

**HALLIBURTON**

Tarpon Offshore Lp  
2000 Dairy Ashford Ste 578  
Houston, Texas 77077

OCSG-32181  
Well #1  
EUGENE ISLAND BIK:305  
United States of America

**Rig: Hercules #300**

## **Cementing Cost Estimate**

**Prepared for: Mr. Michael Patin**

**November 14, 2011  
Version: 2**

**Submitted by:  
Jay Belden  
Halliburton  
10200 Bellaire Blvd  
Houston, Texas 77072-5299  
281.575.4569**

**HALLIBURTON**

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

## **Foreword**

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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: \_\_\_\_\_  
Tony Landry  
Technical Sales Analyst

Submitted by: \_\_\_\_\_  
Jay Belden  
Technical Advisor

SERVICE CENTER:	Lafayette, LA
SERVICE COORDINATOR:	Matt Dauzat / Nathaniel Chaisson
BULK PLANT:	Fourchon, Louisiana
PHONE NUMBER:	1-800-444-7830

**Job Information****18 5/8" Cement Conductor Casing**

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Well Name: OCSG-32181

Well #: 1

18 5/8" Conductor Casing	0 - 1000 ft (MD)
Outer Diameter	18.625 in
Inner Diameter	17.632 in
Linear Weight	97.70 lbm/ft
Thread	BTC
Casing Grade	J-55
22" Open Hole	500 - 1000 ft (MD)
Inner Diameter	22.000 in
Job Excess	200 %
24" Drive Pipe (3/4" Wall)	0 - 500 ft (MD)
Outer Diameter	24.000 in
Inner Diameter	22.500 in
Job Excess	200 %
Mud Type	Water Based Mud
Mud Weight	9 lbm/gal
BHST	92 degF

**Calculations****18 5/8" Cement Conductor Casing**

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Spacer:

$$\begin{aligned} 107.66 \text{ ft} * 0.8692 \text{ ft}^3/\text{ft} * 200 \% &= 280.73 \text{ ft}^3 \\ \text{Total Spacer} &= 280.73 \text{ ft}^3 \\ &= 50.00 \text{ bbl} \end{aligned}$$

Cement : (324.00 ft fill)

$$\begin{aligned} 324.00 \text{ ft} * 0.8692 \text{ ft}^3/\text{ft} * 200 \% &= 844.83 \text{ ft}^3 \\ \text{Total Lead Cement} &= 844.83 \text{ ft}^3 \\ &= 150.47 \text{ bbl} \\ \text{Sacks of Cement} &= 275 \text{ sks} \end{aligned}$$

Cement : (500.00 ft fill)

$$\begin{aligned} 500.00 \text{ ft} * 0.7478 \text{ ft}^3/\text{ft} * 200 \% &= 1121.72 \text{ ft}^3 \\ \text{Tail Cement} &= 1121.72 \text{ ft}^3 \\ &= 199.79 \text{ bbl} \end{aligned}$$

Shoe Joint Volume: (45.00 ft fill)

$$\begin{aligned} 45.00 \text{ ft} * 1.6956 \text{ ft}^3/\text{ft} &= 76.30 \text{ ft}^3 \\ &= 13.59 \text{ bbl} \\ \text{Tail plus shoe joint} &= 1198.03 \text{ ft}^3 \\ &= 213.38 \text{ bbl} \\ \text{Total Tail} &= 1109 \text{ sks} \end{aligned}$$

Total Pipe Capacity:

$$\begin{aligned} 1000.00 \text{ ft} * 1.6956 \text{ ft}^3/\text{ft} &= 1695.63 \text{ ft}^3 \\ &= 302.00 \text{ bbl} \end{aligned}$$

Displacement Volume to Shoe Joint:

$$\begin{aligned} \text{Capacity of Pipe - Shoe Joint} &= 302.00 \text{ bbl} - 13.59 \text{ bbl} \\ &= 288.41 \text{ bbl} \end{aligned}$$

## Fluid Instructions

**SPACER**

Sea Water

Fluid Density: 8.54 lbm/gal

Fluid Volume: 50 bbl

**LEAD CEMENT**

Premium Cement

94 lbm/sk Premium Cement (Cement)

0.25 % D-AIR 3000 (Defoamer)

0.07 % Halliburton EZ-FLO (Bulk Flow Enhancer)

0.63 Gal/sk Liquid Econolite (Light Weight Additive)

Sea Water (Mixing Fluid)

Fluid Weight 11.40 lbm/gal

Slurry Yield: 3.07 ft<sup>3</sup>/sk

Total Mixing Fluid: 19.36 Gal/sk

Top of Fluid: 325 ft

Calculated Fill: 175 ft

Volume: 150.47 bbl

Calculated Sacks: 275.19 sks

Proposed Sacks: 276 sks

**TAIL CEMENT**

Premium Cement

94 lbm/sk Premium Cement (Cement)

