirements in the Purchase Contract provided, in the event Buyer is unable to accept delivery, upon completion of the manufacture of the Goods in accordance with such requirements, Buyer agrees that (i) title and risk of ownership shall pass to Buyer on date of Seller's invoice, and (ii) Buyer will make payments within thirty days after date of such invoice. Seller shall retain custodial risk of loss until delivery is made in accordance with such requirements.

12. EXPORT COMPLIANCE: The Buyer 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 hereunder (collectively, "Items"). Based on and in reliance on such information, the Seller will supply such Items in compliance with applicable trade and customs laws including that of the United States of America. The Seller cautions and the Buyer acknowledges that any change in end-use, end-user or country of end-use (including a shipment between countries other than the U.S.) may be restricted or prohibited by applicable trade and customs law, whether it be of the U.S. or other country. The Parties shall comply with all trade and customs laws (including U.S. Export Controls) except for any such laws which conflict with or are otherwise penalized under the laws of the U.S., which in the event of such conflict, Seller shall notify Buyer. The Buyer agrees in particular that it shall not use and shall not permit any third party to use such items in connection with the design, production, use, or storage of chemical, biological or nuclear weapons or missiles of any kind.

13. TRANSPORTATION CHARGES, ALLOWANCES, CLAIMS. All prices are F.O.B. Seller's plant or other designated shipping point. No freight is allowed unless stated in Seller's quotation (if any) or in a written contract which may exist between Seller and Buyer at the time of shipment. If Seller's quotation or a written contract states that all or a portion of freight is allowed, all prices are F.O.B. Seller's plant or other designated shipping point, with most economical surface transportation allowed. If the quoted or contractual price includes transportation, Seller reserves the right to designate the common carrier and to ship in the manner it deems most economical. Added costs due to special routing requested by the Buyer are chargeable to the Buyer. Under no circumstances is any freight allowance which is absorbed by Seller to be deducted from the selling price. If the quoted price or contract includes transportation, no deduction will be made in lieu thereof whether Buyer accepts shipment at plant, warehouse, freight station, or otherwise supplies its own transportation. When sales are made from the Seller's warehouse, Seller reserves the right to charge either actual or pro-rated freight from Seller's principle point of manufacture to Seller's warehouse. Buyer assumes risk of loss 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 transit, but does not guarantee against such damage. Unless requested in writing by the Buyer, no shipments are insured by Seller against damage or loss in transit. Seller will place insurance as nearly as possible in accordance with Buyer's written instructions but in such case Seller acts only as agent between the insurance company and the Buyer and assumes no liability whatsoever. Any claims for shipping loss, breakage or damage (obvious or concealed) are Buyer's responsibility and should be made to the carrier. All claims regarding shortages must be made within thirty (30) days from receipt of shipment and must be accompanied by the packing list(s) covering the shipment. 14. INDEMNIFICATION AND LIMITATION OF LIABILITY:

A. INDEMNIFICATION: Buyer Group means: Buyer, its parent (if any), subsidiaries, affiliates, co-owners, co-venturers, partners and any entity with whom Buyer has an economic interest with respect to the Work including Buyer's customer and its and their respective employees, personnel, directors, officers, borrowed servants, representatives, agents, contractors and subcontractors (respectively and of any tier or level and who are not included within the Seller Group). Seller Group means Seller, its parent (if any), subsidiaries, affiliates, co-owners and its and their respective employees, personnel, directors, officers, borrowed servants, representatives, agents, contractors and subcontractors (respectively and of any tier or level and who are not included within the Buyer Group). Negligence means: sole, joint or concurrent, active, passive, gross or willful misconduct.

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

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

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

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

(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 harmless from and against any and all Claims asserted against them by or on behalf of any third party for the death(s) of or personal injury (ies) to such a third party, as well as loss (es) of or damage(s) to the property of such a third party. A third party is a person or entity not included in Buyer Group or Seller Group. It is agreed by Buyer and Seller that their respective duty of indemnity to each other with respect to Claims asserted against them by a third party pursuant to this Article 14 (A) (5) shall be limited to their respective degree of Negligence.

(6) Notwithstanding any other provision contained in this Agreement, Buyer shall Indemnify and hold the members of Seller Group harmless from and against all Claims (including clean-up costs and loss (es) of oil, gas or hydrocarbons) arising from pollution, contamination, dumping or spilling of any substance and even if arising out of or attributable to the Negligence of the members of the Seller Group.

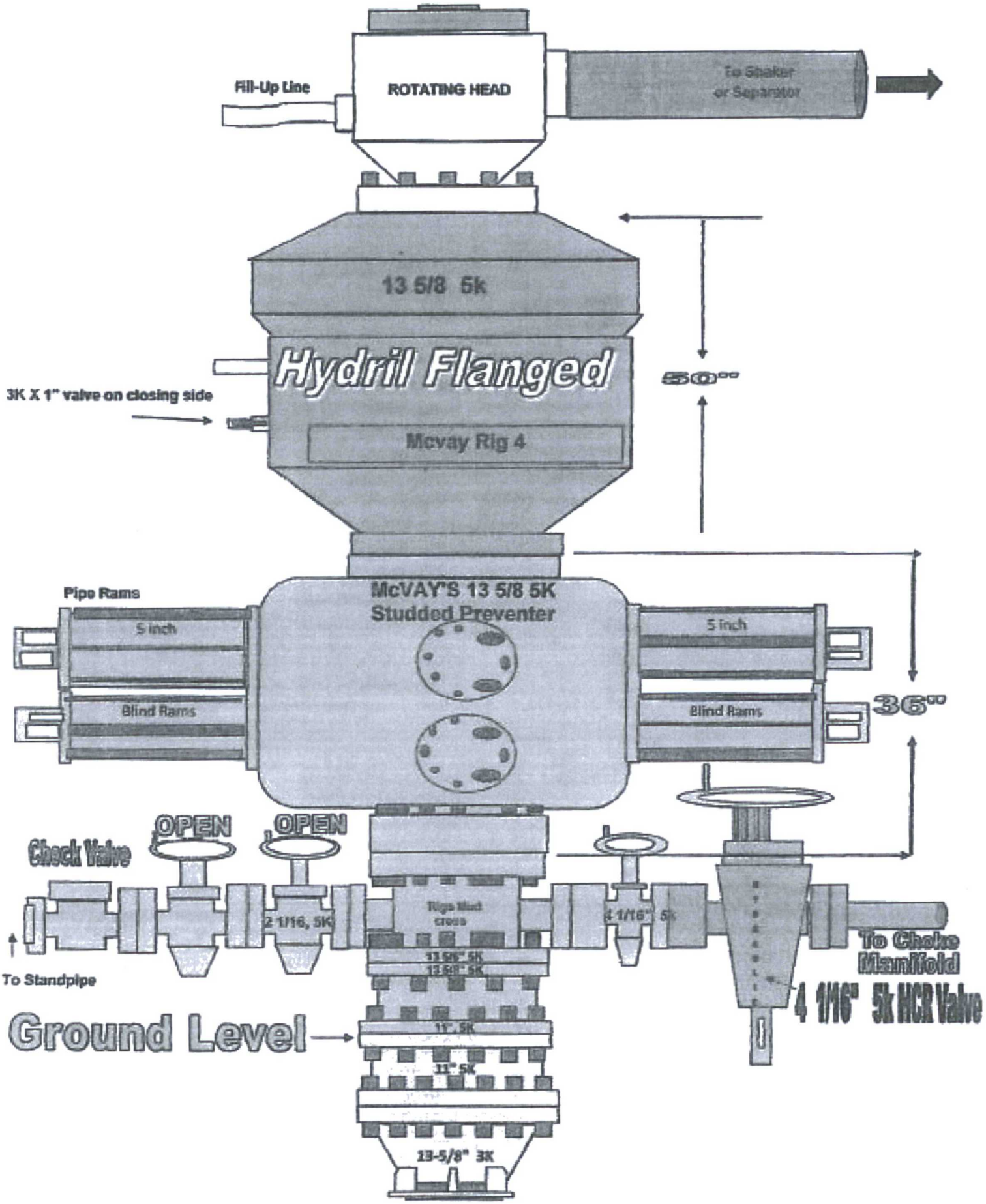
B. INDEMNITY FOR CONSEQUENTIAL DAMAGES: UNDER NO CIRCUMSTANCES SHALL SELLER BE LIABLE FOR ANY SPECIAL, CONSEQUENTIAL, INCIDENTAL, EXEMPLARY OR PUNITIVE DAMAGES (collectively "CONSEQUENTIAL"), AS DEFINED BY THE LAWS GOVERNING THIS PURCHASE ORDER, NOR FOR ANY LOSS OF ANTICIPATED PROFITS, LOSS OF BUSINESS OPPORTUNITY, LOSS OF USE OF EQUIPMENT OR OF ANY INSTALLATION, SYSTEM OR FACILITY INTO WHICH SELLER'S EQUIPMENT MAY BE LOCATED OR AT WHICH MEMBERS OF THE SELLER GROUP MAY BE PERFORMING WORK AND BUYER AGREES TO INDEMNIFY AND HOLD SELLER GROUP HARMLESS FROM AND AGAINST ANY CLAIMS FOR SUCH CONSEQUENTIAL DAMAGES EVEN IF ARISING 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 OBLIGATIONS AND/OR LIABILITIES HEREBY ASSUMED BY THE PARTIES SHALL BE: (i) SUPPORTED BY INSURANCE; (ii) WITHOUT LIMIT; (iii) AND WITHOUT REGARD TO THE CAUSE OR CAUSES THEREOF, INCLUDING, BUT NOT LIMITED TO, PREEXISTING CONDITIONS (WHETHER SUCH CONDITIONS BE PATENT OR LATENT), THE UNSEAWORTHINESS OF ANY VESSEL OR VESSELS (WHETHER OR NOT PREEXISTING); THE UNAIRWORTHINESS OF ANY AIRCRAFT; BREACH OF REPRESENTATION OR WARRANTY (EXPRESS OR IMPLIED); BREACH OF CONTRACT; BREACH OF DUTY (STATUTORY, CONTRACTUAL, COMMON LAW OR OTHERWISE); STRICT LIABILITY; CONDITION OF RUIN OR DEFECTIVE PREMISES, EQUIPMENT, FACILITIES, OR APPURTENANCES OF ANY PARTY UNDER ANY CODE, LAW OR (WHETHER OR NOT SAID CONDITION IS PREEXISTING AND/OR LATENT, PATENT OR OTHERWISE); THE LOADING OR UNLOADING OF PERSONS OR CARGO; TORT, OR THE NEGLIGENCE OR FAULT OF ANY PARTY (AS DEFINED AT THE BEGINNING OF THIS ARTICLE 14, OR ANY OTHER THEORY OF LEGAL LIABILITY. Seller's total responsibility for any claims, damages, losses or liability arising out of or related to its performance of this contract or the products or services covered hereunder shall not exceed the purchase price.

