## bp

## Margaret J. Lowe

Senior Environmental Engineer Permian Asset





BP America Production Company 600 N. Marienfeld Suite 869 PO Box 1610 Midland, TX 79701

February 24, 2006

Larry Johnson Environmental Engineer Specialist NM Oil Conservation Division 1625 N. French Dr. Hobbs, NM 88240

Reference: Flounder State # 1

Section 30, TS 17S, R 35E

API#30025 366230000

Dear Mr. Johnson:

Thank you for your understanding and response to BP's recent circumstances. We greatly appreciate the deadline extension.

On April 22, 2004, BP reported a release of approximately 820 barrels of brine and 5000 barrels of fresh water from the reserve pit at the Flounder State # 1 in Lea County, NM. In order to vertically and horizontally delineate the chloride release, the following actions have been taken.

Two boreholes were drilled in June 2004 to the south and southeast of the pit with all chloride levels below 130 ppm. An additional five boreholes (BH-1, BH-3, BH-4, BH-5 and BH-6) were drilled to the east, north, west and northwest of the reserve pit in September 2005. Chloride concentrations in Borehole #3 (west side of pit) ranged from 1104 ppm at 15 feet below ground surface (BGS) with an immediate reduction to 336 ppm at 20 feet BGS to a low of 32 ppm at 45 feet BGS. All samples from Boreholes 1, 4, 5 and 6 (north, east and northwest of pit) were less than 113 ppm.

In October and November, 2005, a deep-bury trench was dug for the reserve pit cuttings along the north and east side of the reserve pit. After the cuttings and the liners were moved from the reserve pit into the deep trench, chloride contamination was evident in the underlying caliche. This caliche was removed until the chloride concentrations were less than 1000 ppm as Mr. Jerry Brian discussed with you.

When the excavation was complete, two temporary monitoring wells were drilled and completed. Monitoring well 1 (BH-2) in the brine section of the pit and monitoring well 2 (BH-4) on the outside northwest corner of the pit were completed and sampled at 100 feet BGS. Depth to groundwater was 96 feet in both wells. The wells were drilled to 111 feet BGS; the screen interval was 91 to 106 feet BGS. The wells were sampled for chlorides on November 22, 2005. BH-2 contained 120 ppm chlorides; BH-4 contained 100 ppm chlorides.

In response to your recent letter, BP submits the following information.

1. The information submitted indicates only where the chloride contamination is not located. The purpose of delineation is to establish the actual location so a viable plan can be constructed. After removing the cuttings and the pit liner from the reserve pit area, an

application -pPACO614628104 RP# 900 Mr. Larry Johnson NM Oil Conservation Division February 24, 2006 Page 2

additional 3200 cubic yards of soil was removed. This soil ranged in chloride concentrations from less than 1000 ppm to 17,828 ppm. Based on composite sampling of the 2000 cubic yards of material stockpiled on location, the average concentration was 6628 ppm. The remaining 1200 cubic yards that are in the deep-bury trench were the soil immediately below the lining and would likely have higher chloride concentrations. Using a conservative 7000 ppm concentration for this soil, approximately 43,300 lbs of chlorides have been removed from the impacted area. Based on known concentrations and volumes of the original release, about 51,800 lbs chlorides were released to the environment. Through the excavation effort approximately 83 per cent of the chlorides have been removed. Calculations are shown in Attachment 1.

- 2. Only one borehole was conducted inside the pit area, with the rest on the outside perimeter. In the delineation plan dated August 3, 2005, Jerry Brian, Ocotillo Environmental, acting as BP's agent, stated that we would drill one borehole/monitoring well inside the reserve pit area. In the email of August 8, 2005, the New Mexico Oil Conservation Davison approved this plan. See proposed work plan below.
- 3. The area is scarce in natural impervious soil matrix layers. Reports during the excavation process indicated various "fractured areas". This demonstrates presence of potential vertical preferential pathways to the underlying ground waters. BP agrees that this would likely be true for the Caliche to the 15 foot depth that was excavated.
- 4. Groundwater gradient was not established as directed. In reviewing all the correspondence between the OCD and BP, BP was not able to find any discussion of determining the groundwater gradient. We propose to determine the hydraulic gradient near the reserve pit (See proposed work plan below).
- 5. No documentation of lab testing nor chain-of-custody was provided. BP intended to submit this data with the January 10, 2006, letter, and unfortunately neglected to attach them. All lab results and chain-of-custody are included in Attachment 2.