0.25 % D-AIR 3000 (Defoamer)

0.07 % Halliburton EZ-FLO (Bulk Flow Enhancer)

Sea Water (Mixing Fluid)

Fluid Weight 16.40 lbm/gal

Slurry Yield: 1.08 ft<sup>3</sup>/sk

Total Mixing Fluid: 4.47 Gal/sk

Top of Fluid: 500 ft

Calculated Fill: 500 ft

Volume: 213.38 bbl

Calculated Sacks: 1109.28 sks

Proposed Sacks: 1110 sks

Displacement

Fluid Density: 9 lbm/gal

Fluid Volume 288.41 bbl

**Detailed Pumping Schedule**

Fluid #	Fluid Type	Fluid Name	Surface Density lbm/gal	Estimated Avg Rate bbl/min	Downhole Volume
1	Spacer	Sea Water	8.5		50 bbl
2	Cement	Lead Cement	11.4		276 sks
3	Cement	Tail Cement	16.4		1110 sks
4	Mud	Displacement	9.0		288.41 bbl

Circulate and condition until proper mud properties are achieved, minimum two (2) bottoms up.

Precede cement with 50 bbls. of Sea Water.

Mix and Pump Lead Cement.

Mix and Pump Tail Cement.

Drop top cement plug.

Displace cement to float collar.

**RECOMMENDED CEMENTING PRACTICES**

- 1) Mud Fluid Loss - Decreasing the filtrate loss into a permeable zone enhances the creation of a thin filter cake. This increases the fluid mud in the hole which is more easily removed. Generally an API fluid loss of 7 or 8 is sufficient, with high temperature - high pressure fluid loss no more than double this amount.
- 2) Mud Gel Strength - A non-thixotropic mud is desirable for good mud removal. This is a mud conditioned so the 10 second gel strength and 10 minute gel strength are similar. Example: 5/5 or 5/6.
- 3) Mud Properties - Viscosity (PV) should be less than 15, less than 10, if possible. Yield Point (YP) should less than 10 down to around 5.
- 4) Circulation - Circulate bottoms up twice, or until well conditioned mud is being returned to surface.
- 5) Pipe Movement - May be one of the most influential factors in mud removal. Reciprocation and or rotation, when feasible, mechanically breaks up gelled mud and constantly changes flow patterns in the annulus.
- 6) Pipe Centralization - Creates a uniform annular flow area perpendicular to the flow direction. Cement slurry will take the path of least resistance so centralization is important in keeping the pipe off the walls of the hole. Generally a 70% standoff is strived for in centralization, however even the slightest decentralization will cause a channel. Since perfect centralization is not possible it should be used in conjunction with other methods.
- 7) Rat Hole - Spot a weighted viscous gel pill in the rat hole before running pipe. This pill will help prevent cement swapping with lighter weight mud in the rat hole when displacement stops.
- 8) Annular Velocity - Pump rates prior to cementing and during cement displacement should produce annular velocities of 200 - 250 feet/minute to obtain good mud removal. It may, however, be necessary to reduce pump rates in order to maintain full returns at surface.

## Cost Estimate

## 18 5/8" Cement Conductor Casing

### SAP Quote # 0

<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>
100003687	PREMIUM CEMENT	1386	SK	39.13	54,234.18	32,540.51
101007446	D-AIR 3000	326	LB	10.07	3,282.82	1,969.69
101002314	EZ-FLO	92	LB	24.67	2,269.64	1,361.78
102381	LIQUID ECONOLITE	174	GAL	9.34	1,625.16	975.10
3965	HANDLE&DUMP SVC CHRГ, CMT&ADDITIVES,ZI NUMBER OF EACH	1402 1	CF	5.49	7,696.98	4,618.19
100003153	PLUG - CMTG - TOP - 18-5/8 AND 20 IN.	1	EA	2,896.00	2,896.00	1,448.00
	<b>SubTotal</b>		<b>USD</b>		<b>72,004.78</b>	<b>42,913.27</b>
94755	DAILY SERVICE CHARGE, ZI DAYS OR PARTIAL DAY(WHOLE NO.)	1 1	EA	1,700.00	1,700.00	1,700.00
18646	TANKS, STEEL/LINED 1000 GAL, 0-5 DAYS,ZI DAYS OR FRACTION (MIN5)	1 5	EA		1,715.00	1,029.00
18652	PLG CNTR >13.375 W/HES 0-5 DAYS ZI DAYS OR FRACTION (MIN5)	1 5	EA		3,893.00	2,335.80
90	ZI QUICK LATCH ATTACHMENT SIZE IN INCHES/MILLIMETER INCHES/MILLIMETERS (IN/MM)	1 18.625 IN	JOB	1,110.00	1,110.00	666.00
2	MILEAGE FOR CEMENTING CREW,ZI Number of Units	160 1	MI	5.76	921.60	921.60
86954	ZI FUEL SURCHG-CARS/PICKUPS<1 1/2TON Number of Units	160 1	MI	0.23	36.80	36.80
	<b>SubTotal</b>		<b>USD</b>		<b>9,376.40</b>	<b>6,689.20</b>
	<b>Total</b>		<b>USD</b>			<b>81,381.18</b>
	<b>Discount</b>		<b>USD</b>			<b>31,778.71</b>
	<b>Discounted Total</b>		<b>USD</b>			<b>49,602.47</b>