15. MODIFICATION, RESCISSION & WAIVER. The terms herein may not be modified or rescinded nor any of its provisions waived unless such modification, rescission or waiver is in writing and signed by an authorized employee of Seller at its office in Houston, Texas. Failure of Seller to insist in 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 hereunder shall not be construed as a waiver or relinquishment of any such term, condition, or right hereunder and shall not affect Seller's right to insist upon strict performance and compliance with regard to any unexecuted portions of this contract or future performance of these terms and conditions. All orders must be accepted by an authorized employee of Seller. The rights and duties of the parties and construction and effect of all provisions hereof shall be governed by and construed according to the internal laws of the State of Texas. Any disputes which arise under this agreement shall be venued in the District Court of Harris County, Texas or in the Southern District of Texas.

REV08/06

McVay Rig 4


Fill-Up Line
ROTATING HEAD
To Shaker or Separator
13 5/8 5k
Hydril Flanged
Mcvay Rig 4
3K X 1" valve on closing side
50"
Pipe Rams
5 inch
Blind Rams
McVAY'S 13 5/8 5K
Studded Preventer
5 inch
Blind Rams
36"
Check Valve
OPEN
OPEN
2 1/16, 5K
4 1/16" 5k
To Standpipe
To Choke Manifold
4 1/16" 5k HCR Valve
Ground Level
11", 5K
11" 5K
13-5/8" 3K

Midwest Hose & Specialty, Inc.

Internal Hydrostatic Test Graph

February 19, 2017

Customer: Hobbs

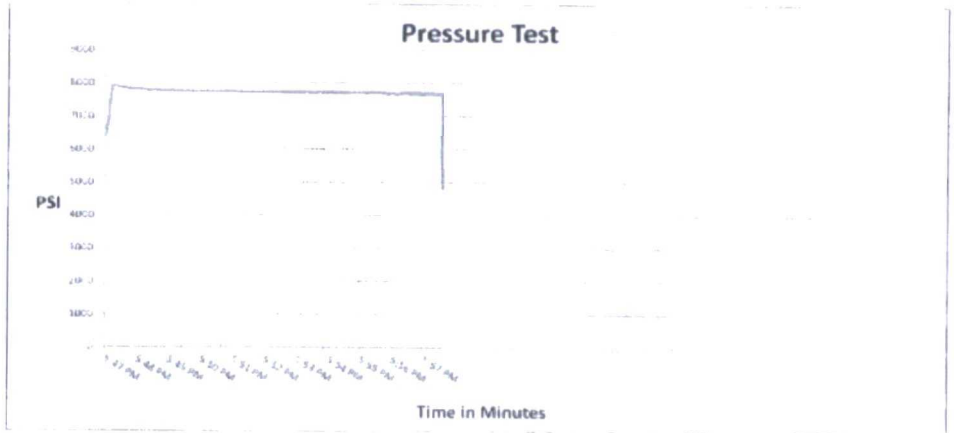
Pick Ticket #: 384842

Hose Specifications

Hose Type	Length
D	28
I.D.	**O.D.**
3.5"	5.03"
Working Pressure	**Burst Pressure**
5000 PSI	[illegible]

Verification

Type of Fitting	Crimping Method
4 1/16 5K	Swage
Die Size	**Final O.D.**
5.62"	5.55"
Hose Serial #	**Hose Assembly Serial #**
10958	384842



Test Pressure	Time Held at Test Pressure	Actual Burst Pressure	Peak Pressure
7500 PSI	20 2/4 Minutes		[illegible]

Comments: Hose assembly pressure tested with water at ambient temperature

Tested By: Richard Davis

Approved By: Charles Ash

Midwest Hose
& Specialty, Inc.

Internal Hydrostatic Test Certificate

General Information		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
Fittings			
End A		**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"**
Hydrostatic Test Requirements			
Test Pressure (psi)	**7,500**	***Hose assembly was tested with ambient water temperature.***	
Test Pressure Hold Time (minutes)	**10 1/2**		

Date Tested	*Tested By*	*Approved By*
2/19/2017	Richard Davis	

Midwest Hose
& Specialty, Inc.

Certificate of Conformity

Customer: **HOBBS**	*Customer P.O.#* **356945**
Sales Order # **318810**	*Date Assembled:* **2/19/2017**

Specifications

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**		

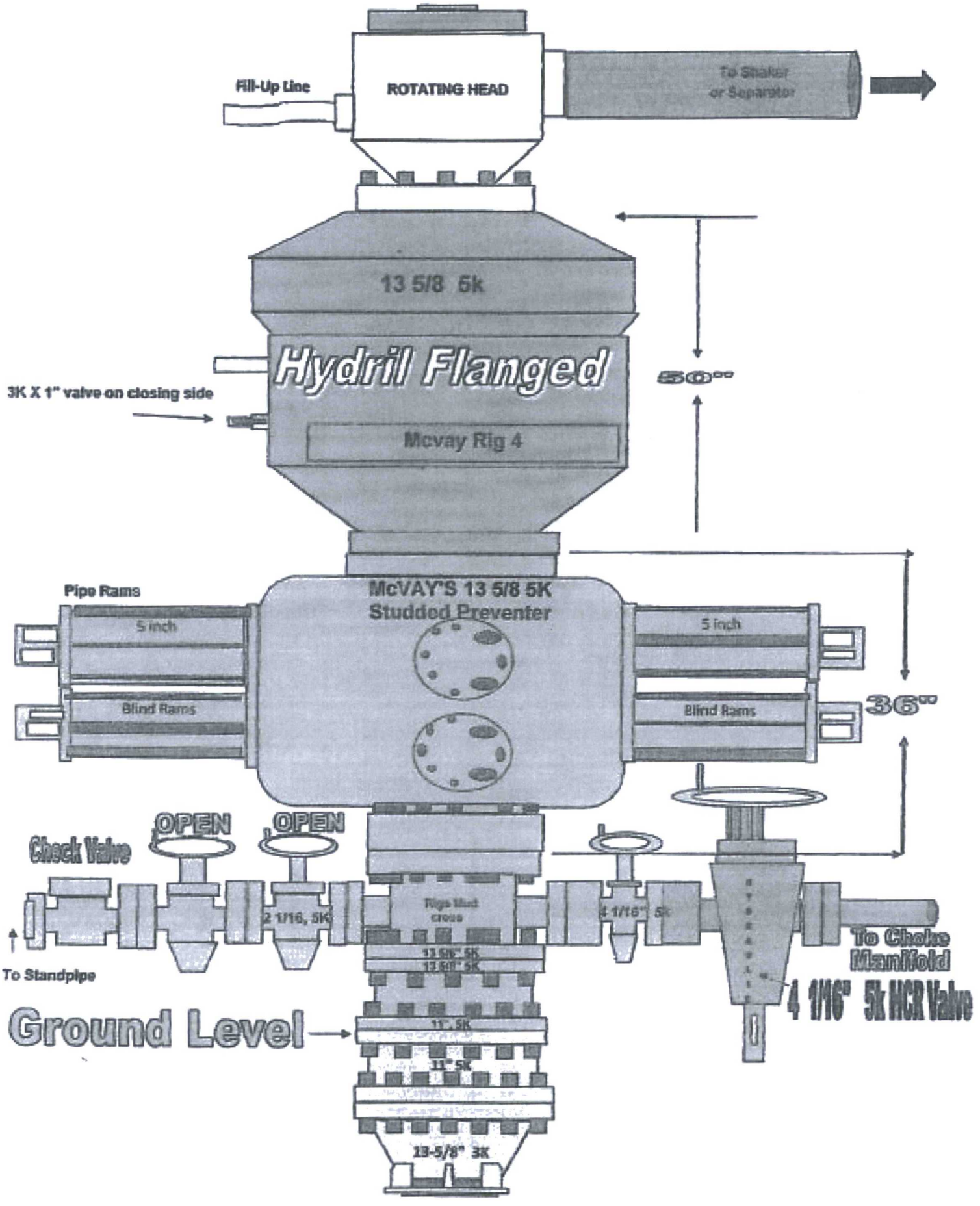
We hereby certify that the above material supplied for the referenced purchase order to be true according to the requirements of the purchase order and current industry standards.

Supplier:
Midwest Hose & Specialty, Inc.
3312 S I-35 Service Rd
Oklahoma City, OK 73129

Comments:

Approved By	*Date*
	2/20/2017

McVay Rig 4


Fill-Up Line
ROTATING HEAD
To Shaker or Separator
13 5/8 5k
Hydril Flanged
Mcvay Rig 4
3K X 1" valve on closing side
50"
Pipe Rams
McVAY'S 13 5/8 5K
Studded Preventer
5 inch
5 inch
Blind Rams
Blind Rams
36"
OPEN
OPEN
Check Valve
2 1/16, 5K
4 1/16" 5K
To Choke Manifold
To Standpipe
4 1/16" 5k HCR Valve
Ground Level
11", 5K
11" 5K
13-5/8" 3K

Midwest Hose & Specialty, Inc.

Internal Hydrostatic Test Graph

February 19, 2017

Customer: Hobbs

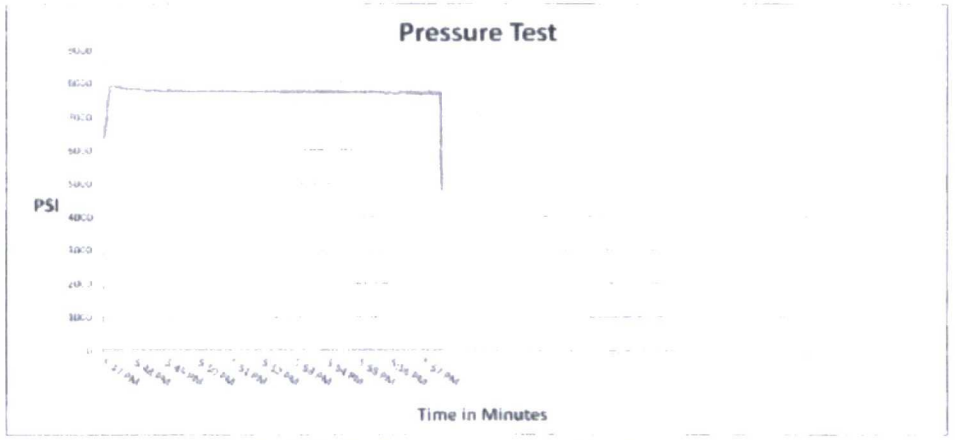
Pick Ticket #: 384842

Hose Specifications

Hose Type	Length
D	20
I.D.	**O.D.**
5"	5.03"
Working Pressure	**Burst Pressure**
5000 PSI	[illegible]

Verification

Type of Fitting	Coupling Method
4 1/2 SR	Swage
Die Size	**Final O.D.**
5.62"	5.55"
Hose Serial #	**Hose Assembly Serial #**
10958	384842



Test Pressure	Time Held at Test Pressure	Actual Burst Pressure	Peak Pressure
7500 PSI	20 1/4 Minutes		[illegible] PSI

Comments: Hose assembly pressure tested with water at ambient temperature.

