

Black Hills Exploration & Prod-ebiz
Do Not Mail - 1515 Wynkoop St
Denver, Colorado 80202

DHS 3C-20 D17

Mesa County, Colorado
United States of America
S:17 T:9S R:98W
API/UWI 05077102040000

Production String Recommendation

Prepared for: Mr Lance Nelson

May 23, 2013
Version: 6

Submitted by:
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Halliburton
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HALLIBURTON

Halliburton appreciates the opportunity to present this proposal and looks forward to being of service to you.

Foreword

Enclosed is our cost estimate for cementing the casing strings in the referenced well. The information in this cost estimate includes well data, calculations, materials requirements, and cost estimates. This cost estimate is based on information from our field personnel and previous cementing services in the area.

The selection and use of non-Halliburton plugs and casing attachments often compromises the holistic approach and may jeopardize the overall objective for effective zonal isolation. Furthermore, Halliburton is not involved in the design, manufacture or use of plugs and casing attachments supplied by other manufacturers and assumes no liability for their installation and operation. For this reason we recommend Halliburton plugs and casing attachments be used when Halliburton performs any zonal isolation operation.

Halliburton Energy Services recognizes the importance of meeting society's needs for health, safety, and protection of the environment. It is our intention to proactively work with employees, customers, the public, governments, and others to use natural resources in an environmentally sound manner while protecting the health, safety, and environmental processes while supplying high quality products and services to our customers.

We appreciate the opportunity to present this cost estimate for your consideration and we look forward to being of service to you. Our Services for your well will be coordinated through the Service Center listed below. If you require any additional information or additional designs, please feel free to contact myself or our field representative listed below.

Prepared by: _____
Jason Crater
Procedure Analyst

Submitted by: _____
Jeff Himes
Technical Advisor

SERVICE CENTER:	Grand Junction
OPERATIONS MANAGER:	Shaun Burns
SERVICE COORDINATOR:	John Trout/Chris Martinez
OPER. ENGINEER:	Keven Nye / Bradley Pruett Kory Hugentobler / Charles Ross
TECHNICAL MANAGER:	Russell Stimatze
PHONE NUMBER:	970-523-3600

Cementing Considerations

1. Cement quality and weight: Choose a cement slurry that is designed to solve the problems specific to each casing string.
2. Waiting time: Hold the cement slurry in place and under pressure until it reaches its initial set without disturbing it. A cement slurry is a time-dependent liquid and must be allowed to undergo a hydration reaction to produce a competent cement sheath. A fresh cement slurry can be worked (thickening or pump time) as long as it is in a plastic state and before going through its transition phase. If the cement slurry is not allowed to transition without being disturbed, it may be subjected to changes in density, dilution, settling, water separation, and gas cutting that may lead to a lack of zonal isolation and possible bridging in the annulus.
3. Pipe movement: Reciprocation and/or rotation mechanically breaks up gelled mud and changes the flow patterns in the annulus to improve displacement efficiency.
4. Mud properties (for cementing):

Rheology:

Plastic Viscosity (PV) < 15 centipoise (cp)

Yield Point (YP) < 10 lb/100 ft²

These properties should be reviewed with the Mud Engineer, Drilling Engineer, and Company Representative(s) to ensure no hole problems are created.

Gel Strength: The 10-second/10-minute gel strength values should be such that the 10-second and 10-minute readings are close together or flat (i.e., 5/6). The 30-minute reading should be less than 20 lb/100 ft². Sufficient shear stress may not be achieved on a primary cement job to remove mud left in the hole if the mud were to develop more than 25 lb/100 ft² of gel strength.

Fluid Loss: Decreasing the filtrate loss into a permeable zone enhances the creation of a thin, competent filter cake. A thin, competent filter cake created by a low fluid loss mud system is desirable over a thick, partially gelled filter cake. A mud system created with a low fluid loss will be more easily displaced. The fluid loss value should be < 15 cc's (ideal would be 5 cc's).