**Primary Plant:** HOUMA WHSE AB2, LA USA  
**Secondary Plant:** Fourchon, LA USA C\_PORT 1

**Price Book Ref:** 06 Gulf Coast Off-Shore  
**Price Date:** 11/14/2011

**Job Information****13 3/8" Cement Surface Casing**

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Well Name: OCSG-32181

Well #: 1

13 3/8" Surface Casing	0 - 4000 ft (MD)
Outer Diameter	13.375 in
Inner Diameter	12.515 in
Linear Weight	61 lbm/ft
Thread	BTC
Casing Grade	J-55

17 1/2" Open Hole	1000 - 4000 ft (MD)
Inner Diameter	17.500 in
Job Excess	100 %

18 5/8" Conductor Casing	0 - 1000 ft (MD)
Outer Diameter	18.625 in
Inner Diameter	17.632 in
Linear Weight	97.70 lbm/ft
Thread	BTC
Casing Grade	J-55
Job Excess	100 %

## Well Bore Data:

Mud Type	Water Based Mud
Mud Weight	9.30 lbm/gal
BHST	128 degF

**Calculations****13 3/8" Cement Surface Casing**

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Spacer:

$$\begin{aligned} 194.97 \text{ ft} * 0.7199 \text{ ft}^3/\text{ft} * 100 \% &= 280.73 \text{ ft}^3 \\ \text{Total Spacer} &= 280.73 \text{ ft}^3 \\ &= 50.00 \text{ bbl} \end{aligned}$$

Cement : (3278.00 ft fill)

$$\begin{aligned} 778.00 \text{ ft} * 0.7199 \text{ ft}^3/\text{ft} * 100 \% &= 1120.21 \text{ ft}^3 \\ 2500.00 \text{ ft} * 0.6946 \text{ ft}^3/\text{ft} * 100 \% &= 3473.19 \text{ ft}^3 \\ \text{Total Lead Cement} &= 4593.40 \text{ ft}^3 \\ &= 818.12 \text{ bbl} \\ \text{Sacks of Cement} &= 1496 \text{ sks} \end{aligned}$$

Cement : (500.00 ft fill)

$$\begin{aligned} 500.00 \text{ ft} * 0.6946 \text{ ft}^3/\text{ft} * 100 \% &= 694.64 \text{ ft}^3 \\ \text{Tail Cement} &= 694.64 \text{ ft}^3 \\ &= 123.72 \text{ bbl} \end{aligned}$$

Shoe Joint Volume: (45.00 ft fill)

$$\begin{aligned} 45.00 \text{ ft} * 0.8543 \text{ ft}^3/\text{ft} &= 38.44 \text{ ft}^3 \\ &= 6.85 \text{ bbl} \\ \text{Tail plus shoe joint} &= 733.08 \text{ ft}^3 \\ &= 130.57 \text{ bbl} \\ \text{Total Tail} &= 689 \text{ sks} \end{aligned}$$

Total Pipe Capacity:

$$\begin{aligned} 4000.00 \text{ ft} * 0.8543 \text{ ft}^3/\text{ft} &= 3417.03 \text{ ft}^3 \\ &= 608.60 \text{ bbl} \end{aligned}$$

Displacement Volume to Shoe Joint:

$$\begin{aligned} \text{Capacity of Pipe - Shoe Joint} &= 608.60 \text{ bbl} - 6.85 \text{ bbl} \\ &= 601.75 \text{ bbl} \end{aligned}$$

## Fluid Instructions

**SPACER**

Sea Water

Fluid Density: 8.54 lbm/gal

Fluid Volume: 50 bbl

**LEAD CEMENT**

Premium Cement

94 lbm/sk Premium Cement (Cement)

0.25 % D-AIR 3000 (Defoamer)

0.07 % Halliburton EZ-FLO (Bulk Flow Enhancer)

0.63 Gal/sk Liquid Econolite (Light Weight Additive)

Sea Water (Mixing Fluid)