Tested By: Richard Davis

Approved By: [illegible]

Midwest Hose
& Specialty, Inc.

Internal Hydrostatic Test Certificate

General Information		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
Fittings			
End A		**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"**
Hydrostatic Test Requirements			
Test Pressure (psi)	**7,500**	***Hose assembly was tested with ambient water temperature.***	
Test Pressure Hold Time (minutes)	**10 1/2**		

Date Tested	*Tested By*	*Approved By*
2/19/2017	Richard Dias	

Midwest Hose
& Specialty, Inc.

Certificate of Conformity

Customer: **HOBBS**	*Customer P.O.#* **356945**
Sales Order # **318810**	*Date Assembled:* **2/19/2017**

Specifications

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**		

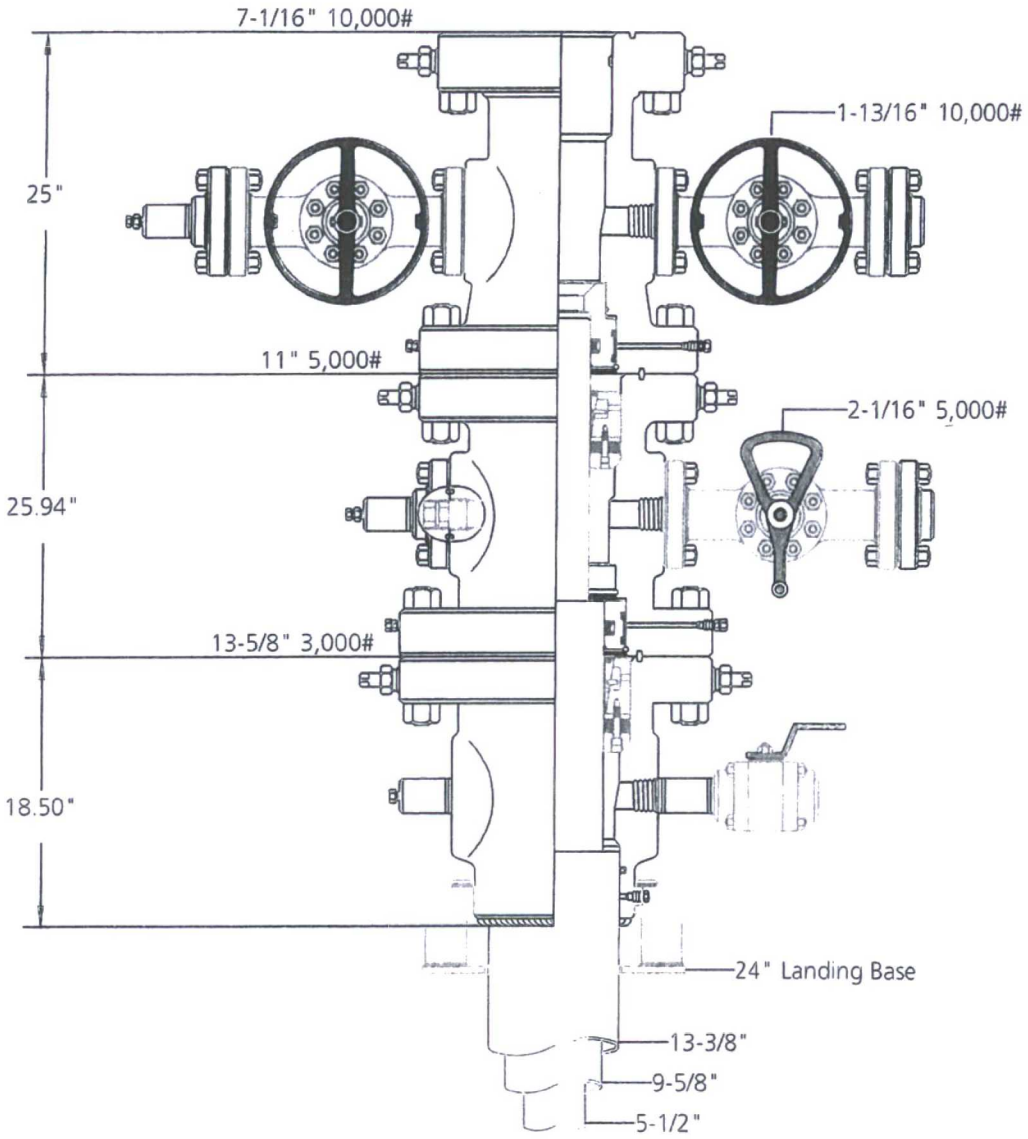
We hereby certify that the above material supplied for the referenced purchase order to be true according to the requirements of the purchase order and current industry standards.

Supplier:
Midwest Hose & Specialty, Inc.
3312 S I-35 Service Rd
Oklahoma City, OK 73129

Comments:

Approved By	*Date*
	2/20/2017

Note: Dimensional information reflected on this drawing are estimated measurements only.



Legacy Reserves
Conventional 3- String

CAMERON

Name	Jeanette	Date	7-15-15	Working Pressure	#	1274616

CAMERON
A Schlumberger Company

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
EX-WORKS - ODESSA, TX

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

Ship To : 22039905
LEGACY RESERVES LP
303 W WALL STE 1400
MIDLAND TX 79701-5126
USA

Inside Sales Contact: Joycelyn M. FAILLA/713-469-7221 Email: joycelyn.failla@c-a-m.com
Outside Sales Contact: David Treece/432-337-5475 Email: david.treece@c-a-m.com

Customer Reference : **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"

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 BASE)	652 lb	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, 310C5, 3000 PSI (206 BAR) MOP, 2719 PSI (187 BAR) MOP AT MAX TEMP, CARBON STEEL BODY,	13 lb	1	EA	102.89	102.89

Item	Material Number Description	Extended Weight	Qty	UM	Unit Net Price USD	Extended Price USD
	CARBON STEEL/CHR PLATED BALL, CARBON STEEL/ZINC PLATED STEM, ACETAL PLASTIC SEAT, WRENCH WITH LOCK DEVICE LESS LOCK, API 607, B16.34, -20 F (-29 C) - +220 F (+104 C), ADJUSTABLE STEM PACKING					
60	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					
100	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
110	621650-03 ASSY: STUD & NUTS, 1.375 X 10.750" LONG (B7 & 2H)	130 lb	20	EA	15.65	313.00
120	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
130	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
140	640518-10 'NX' BUSHING, 13-5/8 NOM X 9-5/8	16 lb	1	EA	1,454.59	1,454.59

Item	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 WP, W/1-1/2" VEE TUBING THD, API 6A 20TH ED/ISO 10423, MATL CLASS DD-NL	1 lb	1 EA	74.93	74.93
160	2737400-01-01 ASSEMBLY, AOP COMMERCIAL GATE VALVE, 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	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
180	007481-01 BULL PLUG, 2" LP, TAPPED 1/2" NPT, 3.75" LONG.	3 lb	1 EA	27.34	27.34
190	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

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/ INTERGRAL 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

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:

Total	Section A - CASING HEAD ASSY	4,274.16
Total	Section B - CASING SPOOL ASSY	10,161.74
Total	Section C - TUBING SPOOL	11,265.68

Price Summary :

Total Price :	**25,701.58 USD**
Total Quotation Price :	**25,701.58 USD**

****
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.

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 accordance with the terms and conditions of sale set forth herein. SELLER'S ACCEPTANCE OF THIS ORDER IS EXPRESSLY CONDITIONED ON BUYER'S ASSENT TO THE TERMS CONTAINED HEREIN. The terms and conditions of Seller's proposal (if any) and acknowledgement shall prevail over any conflicting or different terms in Buyer's order unless Buyer notifies Seller in writing of its objections thereto within fifteen (15) days from receipt of Seller's acknowledgement. Buyer's standard terms of purchase will not be considered a counteroffer to Seller's terms and conditions of sale. The failure of Seller to object to any provision in conflict herewith whether contained 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 at the time a quotation is made is subject to prior sale. Prices quoted are subject to change without notice. The price in effect at the time of shipment including any escalation formula will apply, unless a valid quotation or written agreement to the contrary exists between Buyer and Seller. All prices shown are in U.S. dollars and are F.O.B. Seller's shipping point. Seller reserves the right to place a service charge on past due accounts at the highest rate permitted by law. Any documentation pertaining to traceability requirements for raw materials or products or documentation required for any routine or special processes must be identified by the Buyer at the time of quotation (if any) or at the time of order placement.

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

4. SHIPPING SCHEDULE AND DELIVERY: Shipment schedules are given as accurately as conditions permit and every effort will be made to make shipments as scheduled. Seller will not be responsible for deviations in meeting shipping schedules nor for any losses or damages to Buyer (or any third party) occasioned by deviations in the shipping schedule, whether due to Acts of God, orders bearing priority ratings established pursuant to law, differences with workmen, local labor shortages, fire, flood, shortages or failure of raw materials, supplies, fuel, power or transportation, breakdown of equipment or any other causes beyond Seller's reasonable control, whether of similar or dissimilar nature than those enumerated. Seller shall have additional time within which to perform as may be reasonably necessary under the circumstances and shall have the right to apportion its production among its customers in such a manner as it may consider to be equitable. Seller reserves the right to furnish commercially equivalent or better substitutes for materials or to subcontract the Buyer's order or portions thereof as Seller deems necessary. In no event shall Seller be liable for any consequential damages resulting from failure or delay in shipment. If Buyer requires drawings, procedures, standards or similar material for approval, shipping schedules will be calculated from the time such approvals are received by Seller, since shipping schedules are based on Seller having all required information and a firm order from Buyer which is enterable into production. Any hold points, witness points or the need for inspection by Buyer's representatives must be identified by Buyer at the time of quotation (if any) and/or order placement in order that the effect on the prices or shipping schedules (if any) can be taken into account. Additional inspection or testing required by Buyer which affects normal production sequence will be considered as extending the shipping dates accordingly.