5. Circulation: Prior to cementing, circulate full hole volume twice, or until well conditioned mud is being returned to the surface. There should be no cutting in the mud returns. An annular velocity of 260 feet per minute is optimum (SPE/IADC 18617), if possible.
6. Flow rate: Turbulent flow is the most desirable flow regime for mud removal. If turbulence cannot be achieved, pump at as high a flow rate that can practically and safely be used to create the maximum flow energy. The highest mud removal is achieved when the maximum flow energy is obtained.
7. Pipe Centralization: A minimum standoff of 70% should be targeted for optimum displacement efficiency.
8. Rat hole: A weighted viscous pill placed in the rat hole prior to cementing will minimize the risk of higher density cement mixing with lower density mud when the well is static.
9. Top and Bottom plugs: A top and bottom plug is recommended to be run on all primary casing jobs. The bottom plug should be run after the spacer and ahead of the first cement slurry.
10. Spacers and flushes: Spacers and/or flushes should be used to prevent contamination between the cement slurry and the drilling fluid. They are also used to clean the wellbore and aid with bonding. To determine the volume, either a minimum of 10 minutes of contact time or 1000ft. of annular fill, whichever is greater, is recommended. **For drilling operations using diesel-based drilling fluids**, we suggest Tuned Spacer III. This is a water-based spacer designed to eliminate the use of diesel thereby mitigating environmental impact and reducing job cost. This spacer can be customized to the desired density and rheology (PV and YP) in order to better to remove mud and filter cake from the hole. This will result in the best zonal isolation by providing superior cement-to-casing and cement-to-formation bonds.

Job Information

Production Casing

Well Name: DHS

Well #: 3C-20 D17

4 1/2" Production String	7760 - 16960 ft (MD)
Outer Diameter	4.500 in
Inner Diameter	4.000 in
Linear Weight	11.60 lbm/ft
Casing Grade	N-80

4" Drill Pipe	0 - 5300 ft (MD)
Outer Diameter	4.000 in
Inner Diameter	3.340 in
Linear Weight	14 lbm/ft

5 1/2" Production String	0 - 7760 ft (MD)
Outer Diameter	5.500 in
Inner Diameter	4.892 in
Linear Weight	17 lbm/ft
Casing Grade	N-80

7 5/8" Intermediate Casing	0 - 5830 ft (MD)
Outer Diameter	7.625 in
Inner Diameter	6.969 in
Linear Weight	26.40 lbm/ft
Casing Grade	N-80

6 3/4" Open Hole	5450 - 8040 ft (MD)
Inner Diameter	6.750 in
Job Excess	25 %

6 3/4" Open Hole	8040 - 16960 ft (MD)
Inner Diameter	6.750 in
Job Excess	25 %

Calculations**Production Casing**

Spacer:

$$\begin{aligned} 1941.26 \text{ ft} * 0.0999 \text{ ft}^3/\text{ft} * 0 \% &= 193.94 \text{ ft}^3 \\ 150.00 \text{ ft} * 0.0999 \text{ ft}^3/\text{ft} * 0 \% &= 14.99 \text{ ft}^3 \\ 150.00 \text{ ft} * 0.0835 \text{ ft}^3/\text{ft} * 25 \% &= 15.66 \text{ ft}^3 \\ \text{Total Spacer} &= 224.58 \text{ ft}^3 \\ &= 40.00 \text{ bbl} \end{aligned}$$

Cement : (300.00 ft fill)

$$\begin{aligned} 230.00 \text{ ft} * 0.0835 \text{ ft}^3/\text{ft} * 25 \% &= 24.01 \text{ ft}^3 \\ 70.00 \text{ ft} * 0.0835 \text{ ft}^3/\text{ft} * 25 \% &= 7.31 \text{ ft}^3 \\ \text{Total Lead Cement} &= 31.32 \text{ ft}^3 \\ &= 5.58 \text{ bbl} \\ \text{Sacks of Cement} &= 18 \text{ sks} \end{aligned}$$

Cement : (11060.00 ft fill)

$$\begin{aligned} 1860.00 \text{ ft} * 0.0835 \text{ ft}^3/\text{ft} * 25 \% &= 194.18 \text{ ft}^3 \\ 280.00 \text{ ft} * 0.1381 \text{ ft}^3/\text{ft} * 25 \% &= 48.32 \text{ ft}^3 \\ 8920.00 \text{ ft} * 0.1381 \text{ ft}^3/\text{ft} * 25 \% &= 1539.35 \text{ ft}^3 \\ \text{Tail Cement} &= 1781.85 \text{ ft}^3 \\ &= 317.36 \text{ bbl} \end{aligned}$$