Fluid Weight 11.40 lbm/gal

Slurry Yield: 3.07 ft<sup>3</sup>/sk

Total Mixing Fluid: 19.36 Gal/sk

Top of Fluid: 325 ft

Calculated Fill: 3125 ft

Volume: 818.12 bbl

Calculated Sacks: 1496.22 sks

Proposed Sacks: 1500 sks

**TAIL CEMENT**

Premium Cement

94 lbm/sk Premium Cement (Cement)

0.25 % D-AIR 3000 (Defoamer)

0.07 % Halliburton EZ-FLO (Bulk Flow Enhancer)

Fresh Water (Mixing Fluid)

Fluid Weight 16.40 lbm/gal

Slurry Yield: 1.06 ft<sup>3</sup>/sk

Total Mixing Fluid: 4.35 Gal/sk

Top of Fluid: 3500 ft

Calculated Fill: 500 ft

Volume: 130.57 bbl

Calculated Sacks: 688.98 sks

Proposed Sacks: 690 sks

Displacement

Fluid Density: 9.30 lbm/gal

Fluid Volume 601.75 bbl

**Detailed Pumping Schedule**

Fluid #	Fluid Type	Fluid Name	Surface Density lbm/gal	Estimated Avg Rate bbl/min	Downhole Volume
1	Spacer	Sea Water	8.5		50 bbl
2	Cement	Lead Cement	11.4		1500 sks
3	Cement	Tail Cement	16.4		690 sks
4	Mud	Displacement	9.3		601.75 bbl

Circulate and condition until proper mud properties are achieved, minimum two (2) bottoms up.

Precede cement with 50 bbls. of Sea Water.

Drop bottom cement plug.

Mix and Pump Lead Cement.

Mix and Pump Tail Cement.

Drop top cement plug.

Displace cement to float collar.

**RECOMMENDED CEMENTING PRACTICES**

- 1) Mud Fluid Loss - Decreasing the filtrate loss into a permeable zone enhances the creation of a thin filter cake. This increases the fluid mud in the hole which is more easily removed. Generally an API fluid loss of 7 or 8 is sufficient, with high temperature - high pressure fluid loss no more than double this amount.
- 2) Mud Gel Strength - A non-thixotropic mud is desirable for good mud removal. This is a mud conditioned so the 10 second gel strength and 10 minute gel strength are similar. Example: 5/5 or 5/6.
- 3) Mud Properties - Viscosity (PV) should be less than 15, less than 10, if possible. Yield Point (YP) should less than 10 down to around 5.
- 4) Circulation - Circulate bottoms up twice, or until well conditioned mud is being returned to surface.
- 5) Pipe Movement - May be one of the most influential factors in mud removal. Reciprocation and or rotation, when feasible, mechanically breaks up gelled mud and constantly changes flow patterns in the annulus.
- 6) Pipe Centralization - Creates a uniform annular flow area perpendicular to the flow direction. Cement slurry will take the path of least resistance so centralization is important in keeping the pipe off the walls of the hole. Generally a 70% standoff is strived for in centralization, however even the slightest decentralization will cause a channel. Since perfect centralization is not possible it should be used in conjunction with other methods.
- 7) Rat Hole - Spot a weighted viscous gel pill in the rat hole before running pipe. This pill will help prevent cement swapping with lighter weight mud in the rat hole when displacement stops.
- 8) Annular Velocity - Pump rates prior to cementing and during cement displacement should produce annular velocities of 200 - 250 feet/minute to obtain good mud removal. It may, however, be necessary to reduce pump rates in order to maintain full returns at surface.

## Cost Estimate

## 13 3/8" Cement Surface Casing

### SAP Quote # 0

<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>
100003687	PREMIUM CEMENT	2190	SK	39.13	85,694.70	51,416.82
101007446	D-AIR 3000	515	LB	10.07	5,186.05	3,111.63
101002314	EZ-FLO	145	LB	24.67	3,577.15	2,146.29
102381	LIQUID ECONOLITE	945	GAL	9.34	8,826.30	5,295.78
3965	HANDLE&DUMP SVC CHRGE, CMT&ADDITIVES,ZI NUMBER OF EACH	2215 1	CF	5.49	12,160.35	7,296.21
101235693	PLUG,CMTG,TOP,13 3/8,HWE,11.79 MIN/12.72	1	EA	998.00	998.00	499.00
101235691	PLUG,CMTG,BOT,13 3/8,HWE,11.79 MIN/12.72	1	EA	998.00	998.00	499.00
	<b>SubTotal</b>		<b>USD</b>		<b>117,440.55</b>	<b>70,264.73</b>
94755	DAILY SERVICE CHARGE, ZI DAYS OR PARTIAL DAY(WHOLE NO.)	1 1	EA	1,700.00	1,700.00	1,700.00
18646	TANKS, STEEL/LINED 1000 GAL, 0-5 DAYS,ZI DAYS OR FRACTION (MIN5)	1 5	EA		1,715.00	1,029.00
18653	PLG CNTR 7.625 -13.375 W/HES 0-5 DAYS ZI DAYS OR FRACTION (MIN5)	1 5	EA		2,964.00	1,778.40
90	ZI QUICK LATCH ATTACHMENT SIZE IN INCHES/MILLIMETER INCHES/MILLIMETERS (IN/MM)	1 13.375 IN	JOB	924.00	924.00	554.40
2	MILEAGE FOR CEMENTING CREW,ZI Number of Units	160 1	MI	5.76	921.60	921.60
86954	ZI FUEL SURCHG-CARS/PICKUPS<1 1/2TON Number of Units	160 1	MI	0.23	36.80	36.80
	<b>SubTotal</b>		<b>USD</b>		<b>8,261.40</b>	<b>6,020.20</b>
	<b>Total</b>		<b>USD</b>			<b>125,701.95</b>
	<b>Discount</b>		<b>USD</b>			<b>49,417.02</b>
	<b>Discounted Total</b>		<b>USD</b>			<b>76,284.93</b>