5. TERMS OF PAYMENT: Terms of payment are 30 days from date of invoice unless otherwise stated in the quotation or Seller's order acknowledgment.

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

7. WARRANTIES: Contractor warrants that goods of its manufacture shall be free from defects in materials and workmanship for a period of one (1) year after being placed in service or eighteen (18) months from delivery, whichever is earlier, when all such goods are used in the service and within the pressure range for which the goods were manufactured. In the case of products or parts not wholly of Contractor's manufacture, Contractor's liability shall be limited to the extent of its recovery from the manufacturer of such products or parts under its liability to Contractor. Parts subject to regular replacement due to operational wear are not covered by this warranty. In the event that Company discovers a defect in the manufactured goods within the warranty period specified above, Company shall notify Contractor of such defect and if in Contractor's sole judgment the product or repair does not conform or is found to be defective in material or workmanship, then, Company shall, at Contractor's request, return the part or product F.O.B. to Contractor's designated plant or service location. Contractor, at its option and expense, shall repair or replace the defective part or product, or repay to Company the full price paid by Company for such defective part, repair or product. Any repayment of purchase price shall be without interest. Company shall be responsible for any costs related to removal, transportation and re-installation of the defective part or goods. Contractor shall not be liable for any damages, claims, losses or expenses of Company resulting from such defects, recovery under general tort law or strict liability or for damages resulting from delays, loss of use, or other direct, indirect, incidental or consequential damages of any kind. Contractor will not be responsible for (i) failures of products which have been in any way tampered with or altered by anyone other than an authorized representative of Contractor, (ii) failures due to lack of compliance with recommended maintenance procedures, (iii) products which have been repaired or altered in such a way (in Contractor's judgment) as to affect the products adversely, or (iv) products requiring replacement due to normal wear and tear. EXCEPT FOR THE WARRANTIES EXPRESSLY STATED ABOVE, THERE ARE NO OTHER WARRANTIES AND NONE SHALL BE IMPLIED BY LAW INCLUDING THOSE OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

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

9. LABOR STANDARDS: Seller hereby certifies that these products were produced in accordance with all applicable requirements of Section 6, 7 and 12 of the Fair Labor Standards Act as amended and of regulations and orders of the United States Department of Labor issued under Section 14 thereof.

10. INSPECTION: Unless otherwise agreed in writing, final inspection and acceptance of products must be made at Seller's plant or other shipping or receiving point designated by Seller and shall be conclusive except as regards latent defects. Buyer's representatives may inspect at the Seller's plant or shipping point during working hours prior to shipment in such manner as will not interfere with operations.

11. DELIVERY AND ACCEPTANCE: Delivery shall be in accordance with the requirements in the Purchase Contract; provided, in the event Buyer is unable to accept delivery upon completion of the manufacture of the Goods in accordance with such requirements, Buyer agrees that (i) title and risk of ownership shall pass to Buyer on date of Seller's invoice, and (ii) Buyer will make payments within thirty days after date of such invoice. Seller shall retain custodial risk of loss until delivery is made in accordance with such requirements.

12. EXPORT COMPLIANCE: The Buyer 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 hereunder (collectively, "Items"). Based on and in reliance on such information, the Seller will supply such Items in compliance with applicable trade and customs laws including that of the United States of America. The Seller cautions and the Buyer acknowledges that any change in end-use, end-user or country of end-use (including a shipment between countries other than the U.S.) may be restricted or prohibited by applicable trade and customs law, whether it be of the U.S. or other country. The Parties shall comply with all trade and customs laws (including U.S. Export Controls) except for any such laws which conflict with or are otherwise penalized under the laws of the U.S., which in the event of such conflict, Seller shall notify Buyer. The Buyer agrees in particular that it shall not use and shall not permit any third party to use such items in connection with the design, production, use, or storage of chemical, biological or nuclear weapons or missiles of any kind.

13. TRANSPORTATION CHARGES, ALLOWANCES, CLAIMS: All prices are F.O.B. Seller's plant or other designated shipping point. No freight is allowed unless stated in Seller's quotation (if any) or in a written contract which may exist between Seller and Buyer at the time of shipment. If Seller's quotation or a written contract states that all or a portion of freight is allowed, all prices are F.O.B. Seller's plant or other designated shipping point, with most economical surface transportation allowed. If the quoted or contractual price includes transportation, Seller reserves the right to designate the common carrier and to ship in the manner it deems most economical. Added costs due to special routing requested by the Buyer are chargeable to the Buyer. Under no circumstances is any freight allowance which is absorbed by Seller to be deducted from the selling price. If the quoted price or contract includes transportation, no deduction will be made in lieu thereof whether Buyer accepts shipment at plant, warehouse, freight station, or otherwise supplies its own transportation. When sales are made from the Seller's warehouse, Seller reserves the right to charge either actual or pro-rated freight from Seller's principle point of manufacture to Seller's warehouse. Buyer assumes risk of loss 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 transit, but does not guarantee against such damage. Unless requested in writing by the Buyer, no shipments are insured by Seller against damage or loss in transit. Seller will place insurance as nearly as possible in accordance with Buyer's written instructions but in such case Seller acts only as agent between the insurance company and the Buyer and assumes no liability whatsoever. Any claims for shipping loss, breakage or damage (obvious or concealed) are Buyer's responsibility and should be made to the carrier. All claims regarding shortages must be made within thirty (30) days from receipt of shipment and must be accompanied by the packing list(s) covering the shipment. 14. INDEMNIFICATION AND LIMITATION OF LIABILITY:

A. INDEMNIFICATION: Buyer Group means: Buyer, its parent (if any), subsidiaries, affiliates, co-owners, co-venturers, partners and any entity with whom Buyer has an economic interest with respect to the Work including Buyer's customer and its and their respective employees, personnel, directors, officers, borrowed servants, representatives, agents, contractors and subcontractors (respectively and of any tier or level and who are not included within the Seller Group). Seller Group means: Seller, its parent (if any), subsidiaries, affiliates, co-owners and its and their respective employees, personnel, directors, officers, borrowed servants, representatives, agents, contractors and subcontractors (respectively and of any tier or level and who are not included within the Buyer Group). Negligence means: sole, joint or concurrent, active, passive, gross or willful misconduct.

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

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

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

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

(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 harmless from and against any and all Claims asserted against them by or on behalf of any third party for the death(s) of or personal injury (ies) to such a third party, as well as loss (es) of or damage(s) to the property of such a third party. A third party is a person or entity not included in Buyer Group or Seller Group. It is agreed by Buyer and Seller that their respective duty of indemnity to each other with respect to Claims asserted against them by a third party pursuant to this Article 14 (A) (5) shall be limited to their respective degree of Negligence.

(6) Notwithstanding any other provision contained in this Agreement, Buyer shall Indemnify and hold the members of Seller Group harmless from and against all Claims (including clean-up costs and loss (es) of oil, gas or hydrocarbons) arising from pollution, contamination, dumping or spilling of any substance and even if arising out of or attributable to the Negligence of the members of the Seller Group.

B. INDEMNITY FOR CONSEQUENTIAL DAMAGES: UNDER NO CIRCUMSTANCES SHALL SELLER BE LIABLE FOR ANY SPECIAL, CONSEQUENTIAL, INCIDENTAL, EXEMPLARY OR PUNITIVE DAMAGES (collectively, "CONSEQUENTIAL"), AS DEFINED BY THE LAWS GOVERNING THIS PURCHASE ORDER, NOR FOR ANY LOSS OF ANTICIPATED PROFITS, 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 MEMBERS OF THE SELLER GROUP MAY BE PERFORMING WORK AND BUYER AGREES TO INDEMNIFY AND HOLD SELLER GROUP HARMLESS FROM AND AGAINST ANY CLAIMS FOR SUCH CONSEQUENTIAL DAMAGES EVEN IF ARISING 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 OBLIGATIONS AND/OR LIABILITIES HEREBY ASSUMED BY THE PARTIES SHALL BE: (i) SUPPORTED BY INSURANCE; (ii) WITHOUT LIMIT; (iii) AND WITHOUT REGARD TO THE CAUSE OR CAUSES THEREOF, INCLUDING, BUT NOT LIMITED TO, PREEXISTING CONDITIONS (WHETHER SUCH CONDITIONS BE PATENT OR LATENT). THE UNSEAWORTHINESS OF ANY VESSEL OR VESSELS (WHETHER OR NOT PREEXISTING); THE UNAIRWORTHINESS OF ANY AIRCRAFT; BREACH OF REPRESENTATION OR WARRANTY (EXPRESS OR IMPLIED); BREACH OF CONTRACT; BREACH OF DUTY (STATUTORY, CONTRACTUAL, COMMON LAW OR OTHERWISE); STRICT LIABILITY; CONDITION OF RUIN OR DEFECTIVE PREMISES. EQUIPMENT, FACILITIES, OR APPURTENANCES OF ANY PARTY UNDER ANY CODE, LAW OR (WHETHER OR NOT SAID CONDITION IS PREEXISTING AND/OR LATENT, PATENT OR OTHERWISE). THE LOADING OR UNLOADING OF PERSONS OR CARGO; TORT; OR THE NEGLIGENCE OR FAULT OF ANY PARTY (AS DEFINED AT THE BEGINNING OF THIS ARTICLE 14, OR ANY OTHER THEORY OF LEGAL LIABILITY. Seller's total responsibility for any claims, damages, losses or liability arising out of or related to its performance of this contract or the products or services covered hereunder shall not exceed the purchase price.

15. MODIFICATION, RESCISSION & WAIVER: The terms herein may not be modified or rescinded nor any of its provisions waived unless such modification, rescission or waiver is in writing and signed by an authorized employee of Seller at its office in Houston, Texas. Failure of Seller to insist in 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 hereunder shall not be construed as a waiver or relinquishment of any such term, condition, or right hereunder and shall not affect Seller's right to insist upon strict performance and compliance with regard to any unexecuted portions of this contract or future performance of these terms and conditions. All orders must be accepted by an authorized employee of Seller. The rights and duties of the parties and construction and effect of all provisions hereof shall be governed by and construed according to the internal laws of the State of Texas. Any disputes which arise under this agreement shall be venued in the District Court of Harris County, Texas or in the Southern District of Texas.