Shoe Joint Volume: (0.00 ft fill)

$$\begin{aligned} 0.00 \text{ ft} * 0.0873 \text{ ft}^3/\text{ft} &= 0.00 \text{ ft}^3 \\ &= 0.00 \text{ bbl} \\ \text{Tail plus shoe joint} &= 1781.85 \text{ ft}^3 \\ &= 317.36 \text{ bbl} \\ \text{Total Tail} &= 1231 \text{ sks} \end{aligned}$$

Total Pipe Capacity:

$$\begin{aligned} 5300.00 \text{ ft} * 0.0608 \text{ ft}^3/\text{ft} &= 322.48 \text{ ft}^3 \\ 2460.00 \text{ ft} * 0.1305 \text{ ft}^3/\text{ft} &= 321.10 \text{ ft}^3 \\ 9200.00 \text{ ft} * 0.0873 \text{ ft}^3/\text{ft} &= 802.85 \text{ ft}^3 \\ &= 257.62 \text{ bbl} \end{aligned}$$

Displacement Volume to Shoe Joint:

$$\begin{aligned} \text{Capacity of Pipe - Shoe Joint} &= 257.62 \text{ bbl} - 0.00 \text{ bbl} \\ &= 257.62 \text{ bbl} \end{aligned}$$

Job Recommendation

Production Casing

Fluid Instructions

Fluid 1: Rheologically Enhanced Spacer
 TUNED SPACER III
 117.6 lbm/bbl Barite (Heavy Weight Additive)

Fluid Density: 11 lbm/gal
 Fluid Volume: 40 bbl

Fluid 2: Lead Cement
 HALCEM (TM) SYSTEM
 0.2 % Halad(R)-413 (Additive Material)

Fluid Weight 12.60 lbm/gal
 Slurry Yield: 1.75 ft³/sk
 Total Mixing Fluid: 8.98 Gal/sk
 Top of Fluid: 5600 ft
 Calculated Fill: 300 ft
 Volume: 5.58 bbl
 Calculated Sacks: 17.87 sks
 Proposed Sacks: 20 sks

Fluid 3: Tail Cement
 HALCEM (TM) SYSTEM
 0.2 % Halad(R)-413 (Additive Material)

Fluid Weight 13.50 lbm/gal
 Slurry Yield: 1.45 ft³/sk
 Total Mixing Fluid: 6.70 Gal/sk
 Top of Fluid: 5900 ft
 Calculated Fill: 11060 ft
 Volume: 317.36 bbl
 Calculated Sacks: 1231.41 sks
 Proposed Sacks: 1240 sks

Job Procedure

Production Casing

Detailed Pumping Schedule

Fluid #	Fluid Type	Fluid Name	Surface Density lbm/gal	Estimated Avg Rate bbl/min	Downhole Volume
1	Spacer	TUNED SPACER III	11.0		40 bbl
2	Cement	12.5 HALCEM	12.6		20 sks
3	Cement	13.5 HALCEM	13.5		1240 sks