**Primary Plant:** HOUMA WHSE AB2, LA USA  
**Secondary Plant:** Fourchon, LA USA C\_PORT 1

**Price Book Ref:** 06 Gulf Coast Off-Shore  
**Price Date:** 11/14/2011

**Job Information****9 5/8" Cement Intermediate Casing**

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Well Name: OCSG-32181

Well #: 1

## 9 5/8" Intermediate Casing

	0 - 9030 ft (MD)
	0 - 9000 ft (TVD)
Outer Diameter	9.625 in
Inner Diameter	8.535 in
Linear Weight	53.50 lbm/ft
Thread	LTC
Casing Grade	P-110

## 12 1/4" Open Hole

	4000 - 9030 ft (MD)
Inner Diameter	12.250 in
Job Excess	30 %

## 13 3/8" Surface Casing

	0 - 4000 ft (MD)
Outer Diameter	13.375 in
Inner Diameter	12.515 in
Linear Weight	61 lbm/ft
Thread	BTC
Casing Grade	J-55

## Well Bore Data:

Mud Type	Oil Based Mud
Mud Weight	10.10 lbm/gal
BHST	188 degF

**Calculations****9 5/8" Cement Intermediate Casing**

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Spacer:

$$\begin{aligned} 804.43 \text{ ft} * 0.349 \text{ ft}^3/\text{ft} * 0 \% &= 280.73 \text{ ft}^3 \\ \text{Total Spacer} &= 280.73 \text{ ft}^3 \\ &= 50.00 \text{ bbl} \end{aligned}$$

Cement : (5657.16 ft fill)

$$\begin{aligned} 627.16 \text{ ft} * 0.349 \text{ ft}^3/\text{ft} * 0 \% &= 218.87 \text{ ft}^3 \\ 5030.00 \text{ ft} * 0.3132 \text{ ft}^3/\text{ft} * 30 \% &= 2047.93 \text{ ft}^3 \\ \text{Primary Cement} &= 2266.80 \text{ ft}^3 \\ &= 403.73 \text{ bbl} \end{aligned}$$

Shoe Joint Volume: (90.00 ft fill)

$$\begin{aligned} 90.00 \text{ ft} * 0.3973 \text{ ft}^3/\text{ft} &= 35.76 \text{ ft}^3 \\ &= 6.37 \text{ bbl} \\ \text{Tail plus shoe joint} &= 2302.56 \text{ ft}^3 \\ &= 410.10 \text{ bbl} \\ \text{Total Tail} &= 2160 \text{ sks} \end{aligned}$$

Total Pipe Capacity:

$$\begin{aligned} 9030.00 \text{ ft} * 0.3973 \text{ ft}^3/\text{ft} &= 3587.75 \text{ ft}^3 \\ &= 639.00 \text{ bbl} \end{aligned}$$

Displacement Volume to Shoe Joint:

$$\begin{aligned} \text{Capacity of Pipe - Shoe Joint} &= 639.00 \text{ bbl} - 6.37 \text{ bbl} \\ &= 632.63 \text{ bbl} \end{aligned}$$

### Fluid Instructions

#### SPACER

##### Tuned Spacer III

0.6 gal/bbl Dual Spacer Surfactant A (Surfactant)  
0.6 gal/bbl Dual Spacer Surfactant B (Surfactant)  
0.6 gal/bbl SEM-8 (Surfactant)

Fluid Density: 10.60 lbm/gal  
Fluid Volume: 50 bbl

#### CEMENT

##### Premium Cement

94 lbm/sk Premium Cement (Cement)  
0.25 % D-AIR 3000 (Defoamer)  
0.07 % Halliburton EZ-FLO (Bulk Flow Enhancer)  
0.08 Gal/sk Halad(R)-344 EXP (Low Fluid Loss Control)  
0.04 Gal/sk HR-6L (Retarder) (Est)  
Fresh Water (Mixing Fluid)