REV08/06

Midwest Hose & Specialty, Inc.

Internal Hydrostatic Test Graph

February 19, 2017

Customer: Hobbs

Pick Ticket #: 384842

Hose Specifications

Hose Type
D

Length
20

I.D.
.5"

O.D.
.503"

Working Pressure
5000 PSI

Burst Pressure
[illegible]

Verification

Type of Fitting
4 1/16 5K

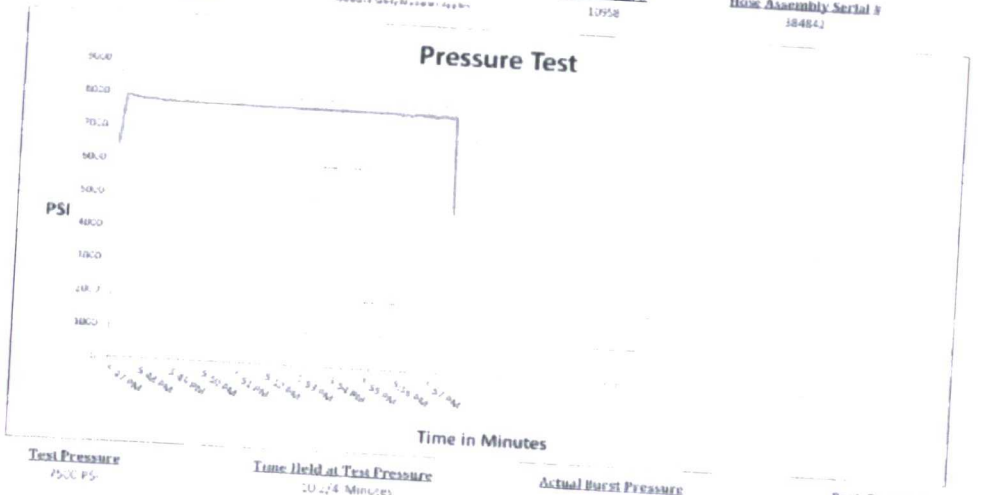
Coupling Method
Swage

Die Size
5.62"

Final O.D.
5.65"

Hose Serial #
10958

Hose Assembly Serial #
384842



Test Pressure
7500 PSI

Time Held at Test Pressure
20.224 Minutes

Actual Burst Pressure

Peak Pressure
7483 PSI

Comments: Hose assembly pressure tested with water at ambient temperature

Tested By: Richard Davis

Approved By: [illegible]

Midwest Hose
& Specialty, Inc.

Internal Hydrostatic Test Certificate

General Information		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
Fittings			
End A		**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"**
Hydrostatic Test Requirements			
Test Pressure (psi)	**7,500**	***Hose assembly was tested with ambient water temperature.***	
Test Pressure Hold Time (minutes)	**10 1/2**		

Date Tested	*Tested By*	*Approved By*
2/19/2017	Richard Dias	

Midwest Hose
& Specialty, Inc.

Certificate of Conformity

Customer: **HOBBS**	*Customer P.O.#* **356945**
Sales Order # **318810**	*Date Assembled:* **2/19/2017**

Specifications

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**		

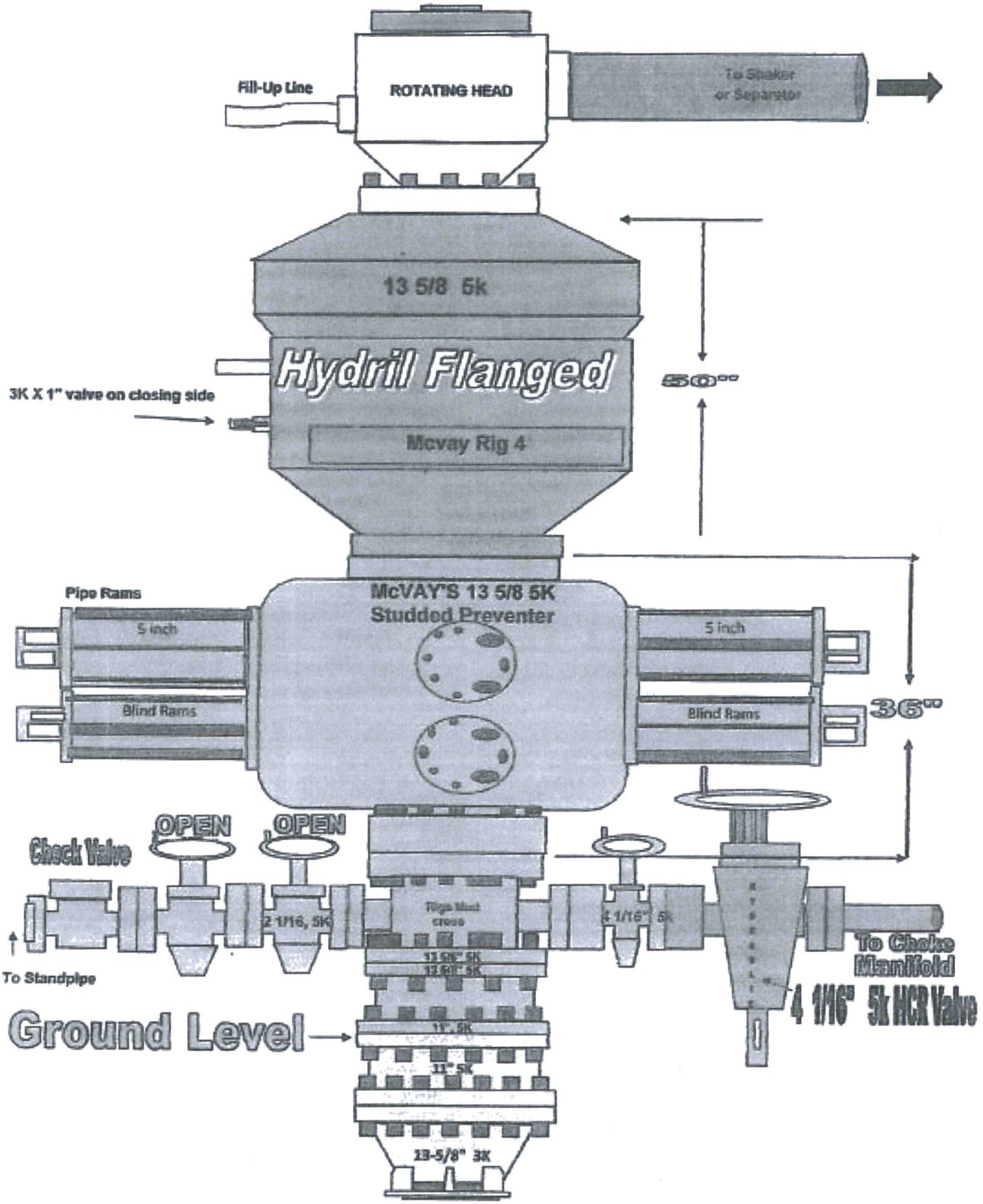
We hereby certify that the above material supplied for the referenced purchase order to be true according to the requirements of the purchase order and current industry standards.

Supplier:
Midwest Hose & Specialty, Inc.
3312 S I-35 Service Rd
Oklahoma City, OK 73129

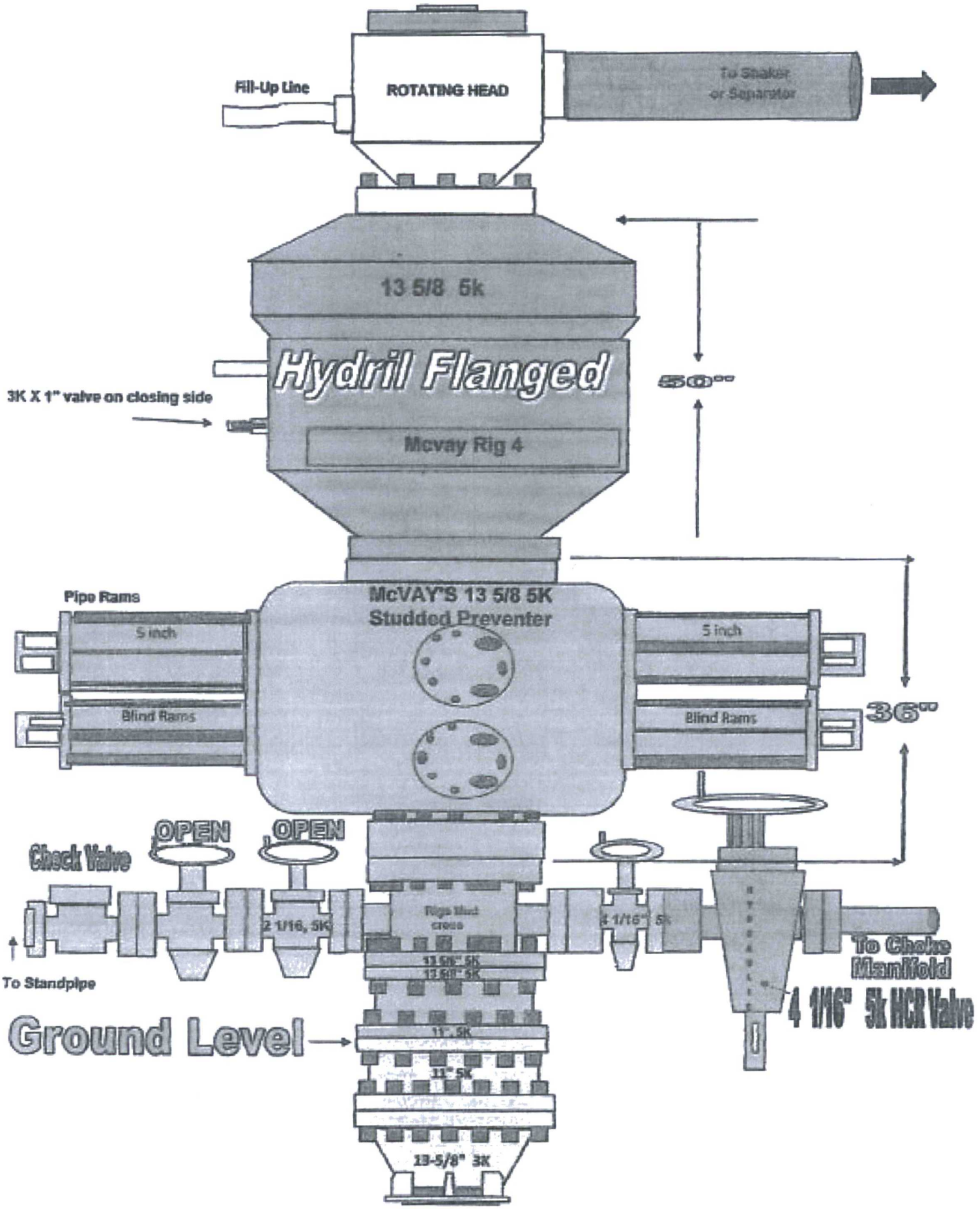
Comments:

Approved By	*Date*
	2/20/2017

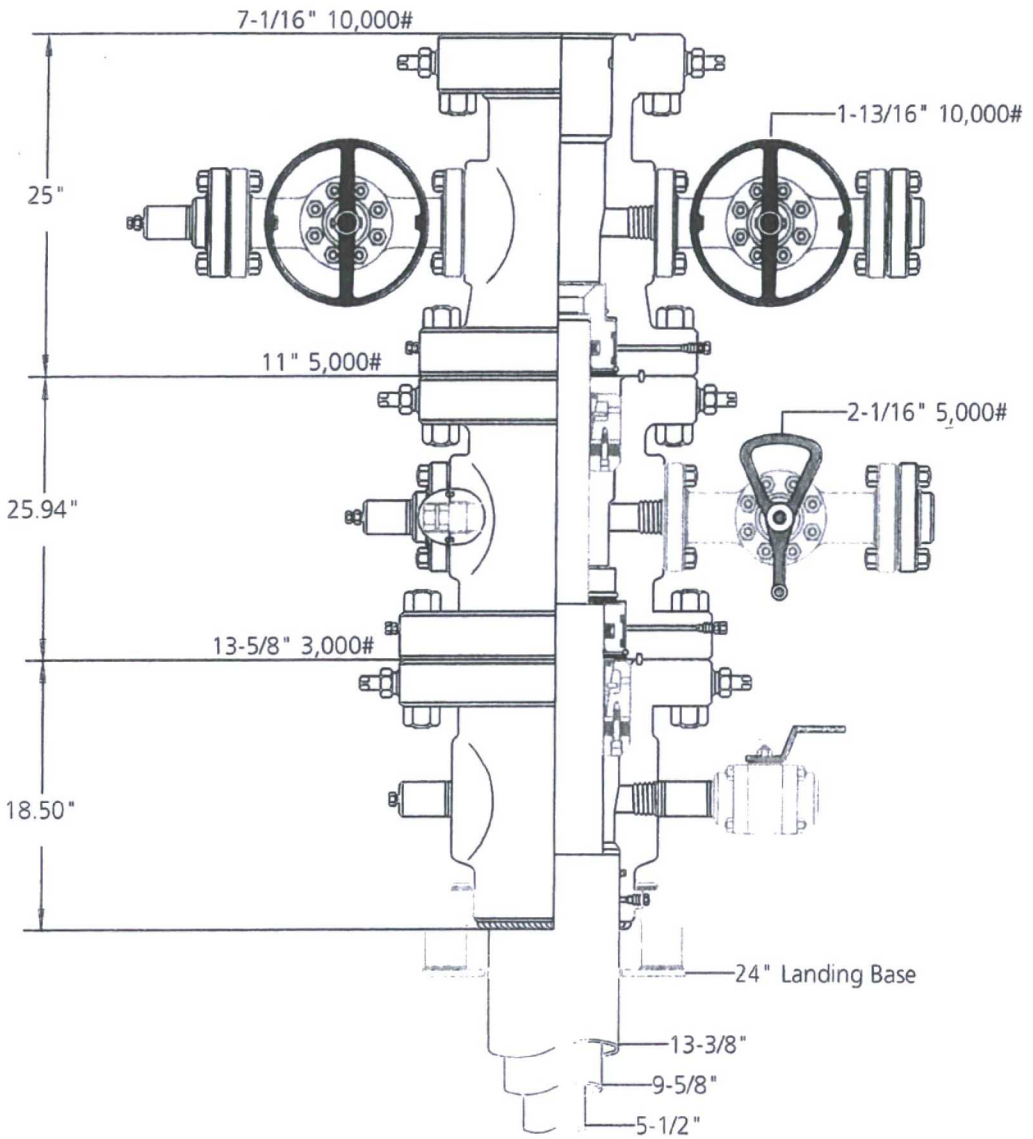
McVay Rig 4


Fill-Up Line
ROTATING HEAD
To Shaker or Separator
13 5/8 5k
Hydril Flanged
Mcvay Rig 4
3K X 1" valve on closing side
50"
Pipe Rams
5 inch
Blind Rams
McVAY'S 13 5/8 5K
Studded Preventer
5 inch
Blind Rams
36"
Check Valve
OPEN
OPEN
2 1/16, 5K
4 1/16" 5k
To Standpipe
To Choke Manifold
4 1/16" 5k HCR Valve
Ground Level
11" 5K
11" 5K
13-5/8" 3K

McVay Rig 4


Fill-Up Line
ROTATING HEAD
To Shaker or Separator
13 5/8 5k
Hydril Flanged
Mcvay Rig 4
3K X 1" valve on closing side
50"
Pipe Rams
McVAY'S 13 5/8 5K
Studded Preventer
5 inch
5 inch
Blind Rams
Blind Rams
36"
OPEN
OPEN
Check Valve
2 1/16, 5K
4 1/16" 5K
To Choke Manifold
4 1/16" 5k HCR Valve
To Standpipe
Ground Level
11" 5K
11" 5K
13-5/8" 3K

Note: Dimensional information reflected on this drawing are estimated measurements only.



Legacy Reserves
Conventional 3- String

CAMERON

Name	Jeanette	Date	7-15-15	Working Pressure	#	1274616

CAMERON
A Schlumberger Company

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
EX-WORKS - ODESSA, TX

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

Ship To : 22039905
LEGACY RESERVES LP
303 W WALL STE 1400
MIDLAND TX 79701-5126
USA

Inside Sales Contact: Joycelyn M. FAILLA/713-469-7221 Email: joycelyn.failla@c-a-m.com
Outside Sales Contact: David Treece/432-337-5475 Email: david.treece@c-a-m.com

Customer Reference : 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"

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 BASE)	652 lb	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, 310C5, 3000 PSI (206 BAR) MOP, 2719 PSI (187 BAR) MOP AT MAX TEMP, CARBON STEEL BODY,	13 lb	1	EA	102.89	102.89

Item	Material Number Description	Extended Weight	Qty	UM	Unit Net Price USD	Extended Price USD
	CARBON STEEL/CHR PLATED BALL, CARBON STEEL/ZINC PLATED STEM, ACETAL PLASTIC SEAT, WRENCH WITH LOCK DEVICE LESS LOCK, API 607, B16.34, -20 F (-29 C) - +220 F (+104 C), ADJUSTABLE STEM PACKING					
60	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					
100	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
110	621650-03 ASSY: STUD & NUTS, 1.375 X 10.750" LONG (B7 & 2H)	130 lb	20	EA	15.65	313.00
120	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
130	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
140	640518-10 'NX' BUSHING, 13-5/8 NOM X 9-5/8	16 lb	1	EA	1,454.59	1,454.59

Item	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 WP, W/1-1/2" VEE TUBING THD, API 6A 20TH ED/ISO 10423, MATL CLASS DD-NL	1 lb	1 EA	74.93	74.93
160	2737400-01-01 ASSEMBLY, AOP COMMERCIAL GATE VALVE, 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	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
180	007481-01 BULL PLUG, 2" LP, TAPPED 1/2" NPT, 3.75" LONG.	3 lb	1 EA	27.34	27.34
190	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

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/ INTERGRAL 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

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:

Total	Section A - CASING HEAD ASSY	4,274.16
Total	Section B - CASING SPOOL ASSY	10,161.74
Total	Section C - TUBING SPOOL	11,265.68

Price Summary :

Total Price :	**25,701.58 USD**
Total Quotation Price :	**25,701.58 USD**

****
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.

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 accordance with the terms and conditions of sale set forth herein. SELLER'S ACCEPTANCE OF THIS ORDER IS EXPRESSLY CONDITIONED ON BUYER'S ASSENT TO THE TERMS CONTAINED HEREIN. The terms and conditions of Seller's proposal (if any) and acknowledgement shall prevail over any conflicting or different terms in Buyer's order unless Buyer notifies Seller in writing of its objections thereto within fifteen (15) days from receipt of Seller's acknowledgement. Buyer's standard terms of purchase will not be considered a counteroffer to Seller's terms and conditions of sale. The failure of Seller to object to any provision in conflict herewith whether contained 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 at the time a quotation is made is subject to prior sale. Prices quoted are subject to change without notice. The price in effect at the time of shipment including any escalation formula will apply, unless a valid quotation or written agreement to the contrary exists between Buyer and Seller. All prices shown are in U.S. dollars and are F.O.B. Seller's shipping point. Seller reserves the right to place a service charge on past due accounts at the highest rate permitted by law. Any documentation pertaining to traceability requirements for raw materials or products or documentation required for any routine or special processes must be identified by the Buyer at the time of quotation (if any) or at the time of order placement.

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

4. SHIPPING SCHEDULE AND DELIVERY: Shipment schedules are given as accurately as conditions permit and every effort will be made to make shipments as scheduled. Seller will not be responsible for deviations in meeting shipping schedules nor for any losses or damages to Buyer (or any third party) occasioned by deviations in the shipping schedule, whether due to Acts of God, orders bearing priority ratings established pursuant to law, differences with workmen, local labor shortages, fire, flood, shortages or failure of raw materials, supplies, fuel, power or transportation, breakdown of equipment or any other causes beyond Seller's reasonable control, whether of similar or dissimilar nature than those enumerated. Seller shall have additional time within which to perform as may be reasonably necessary under the circumstances and shall have the right to apportion its production among its customers in such a manner as it may consider to be equitable. Seller reserves the right to furnish commercially equivalent or better substitutes for materials or to subcontract the Buyer's order or portions thereof as Seller deems necessary. In no event shall Seller be liable for any consequential damages resulting from failure or delay in shipment. If Buyer requires drawings, procedures, standards or similar material for approval, shipping schedules will be calculated from the time such approvals are received by Seller, since shipping schedules are based on Seller having all required information and a firm order from Buyer which is enterable into production. Any hold points, witness points or the need for inspection by Buyer's representatives must be identified by Buyer at the time of quotation (if any) and/or order placement in order that the effect on the prices or shipping schedules (if any) can be taken into account. Additional inspection or testing required by Buyer which affects normal production sequence will be considered as extending the shipping dates accordingly.