Cost Estimate

Production Casing

<u>Mtrl Nbr</u>	<u>Description</u>	<u>Qty</u>	<u>U/M</u>	<u>Unit Price</u>	<u>Gross Amt</u>	<u>Net Amt</u>
7525	CMT PRODUCTION LINER BOM	1	JOB		0.00	0.00
	Cementing Equipment and Services					
2	MILEAGE FOR CEMENTING CREW,ZI Number of Units	100 1	MI	5.76	576.00	184.32
1	ZI-MILEAGE FROM NEAREST HES BASE,/UNIT Number of Units	100 1	MI	9.79	979.00	313.28
16091	ZI - PUMPING CHARGE DEPTH FEET/METERS (FT/M)	1 16960 FT	EA	41,305.00	41,305.00	13,217.60
16092	ADDITIONAL HOURS (PUMPING EQUIPMENT), ZI HOURS UNIT OF MEASURE - HRS	0 1 H	EA	1,139.00	0.00	0.00
139	ADC (AUTO DENSITY CTRL) SYS, /JOB,ZI NUMBER OF UNITS	1 1	JOB	2,275.00	2,275.00	728.00
130104	PORT. DATA ACQUIS. W/OPTICEM RT W/HES DAYS OR PARTIAL DAY(WHOLE NO.)	1 1	EA	2,549.00	2,549.00	815.68
114	R/A DENSOMETER W/CHART RECORDER,/JOB,ZI NUMBER OF UNITS	1 1	JOB	1,285.00	1,285.00	411.20
74031	TUBING/ROTARY SUB RNTL,3.5",1ST DAY,ZI DAYS OR FRACTION (MIN1)	1 1	EA	120.90	120.90	38.69
92	PORTABLE RADIOS, ZI NUMBER OF JOBS	4 1	EA	323.00	1,292.00	413.44
119534	SUCTION HOSE, 4"/FT W/HES,PER JOB ZI NUMBER OF JOBS	100 1	FT	4.40	440.00	140.80
14089	PUP TRAILER,NON-ACID MATLS,0-8 HRS,ZI HOURS (MIN8)	1 1	EA	822.00	822.00	263.04
11941	FIELD STORAGE BIN DELIVERY, ZI Number of Units	80 1	MI	9.79	783.20	250.62
16115	FIELD STORAGE BIN ON SITE >8 HRS,DAY,ZI DAYS OR PARTIAL DAY(WHOLE NO.)	1 1	EA	1,344.00	1,344.00	430.08
	SubTotal		USD		53,771.10	17,206.75
	Cementing Surcharges					
7	ENVIRONMENTAL CHARGE,/JOB,ZI	1	JOB	134.00	134.00	134.00
8	IRON SAFETY INSPECTION SURCHARGE /JOB ZI	1	JOB	83.00	83.00	83.00
86955	ZI FUEL SURCHG-HEAVY TRKS >1 1/2 TON Number of Units	100 6	MI	0.72	432.00	432.00
86954	ZI FUEL SURCHG-CARS/PICKUPS<1 1/2TON Number of Units	100 6	MI	0.24	144.00	144.00
372867	Cmt PSL - DOT Vehicle Charge, CMT	6	EA	241.00	1,446.00	1,446.00
87605	ZI FUEL SURCHG-CMT & CMT ADDITIVES NUMBER OF TONS	50 69.24	MI	0.24	830.88	830.88
	SubTotal		USD		3,069.88	3,069.88
	Cementing Materials					
76400	ZI MILEAGE,CMT MTLs DEL/RET MIN NUMBER OF TONS	50 69.24	MI	3.35	11,597.70	3,711.26
3965	HANDLE&DUMP SVC CHRg, CMT&ADDITIVES,ZI NUMBER OF EACH	1539 1	CF	5.49	8,449.11	2,703.72

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<u>Mtrl Nbr</u>	<u>Description</u>	<u>Qty</u>	<u>U/M</u>	<u>Unit Price</u>	<u>Gross Amt</u>	<u>Net Amt</u>
	Unit of Measurement	EA				
483826	TUNED SPACER III	40	BBL	293.00	11,720.00	3,750.40
100003681	BARITE	48	SK	31.07	1,491.36	477.24
452986	HALCEM (TM) SYSTEM	20	SK		857.07	274.26
100003738	HALAD-413	2	LB	85.78	171.56	54.90
452986	HALCEM (TM) SYSTEM	1240	SK		44,341.70	14,189.33
100003738	HALAD-413	82	LB	85.78	7,033.96	2,250.87
	SubTotal		USD		85,662.46	27,411.98
	Total		USD			142,503.44
	Discount		USD			94,814.83
	Discounted Total		USD			47,688.61