Fluid Weight 16.40 lbm/gal  
Slurry Yield: 1.07 ft<sup>3</sup>/sk  
Total Mixing Fluid: 4.36 Gal/sk  
Top of Fluid: 3372.84 ft  
Calculated Fill: 5657.16 ft  
Volume: 410.10 bbl  
Calculated Sacks: 2160 sks  
Proposed Sacks: 2160 sks

##### Displacement

Fluid Density: 10.10 lbm/gal  
Fluid Volume 632.63 bbl

**Detailed Pumping Schedule**

Fluid #	Fluid Type	Fluid Name	Surface Density lbm/gal	Estimated Avg Rate bbl/min	Downhole Volume
1	Spacer	Tuned Spacer III	10.6		50 bbl
2	Cement	Cement	16.4		2160 sks
3	Mud	Displacement	10.1		632.63 bbl

Circulate and condition until proper mud properties are achieved, minimum two (2) bottoms up.

Precede cement with 50 bbls. of Tuned III Spacer @10.6 ppg.

Drop bottom cement plug.

Mix and Pump Tail Cement.

Drop top cement plug.

Displace cement to float collar.

**RECOMMENDED CEMENTING PRACTICES**

- 1) Mud Fluid Loss - Decreasing the filtrate loss into a permeable zone enhances the creation of a thin filter cake. This increases the fluid mud in the hole which is more easily removed. Generally an API fluid loss of 7 or 8 is sufficient, with high temperature - high pressure fluid loss no more than double this amount.
- 2) Mud Gel Strength - A non-thixotropic mud is desirable for good mud removal. This is a mud conditioned so the 10 second gel strength and 10 minute gel strength are similar. Example: 5/5 or 5/6.
- 3) Mud Properties - Viscosity (PV) should be less than 15, less than 10, if possible. Yield Point (YP) should be less than 10 down to around 5.
- 4) Circulation - Circulate bottoms up twice, or until well conditioned mud is being returned to surface.
- 5) Pipe Movement - May be one of the most influential factors in mud removal. Reciprocation and or rotation, when feasible, mechanically breaks up gelled mud and constantly changes flow patterns in the annulus.
- 6) Pipe Centralization - Creates a uniform annular flow area perpendicular to the flow direction. Cement slurry will take the path of least resistance so centralization is important in keeping the pipe off the walls of the hole. Generally a 70% standoff is strived for in centralization, however even the slightest decentralization will cause a channel. Since perfect centralization is not possible it should be used in conjunction with other methods.
- 7) Rat Hole - Spot a weighted viscous gel pill in the rat hole before running pipe. This pill will help prevent cement swapping with lighter weight mud in the rat hole when displacement stops.
- 8) Annular Velocity - Pump rates prior to cementing and during cement displacement should produce annular velocities of 200 - 250 feet/minute to obtain good mud removal. It may, however, be necessary to reduce pump rates in order to maintain full returns at surface.

## Cost Estimate

## 9 5/8" Cement Intermediate Casing

### SAP Quote # 0

<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>
483826	TUNED SPACER III	50	BBL	284.00	14,200.00	8,520.00
100003687	PREMIUM CEMENT	2160	SK	39.13	84,520.80	50,712.48
101007446	D-AIR 3000	508	LB	10.07	5,115.56	3,069.34
101002314	EZ-FLO	143	LB	24.67	3,527.81	2,116.69
101249405	HALAD-344 EXP	173	GAL	293.00	50,689.00	30,413.40
100005058	HR-6L RETARDER	87	GAL	57.60	5,011.20	3,006.72
3965	HANDLE&DUMP SVC CHRGM, CMT&ADDITIVES,ZI NUMBER OF EACH	2218 1	CF	5.49	12,176.82	7,306.09
101214575	PLUG,CMTG, TOP,9 5/8,HWE,8.16 MIN/9.06 MA	1	EA	454.00	454.00	227.00
101214570	PLUG,CMTG,BOT,9 5/8,HWE,8.16 MIN/9.06 MA	1	EA	454.00	454.00	227.00
	<b>SubTotal</b>		<b>USD</b>		<b>176,149.19</b>	<b>105,598.72</b>
94755	DAILY SERVICE CHARGE, ZI DAYS OR PARTIAL DAY(WHOLE NO.)	1 1	DAY	1,700.00	1,700.00	1,700.00
18646	TANKS, STEEL/LINED 1000 GAL, 0-5 DAYS,ZI DAYS OR FRACTION (MIN5)	1 5	EA		1,715.00	1,029.00
18653	PLG CNTR 7.625 -13.375 W/HES 0-5 DAYS ZI DAYS OR FRACTION (MIN5)	1 5	EA		2,964.00	1,778.40
90	ZI QUICK LATCH ATTACHMENT SIZE IN INCHES/MILLIMETER INCHES/MILLIMETERS (IN/MM)	1 9.625 IN	JOB	924.00	924.00	554.40
2	MILEAGE FOR CEMENTING CREW,ZI Number of Units	160 1	MI	5.76	921.60	921.60
86954	ZI FUEL SURCHG-CARS/PICKUPS<1 1/2TON Number of Units	160 1	MI	0.23	36.80	36.80
	<b>SubTotal</b>		<b>USD</b>		<b>8,261.40</b>	<b>6,020.20</b>
	<b>Total</b>		<b>USD</b>			<b>184,410.59</b>
	<b>Discount</b>		<b>USD</b>			<b>72,791.67</b>
	<b>Discounted Total</b>		<b>USD</b>			<b>111,618.92</b>