5. TERMS OF PAYMENT: Terms of payment are 30 days from date of invoice unless otherwise stated in the quotation or Seller's order acknowledgment.

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

7. WARRANTIES. Contractor warrants that goods of its manufacture shall be free from defects in materials and workmanship for a period of one (1) year after being placed in service or eighteen (18) months from delivery, whichever is earlier, when all such goods are used in the service and within the pressure range for which the goods were manufactured. In the case of products or parts not wholly of Contractor's manufacture, Contractor's liability shall be limited to the extent of its recovery from the manufacturer of such products or parts under its liability to Contractor. Parts subject to regular replacement due to operational wear are not covered by this warranty. In the event that Company discovers a defect in the manufactured goods within the warranty period specified above, Company shall notify Contractor of such defect and if in Contractor's sole judgment the product or repair does not conform or is found to be defective in material or workmanship, then, Company shall, at Contractor's request, return the part or product F.O.B. to Contractor's designated plant or service location. Contractor, at its option and expense, shall repair or replace the defective part or product, or repay to Company the full price paid by Company for such defective part, repair or product. Any repayment of purchase price shall be without interest. Company shall be responsible for any costs related to removal, transportation and re-installation of the defective part or goods. Contractor shall not be liable for any damages, claims, losses or expenses of Company resulting from such defects, recovery under general tort law or strict liability or for damages resulting from delays, loss of use, or other direct, indirect, incidental or consequential damages of any kind. Contractor will not be responsible for (i) failures of products which have been in any way tampered with or altered by anyone other than an authorized representative of Contractor, (ii) failures due to lack of compliance with recommended maintenance procedures, (iii) products which have been repaired or altered in such a way (in Contractor's judgment) as to affect the products adversely, or (iv) products requiring replacement due to normal wear and tear. EXCEPT FOR THE WARRANTIES EXPRESSLY STATED ABOVE, THERE ARE NO OTHER WARRANTIES AND NONE SHALL BE IMPLIED BY LAW INCLUDING THOSE OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

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

9. LABOR STANDARDS. Seller hereby certifies that these products were produced in accordance with all applicable requirements of Section 6, 7 and 12 of the Fair Labor Standards Act as amended and of regulations and orders of the United States Department of Labor issued under Section 14 thereof.

10. INSPECTION. Unless otherwise agreed in writing, final inspection and acceptance of products must be made at Seller's plant or other shipping or receiving point designated by Seller and shall be conclusive except as regards latent defects. Buyer's representatives may inspect at the Seller's plant or shipping point during working hours prior to shipment in such manner as will not interfere with operations.

11. DELIVERY AND ACCEPTANCE. Delivery shall be in accordance with the requirements in the Purchase Contract, provided, in the event Buyer is unable to accept delivery upon completion of the manufacture of the Goods in accordance with such requirements, Buyer agrees that (i) title and risk of ownership shall pass to Buyer on date of Seller's invoice, and (ii) Buyer will make payments within thirty days after date of such invoice. Seller shall retain custodial risk of loss until delivery is made in accordance with such requirements.

12. EXPORT COMPLIANCE: The Buyer 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 hereunder (collectively, "Items"). Based on and in reliance on such information, the Seller will supply such Items in compliance with applicable trade and customs laws including that of the United States of America. The Seller cautions and the Buyer acknowledges that any change in end-use, end-user or country of end-use (including a shipment between countries other than the U.S.) may be restricted or prohibited by applicable trade and customs law, whether it be of the U.S. or other country. The Parties shall comply with all trade and customs laws (including U.S. Export Controls) except for any such laws which conflict with or are otherwise penalized under the laws of the U.S., which in the event of such conflict, Seller shall notify Buyer. The Buyer agrees in particular that it shall not use and shall not permit any third party to use such items in connection with the design, production, use, or storage of chemical, biological or nuclear weapons or missiles of any kind.

13. TRANSPORTATION CHARGES, ALLOWANCES, CLAIMS. All prices are F.O.B. Seller's plant or other designated shipping point. No freight is allowed unless stated in Seller's quotation (if any) or in a written contract which may exist between Seller and Buyer at the time of shipment. If Seller's quotation or a written contract states that all or a portion of freight is allowed, all prices are F.O.B. Seller's plant or other designated shipping point, with most economical surface transportation allowed. If the quoted or contractual price includes transportation, Seller reserves the right to designate the common carrier and to ship in the manner it deems most economical. Added costs due to special routing requested by the Buyer are chargeable to the Buyer. Under no circumstances is any freight allowance which is absorbed by Seller to be deducted from the selling price. If the quoted price or contract includes transportation, no deduction will be made in lieu thereof whether Buyer accepts shipment at plant, warehouse, freight station, or otherwise supplies its own transportation. When sales are made from the Seller's warehouse, Seller reserves the right to charge either actual or pro-rated freight from Seller's principle point of manufacture to Seller's warehouse. Buyer assumes risk of loss 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 transit, but does not guarantee against such damage. Unless requested in writing by the Buyer, no shipments are insured by Seller against damage or loss in transit. Seller will place insurance as nearly as possible in accordance with Buyer's written instructions but in such case Seller acts only as agent between the insurance company and the Buyer and assumes no liability whatsoever. Any claims for shipping loss, breakage or damage (obvious or concealed) are Buyer's responsibility and should be made to the carrier. All claims regarding shortages must be made within thirty (30) days from receipt of shipment and must be accompanied by the packing list(s) covering the shipment. 14. INDEMNIFICATION AND LIMITATION OF LIABILITY:

A. INDEMNIFICATION: Buyer Group means: Buyer, its parent (if any), subsidiaries, affiliates, co-owners, co-venturers, partners and any entity with whom Buyer has an economic interest with respect to the Work including Buyer's customer and its and their respective employees, personnel, directors, officers, borrowed servants, representatives, agents, contractors and subcontractors (respectively and of any tier or level and who are not included within the Seller Group). Seller Group means: Seller, its parent (if any), subsidiaries, affiliates, co-owners and its and their respective employees, personnel, directors, officers, borrowed servants, representatives, agents, contractors and subcontractors (respectively and of any tier or level and who are not included within the Buyer Group). Negligence means: sole, joint or concurrent, active, passive, gross or willful misconduct.

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

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

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

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

(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 harmless from and against any and all Claims asserted against them by or on behalf of any third party for the death(s) of or personal injury (ies) to such a third party, as well as loss (es) of or damage(s) to the property of such a third party. A third party is a person or entity not included in Buyer Group or Seller Group. It is agreed by Buyer and Seller that their respective duty of indemnity to each other with respect to Claims asserted against them by a third party pursuant to this Article 14 (A) (5) shall be limited to their respective degree of Negligence.

(6) Notwithstanding any other provision contained in this Agreement, Buyer shall Indemnify and hold the members of Seller Group harmless from and against all Claims (including clean-up costs and loss (es) of oil, gas or hydrocarbons) arising from pollution, contamination, dumping or spilling of any substance and even if arising out of or attributable to the Negligence of the members of the Seller Group.

B. INDEMNITY FOR CONSEQUENTIAL DAMAGES: UNDER NO CIRCUMSTANCES SHALL SELLER BE LIABLE FOR ANY SPECIAL, CONSEQUENTIAL, INCIDENTAL, EXEMPLARY OR PUNITIVE DAMAGES (collectively "CONSEQUENTIAL"), AS DEFINED BY THE LAWS GOVERNING THIS PURCHASE ORDER, NOR FOR ANY LOSS OF ANTICIPATED PROFITS, 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 MEMBERS OF THE SELLER GROUP MAY BE PERFORMING WORK AND BUYER AGREES TO INDEMNIFY AND HOLD SELLER GROUP HARMLESS FROM AND AGAINST ANY CLAIMS FOR SUCH CONSEQUENTIAL DAMAGES EVEN IF ARISING 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 OBLIGATIONS AND/OR LIABILITIES HEREBY ASSUMED BY THE PARTIES SHALL BE: (i) SUPPORTED BY INSURANCE; (ii) WITHOUT LIMIT; (iii) AND WITHOUT REGARD TO THE CAUSE OR CAUSES THEREOF, INCLUDING, BUT NOT LIMITED TO, PREEXISTING CONDITIONS (WHETHER SUCH CONDITIONS BE PATENT OR LATENT), THE UNSEAWORTHINESS OF ANY VESSEL OR VESSELS (WHETHER OR NOT PREEXISTING), THE UNAIRWORTHINESS OF ANY AIRCRAFT, BREACH OF REPRESENTATION OR WARRANTY (EXPRESS OR IMPLIED), BREACH OF CONTRACT, BREACH OF DUTY (STATUTORY, CONTRACTUAL, COMMON LAW OR OTHERWISE), STRICT LIABILITY, CONDITION OF RUIN OR DEFECTIVE PREMISES, EQUIPMENT, FACILITIES, OR APPURTENANCES OF ANY PARTY UNDER ANY CODE, LAW OR (WHETHER OR NOT SAID CONDITION IS PREEXISTING AND/OR LATENT, PATENT OR OTHERWISE), THE LOADING OR UNLOADING OF PERSONS OR CARGO, TORT, OR THE NEGLIGENCE OR FAULT OF ANY PARTY (AS DEFINED AT THE BEGINNING OF THIS ARTICLE 14, OR ANY OTHER THEORY OF LEGAL LIABILITY. Seller's total responsibility for any claims, damages, losses or liability arising out of or related to its performance of this contract or the products or services covered hereunder shall not exceed the purchase price.

15. MODIFICATION, RESCISSION & WAIVER. The terms herein may not be modified or rescinded nor any of its provisions waived unless such modification, rescission or waiver is in writing and signed by an authorized employee of Seller at its office in Houston, Texas. Failure of Seller to insist in 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 hereunder shall not be construed as a waiver or relinquishment of any such term, condition, or right hereunder and shall not affect Seller's right to insist upon strict performance and compliance with regard to any unexecuted portions of this contract or future performance of these terms and conditions. All orders must be accepted by an authorized employee of Seller. The rights and duties of the parties and construction and effect of all provisions hereof shall be governed by and construed according to the internal laws of the State of Texas. Any disputes which arise under this agreement shall be venued in the District Court of Harris County, Texas or in the Southern District of Texas.

REV08/06

Surface Casing

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

Size	Grade	#/ft	Collapse	Burst (Internal Yield)	Tensile	Coupling	Length	Dry 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.