Primary Plant: Vernal, UT, USA
NEW
Secondary Plant: Vernal, UT, USA

Price Book Ref: 28 Rockies -
Price Date: 5/24/2013

Casing/Sales Equipment

Production Casing

<u>Mtrl Nbr</u>	<u>Description</u>	<u>Qty</u>	<u>U/M</u>	<u>Unit Price</u>	<u>Gross Amt</u>	<u>Net Amt</u>
374609	CMT CASING EQUIPMENT BOM	0	JOB		0.00	0.00
100004880	SHOE,FLT,4-1/2 8RD,P-110,2-3/4 SSII	1	EA	757.00	757.00	242.24
100004753	CLR,FLT,4-1/2 LG 8RD,9.5-13.5PPF,P-110	1	EA	975.21	975.21	312.07
509667	CNTRLZR SLIDER II 4-1/2X6/18,#0412-0618S	1	EA	384.89	384.89	123.16
230654	SOLID STOP COLLAR 4-1/2", #0412-00SO	1	EA	97.85	97.85	31.31
553499	CENTRALISER SLIDER II 5 1/2" X 6 3/4"	1	EA		0.00	0.00
230656	SOLID STOP COLLAR 5-1/2", #0512-00SO	1	EA	33.55	33.55	10.74
100004476	CTRZR ASSY,5 1/2 CSG X 7 7/8 HOLE,HINGED	1	EA	146.00	146.00	46.72
101237389	PLUG,CMTG,BOT,5 1/2,HWE,4.38 MIN/5.09 MA	1	EA	207.00	207.00	66.24
100005045	KIT,HALL WELD-A	1	EA	74.30	74.30	23.78
2	MILEAGE FOR CEMENTING CREW,ZI	100	MI	5.76	576.00	184.32
	Number of Units	1				
86954	ZI FUEL SURCHG-CARS/PICKUPS<1 1/2TON	100	MI	0.24	24.00	24.00
	Number of Units	1				
	Total		USD			3,275.80
	Discount		USD			2,211.22
	Discounted Total		USD			1,064.58

Primary Plant: Vernal, UT, USA
NEW
Secondary Plant: Vernal, UT, USA

Price Book Ref: 28 Rockies -
Price Date: 5/24/2013

Conditions

NOTE

The cost in this analysis is good for the materials and/or services outlined within and shall be valid for 30 days from the date of this proposal. In order to meet your needs under this proposal with a high quality of service and responsive timing, Halliburton will be allocating limited resources and committing valuable equipment and materials to your area of operations. Accordingly, the discounts reflected in this proposal are available only for materials and services awarded on a first-call basis. Alternate pricing may apply in the event that Halliburton is awarded work on any basis other than as a first-call provider.

The unit prices stated in the proposal are based on our current published prices. The projected equipment, personnel, and material needs are only estimates based on information about the work presently available to us. At the time the work is actually performed, conditions then existing may require an increase or decrease in the equipment, personnel, and/or material needs. Charges will be based upon unit prices in effect at the time the work is performed and the amount of equipment, personnel, and/or material actually utilized in the work. Taxes, if any, are not included. Applicable taxes, if any, will be added to the actual invoice.

It is understood and agreed between the parties that with the exception of the subject discounts, all services performed and equipment and materials sold are provided subject to Halliburton's General Terms and Conditions contained in our current price list, (which include LIMITATION OF LIABILITY and WARRANTY provisions), and pursuant to the applicable Halliburton Work Order Contract (whether or not executed by you), unless a Master Service and/or Sales Contract applicable to the services, equipment, or materials supplied exists between your company and Halliburton, in which case the negotiated Master Contract shall govern the relationship between the parties. A copy of the latest version of our General Terms and Conditions is available from your Halliburton representative or at:

<http://www.halliburton.com/terms> for your convenient review, and we would appreciate receiving any questions you may have about them. Should your company be interested in negotiating a Master Contract with Halliburton, our Law Department would be pleased to work with you to finalize a mutually agreeable contract. In this connection, it is also understood and agreed that Customer will continue to execute Halliburton usual field work orders and/or tickets customarily required by Halliburton in connection with the furnishing of said services, equipment, and materials.

Any terms and conditions contained in purchase orders or other documents issued by the customer shall be of no effect except to confirm the type and quantity of services, equipment, and materials to be supplied to the customer.

If customer does not have an approved open account with Halliburton or a mutually executed written contract with Halliburton, which dictates payment terms different than those set forth in this clause, all sums due are payable in cash at the time of performance of services or delivery of equipment, products, or materials. If customer has an approved open account, invoices are payable on the twentieth day after date of invoice.

Customer agrees to pay interest on any unpaid balance from the date payable until paid at the highest lawful contract rate applicable, but never to exceed 18% per annum. In the event Halliburton employs an attorney for collection of any account, customer agrees to pay attorney fees of 20% of the unpaid account, plus all collection and court costs.