**Primary Plant:** HOUMA WHSE AB2, LA USA  
**Secondary Plant:** Fourchon, LA USA C\_PORT 1

**Price Book Ref:** 06 Gulf Coast Off-Shore  
**Price Date:** 11/14/2011

**Job Information****7 5/8" Cement Production Liner**

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Well Name: OCSG-32181

Well #: 1

## 7 5/8" Production Liner

8900 - 10870 ft (MD)  
8870 - 10795 ft (TVD)  
Outer Diameter 7.625 in  
Inner Diameter 6.765 in  
Linear Weight 33.70 lbm/ft  
Thread LTC  
Casing Grade HCQ-125

## 9 7/8" Open Hole

9030 - 10870 ft (MD)  
Inner Diameter 9.875 in  
Job Excess 30 %

## 9 5/8" Intermediate Casing

0 - 9030 ft (MD)  
0 - 9000 ft (TVD)  
Outer Diameter 9.625 in  
Inner Diameter 8.535 in  
Linear Weight 53.50 lbm/ft  
Thread LTC  
Casing Grade P-110

## 5" WorkString

0 - 8900 ft (MD)  
Outer Diameter 5.000 in  
Inner Diameter 4.276 in  
Linear Weight 19.50 lbm/ft

## Well Bore Data:

Liner Length: 1970 ft  
Top Of Liner: 8900 ft  
Over Lap: 130 ft  
Mud Type Oil Based Mud  
Mud Weight 15.10 lbm/gal  
BHST 210 degF

**Calculations****7 5/8" Cement Production Liner**

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## Spacer:

$$\begin{aligned} 565.25 \text{ ft} * 0.3973 \text{ ft}^3/\text{ft} * 0 \% &= 224.58 \text{ ft}^3 \\ \text{Total Spacer} &= 224.58 \text{ ft}^3 \\ &= 40.00 \text{ bbl} \end{aligned}$$

## Cement : (2001.55 ft fill)

$$\begin{aligned} 31.55 \text{ ft} * 0.3973 \text{ ft}^3/\text{ft} * 0 \% &= 12.53 \text{ ft}^3 \\ 130.00 \text{ ft} * 0.0802 \text{ ft}^3/\text{ft} * 0 \% &= 10.43 \text{ ft}^3 \\ 1840.00 \text{ ft} * 0.2148 \text{ ft}^3/\text{ft} * 30 \% &= 513.70 \text{ ft}^3 \\ \text{Primary Cement} &= 536.66 \text{ ft}^3 \\ &= 95.58 \text{ bbl} \end{aligned}$$

## Shoe Joint Volume: (90.00 ft fill)

$$\begin{aligned} 90.00 \text{ ft} * 0.2496 \text{ ft}^3/\text{ft} &= 22.46 \text{ ft}^3 \\ &= 4.00 \text{ bbl} \\ \text{Tail plus shoe joint} &= 559.13 \text{ ft}^3 \\ &= 99.58 \text{ bbl} \\ \text{Total Tail} &= 525 \text{ sks} \end{aligned}$$

## Total Pipe Capacity:

$$\begin{aligned} 8900.00 \text{ ft} * 0.0997 \text{ ft}^3/\text{ft} &= 887.55 \text{ ft}^3 \\ 1970.00 \text{ ft} * 0.2496 \text{ ft}^3/\text{ft} &= 491.73 \text{ ft}^3 \\ &= 245.66 \text{ bbl} \end{aligned}$$

## Displacement Volume to Shoe Joint:

$$\begin{aligned} \text{Capacity of Pipe - Shoe Joint} &= 245.66 \text{ bbl} - 4.00 \text{ bbl} \\ &= 241.66 \text{ bbl} \end{aligned}$$