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

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

Size	Grade	#/ft	Collapse	Burst (Internal Yield)	Tensile	Coupling	Length	Dry 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.

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

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

Size	Grade	#/ft	Collapse	Burst (Internal Yield)	Tensile	Coupling	Length	Dry 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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Cementing Operations:
J-55: 2570psi / [(0.77psi/ft – 0.433psi/ft)(4000')] = **1.91**
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Casing Pressure Test:
J-55: 3950psi / [(1500psi +1789 psi) - (1747psi)] = **2.56**
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- 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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Overpull:
J-55: 520 kips / (100,000 lbs. + 224,00 lbs.) = **1.6**
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Production Casing

Size	Grade	#/ft	Collapse	Burst (Internal Yield)	Tensile	Coupling	Length	Dry 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).
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Burst: $DF_B = 1.25$

Base Assumption

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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).

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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
13.375"	*J-55*	*54.5*	*1130 psi*	*2730 psi*	*514 kips*	*STC*	*1800'*	*98,100 lbs*	*8.5 ppg*

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

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Size	Grade	#/ft	Collapse	Burst (Internal Yield)	Tensile	Coupling	Length	Dry Weight	Mud Weight
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Frac Pressure:
12,360psi / [(9500 psi)+ (0.468 – 0.433psi/ft)(10,500'TVD)] = **1.28**

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Size	Grade	#/ft	Collapse	Burst (Internal Yield)	Tensile	Coupling	Length	Dry Weight	Mud Weight
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Casing Pressure Test:
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Intermediate Casing

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

1. ***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'	1st. Bone Spring	9,501'
Capitan Reef Bottom	4,710'	2nd. 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

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:***

String	Hole size	Depth	Casing OD	Collar	Weight	Grade
Surface	17-1/2"	1800' MD	New 13-3/8"	STC	54.5#	J-55
Intermediate	12-1/4"	3901' MD	New 9-5/8"	LTC	40#	J-55
Intermediate	12-1/4"	5600' MD	New 9-5/8"	LTC	40#	HCK-55
Production	8-3/4"	18,314' MD	New 5-1/2"	BTC	20#	P-110

13-3/8", J-55:		9-5/8", J-55	
Collapse Factor:	1.42	Collapse Factor:	1.25
Burst Factor:	3.86	Burst Factor:	1.41
Tension Factor:	2.59	Tension Factor:	1.6

9-5/8", HCK-55		5-1/2", P-110	
Collapse Factor:	1.45	Collapse Factor:	2.03
Burst Factor:	1.27	Burst Factor:	1.28
Tension Factor:	4.23	Tension Factor:	1.6

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)

Tail: 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

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

Size	Grade	#/ft	Collapse	Burst (Internal Yield)	Tensile	Coupling	Length	Dry 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.

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

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

Size	Grade	#/ft	Collapse	Burst (Internal Yield)	Tensile	Coupling	Length	Dry 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.

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

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

Size	Grade	#/ft	Collapse	Burst (Internal Yield)	Tensile	Coupling	Length	Dry 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.

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

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

Size	Grade	#/ft	Collapse	Burst (Internal Yield)	Tensile	Coupling	Length	Dry 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.

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

Size	Grade	#/ft	Collapse	Burst (Internal Yield)	Tensile	Coupling	Length	Dry 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 Casing

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

Size	Grade	#/ft	Collapse	Burst (Internal Yield)	Tensile	Coupling	Length	Dry 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.

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

Size	Grade	#/ft	Collapse	Burst (Internal Yield)	Tensile	Coupling	Length	Dry 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 Casing

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

Size	Grade	#/ft	Collapse	Burst (Internal Yield)	Tensile	Coupling	Length	Dry 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.

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

Size	Grade	#/ft	Collapse	Burst (Internal Yield)	Tensile	Coupling	Length	Dry 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 Casing

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

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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

Size	Grade	#/ft	Collapse	Burst (Internal Yield)	Tensile	Coupling	Length	Dry 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**
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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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Overpull:
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HCK-55: 694 kips / (100,000 lbs. + 64,100 lbs.) = **4.23**

Midwest Hose & Specialty, Inc.

Internal Hydrostatic Test Graph

February 19, 2017

Customer: Hobbs

Pick Ticket #: 384842

Hose Specifications

Hose Type
D

I.D.
5.5"

Working Pressure
5000 PSI

Length
20

O.D.
5.03"

Burst Pressure

Verification

Type of Fitting
4 1/2 SK

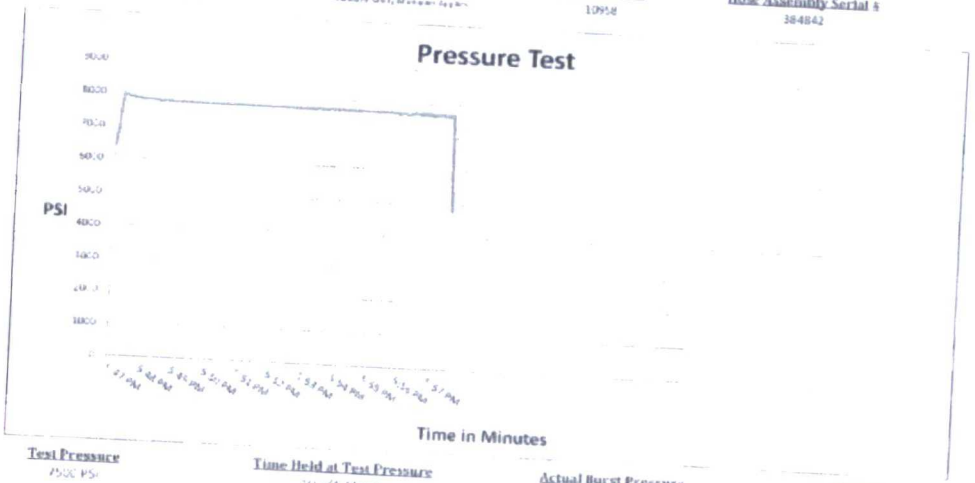
Die Size
5.62"

Hose Serial #
10958

Coupling Method
Swage

Final O.D.
5.65"

Hose Assembly Serial #
384842



Test Pressure
7500 PSI

Time Held at Test Pressure
30 4/4 Minutes

Actual Burst Pressure

Peak Pressure
7480 PSI

Comments: Hose assembly pressure tested with water at ambient temperature

Tested By: Richard Davis

Approved By: Charles Ann

Midwest Hose
& Specialty, Inc.

Internal Hydrostatic Test Certificate

General Information		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
Fittings			
End A		**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"**
Hydrostatic Test Requirements			
Test Pressure (psi)	**7,500**	***Hose assembly was tested with ambient water temperature.***	
Test Pressure Hold Time (minutes)	**10 1/2**		

Date Tested	*Tested By*	*Approved By*
2/19/2017	Richard Dias	

Midwest Hose
& Specialty, Inc.

Certificate of Conformity

Customer: **HOBBS**	*Customer P.O.#* **356945**
Sales Order # **318810**	*Date Assembled:* **2/19/2017**

Specifications

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**		

We hereby certify that the above material supplied for the referenced purchase order to be true according to the requirements of the purchase order and current industry standards.

Supplier:
Midwest Hose & Specialty, Inc.
3312 S I-35 Service Rd
Oklahoma City, OK 73129

Comments:

Approved By	*Date*
	2/20/2017

APD ID: 10400026682 **Submission Date:** 01/31/2018

Operator Name: LEGACY RESERVES OPERATING LP

Well Name: LEA UNIT **Well Number:** 64H

Well Type: OIL WELL **Well Work Type:** Drill

Highlighted data reflects the most recent changes

Show Final Text

Section 1 - Existing Roads

Will existing roads be used? YES

Existing Road Map:

Vicinity_Plat_20180130085535.pdf

Existing Road Purpose: ACCESS,FLUID TRANSPORT **Row(s) Exist?** YES

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

Operator Name: LEGACY RESERVES OPERATING LP

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

Water source type: GW WELL

Describe type:

Source latitude:

Source longitude:

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 (acre-feet): 2.3200758

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:**

Operator Name: LEGACY RESERVES OPERATING LP

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 FACILITY **Disposal location ownership:** PRIVATE
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?

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 width (ft.)**

Cuttings 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 reseeded 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.

Operator Name: LEGACY RESERVES OPERATING LP

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 (acres): 1.03
Road proposed disturbance (acres): 0
Powerline proposed disturbance (acres): 0
Pipeline proposed disturbance (acres): 0
Other proposed disturbance (acres): 0
Total proposed disturbance: 1.03

Well pad interim reclamation (acres): 0
Road interim reclamation (acres): 0
Powerline interim reclamation (acres): 0
Pipeline interim reclamation (acres): 0
Other interim reclamation (acres): 0
Total interim reclamation: 0

Well pad long term disturbance (acres): 1.03
Road long term disturbance (acres): 0
Powerline long term disturbance (acres): 0
Pipeline long term disturbance (acres): 0
Other long term disturbance (acres): 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:

Operator Contact/Responsible 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:

Operator Name: LEGACY RESERVES OPERATING LP

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:**

Operator Name: LEGACY RESERVES OPERATING LP

Well Name: LEA UNIT **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 **Use APD as ROW?**

ROW Type(s):

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

Section 3 - Unlined Pits

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 Dissolved Solids (TDS) concentration equal to or less than that of the existing water to be protected?

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: **Injection well name:**

Assigned injection well API number? **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: **PWD disturbance (acres):**

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: **PWD disturbance (acres):**

Other PWD discharge volume (bbl/day):

Other PWD type description:

Other PWD type attachment:

Have other regulatory requirements been met?

Other regulatory requirements attachment:

AFMSS

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

Bond Info Data Report

04/23/2018

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:

PWD disturbance (acres):

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:

United States Department of the Interior
Bureau of Land Management
CARLSBAD FIELD OFFICE
620 E. GREENE
CARLSBAD, NM 88220 -6292
Phone: (575) 234-5972

Receipt

No: 3756257

Transaction #: 3862137
Date of Transaction: 02/03/2017

CUSTOMER:

LEGACY RESERVES OPERATING LP
303 W WALL ST STE 1800
MIDLAND,TX 79701-5106 US

LINE #	QTY	DESCRIPTION	REMARKS	UNIT PRICE	TOTAL
1	1.00	OIL & GAS / APPLICATION FOR PERMIT TO DRILL (APD) / APD FEE	LEA UNIT 64H	9610.00	9610.00
				TOTAL:	**$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.