## Job Recommendation

## 7 5/8" Cement Production Liner

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### Fluid Instructions

#### SPACER

##### Tuned Spacer III

0.6 gal/bbl Dual Spacer Surfactant A (Surfactant)  
0.6 gal/bbl Dual Spacer Surfactant B (Surfactant)  
0.6 gal/bbl SEM-8 (Surfactant)

Fluid Density: 15.60 lbm/gal  
Fluid Volume: 40 bbl

#### LINER CEMENT

##### Premium Cement

94 lbm/sk Premium Cement (Cement-api)  
0.25 % D-AIR 3000 (Defoamer)  
0.07 % Halliburton EZ-FLO (Bulk Flow Enhancer)  
0.08 Gal/sk Halad(R)-344 EXP (Low Fluid Loss Control)  
0.04 Gal/sk SCR-100L (Retarder) (**Est**)  
Fresh Water (Mixing Fluid)

Fluid Weight 16.40 lbm/gal  
Slurry Yield: 1.07 ft<sup>3</sup>/sk  
Total Mixing Fluid: 4.36 Gal/sk  
Top of Fluid: 8868.45 ft  
Calculated Fill: 2001.55 ft  
Volume: 99.58 bbl  
Calculated Sacks: 525 sks  
Proposed Sacks: 525 sks

##### Displacement

Fluid Density: 15.10 lbm/gal  
Fluid Volume 241.66 bbl

**Detailed Pumping Schedule**

Fluid #	Fluid Type	Fluid Name	Surface Density lbm/gal	Estimated Avg Rate bbl/min	Downhole Volume
1	Spacer	Tuned Spacer III	15.6		40 bbl
2	Cement	Liner Cement	16.4		525 sks
3	Mud	Displacement	15.1		241.66 bbl

Circulate and condition mud until proper mud properties are achieved, minimum two (2) bottoms ups.

Set and release from liner.

Pump 40 bbls. of Tuned Spacer III with Surfactants @ 15.6 ppg.

Drop Drill Pipe Dart for Bottom Plug (optional).

Mix and Pump Liner Cement

Drop Drill Pipe Dart for Top Plug.

Land Drill Pipe Dart in Top Plug and shear Top Plug.

Displace cement to float collar.

## Cost Estimate

## 7 5/8" Cement Production Liner

### SAP Quote # 0

<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>
483826	TUNED SPACER III	40	BBL	284.00	11,360.00	6,816.00
100003687	PREMIUM CEMENT	525	SK	39.13	20,543.25	12,325.95
101007446	D-AIR 3000	124	LB	10.07	1,248.68	749.21
101002314	EZ-FLO	35	LB	24.67	863.45	518.07
101249405	HALAD-344 EXP	42	GAL	293.00	12,306.00	7,383.60
100012238	SCR-100 L	21	GAL	239.00	5,019.00	3,011.40
3965	HANDLE&DUMP SVC CHRG, CMT&ADDITIVES,ZI NUMBER OF EACH	543 1	CF	5.49	2,981.07	1,788.64
	<b>SubTotal</b>		<b>USD</b>		<b>54,321.45</b>	<b>32,592.87</b>
94755	DAILY SERVICE CHARGE, ZI DAYS OR PARTIAL DAY(WHOLE NO.)	1 1	EA	1,700.00	1,700.00	1,700.00
18646	TANKS, STEEL/LINED 1000 GAL, 0-5 DAYS,ZI DAYS OR FRACTION (MIN5)	1 5	EA		1,715.00	1,029.00
2	MILEAGE FOR CEMENTING CREW,ZI Number of Units	160 1	MI	5.76	921.60	921.60
86954	ZI FUEL SURCHG-CARS/PICKUPS<1 1/2TON Number of Units	160 1	MI	0.23	36.80	36.80
	<b>SubTotal</b>		<b>USD</b>		<b>4,373.40</b>	<b>3,687.40</b>
	<b>Total</b>		<b>USD</b>			<b>58,694.85</b>
	<b>Discount</b>		<b>USD</b>			<b>22,414.58</b>
	<b>Discounted Total</b>		<b>USD</b>			<b>36,280.27</b>

Primary Plant: HOUMA WHSE AB2, LA USA  
 Secondary Plant: Fourchon, LA USA C\_PORT 1

Price Book Ref: 06 Gulf Coast Off-Shore  
 Price Date: 11/14/2011

## Conditions

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### NOTE

The cost in this analysis is good for the materials and/or services outlined within. These prices are based on Halliburton being awarded the work on a first call basis. Prices will be reviewed for adjustments if awarded on 2<sup>nd</sup> or 3<sup>rd</sup> call basis and/or after 30 days of this written analysis. This is in an effort to schedule our work and maintain a high quality of performance for our customers.

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/hes/general\\_terms\\_conditions.pdf](http://www.halliburton.com/hes/general_terms_conditions.pdf) 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.