The following is a work plan to assess the residual chlorides remaining in the soil and the potential impact to groundwater.

**Task 1 - Determine the hydraulic gradient at the site:** One additional well will be installed at the site to the northeast of borehole 5. (See Attachment 3.) The new well and the two existing wells will be surveyed relative to one another and water level data provided by these wells will be used to establish the hydraulic gradient within the aquifer near the reserve pit location.

**Task 2 – Determine site specific hydraulic conductivity:** Aquifer slug tests will be conducted in each of the three monitoring wells to determine an average hydraulic conductivity for the site.

**Task 3 – Evaluation of potential chloride impact to the aquifer:** Using the data collected in tasks one and two and the field data regarding chlorides excavated from the pit and underlying soils, an estimate of potential aquifer impact will be prepared. This estimate will be prepared as follows:

- The mass of chlorides determined to have been lost from the spill will be determined in a fashion similar to that described in response note 1 above.
- This mass will be assumed to have conservatively migrated to the aquifer in the water that escaped from the reserve pit.
- The time for this spill to percolate through the vadose zone will be estimated using the USGS vadose zone simulator VS2D (or similar).
- Using the time developed in the step above and site specific data from tasks one and two, a mixing zone calculation will be performed.

Mr. Larry Johnson NM Oil Conservation Division February 24, 2006 Page 3

- The results of the mixing zone calculation will be used to determine an initial chloride concentration that may have existed in the aquifer beneath the reserve pit as a result of the release.
- This concentration will then be used as the source term for a simulation (either analytical (Domenico eqn. based) or numerical (MODFLOW based)) to determine the likely current state of any chloride impact.

**Task 4 – Install two additional down-gradient wells:** Using the information obtained during task three, an estimate of the current location of chloride impact will be made. If it is deemed necessary by the Oil Conservation Division and BP, BP will install two additional wells. This would be an attempt to locate any chloride impacted water that may have migrated from the site. When the results from task three have been evaluated, it may be appropriate to have a meeting with OCD and BP personnel to determine what additional steps need to be taken.

If you need additional information, please contact me by telephone at (432) 688-5799 or by e-mail at <a href="loweril@bp.com">loweril@bp.com</a>.

Sincerely,

Margaret J. Lowe

Sr. Environmental Engineer

## Attachments:

- 1. Lab results and chain-of-custody
- 2. Spreadsheet showing calculations of chloride released and chlorides removed
- 3. Flounder State #1 Plot Plan

Jargant Jowe

cc: R. Anderson/OCD Santa Fe

- C. Williams/OCD Hobbs
- G. Martin/MIO

Well File

File 43C1

## ATTACHMENT 1 CHLORIDE MASS BALANCE

## FLOUNDER STATE # 1 CHLORIDE CALCULATIONS

Calculations of Chlorides Released and Removed by Excavation		2000 cu yds excavated soil stockpiled on surface 1200 cu yds excavated soil in deep bury trench	6638 ppm Cl composite of stockpiled soil	7000 ppm Cl estimate of soil in trench	) = 26552 lbs Cl stockpiled 16800 lbs Cl in trench 43352 lbs Cl removed from under reserve pit
Calculations of Chlorides		66,773,280 mg Cl in Fresh water 23,466,038,400 mg Cl in Brine water	23,532,811,680 mg Cl total released 23,533 kg	51,772 lb Cl total released	(cu yd * 2000 lb/cu yd * ppm) =
	Source of Data	Delivery tickets	Delivery tickets	Analysis of water source	Analysis of brine source
ata	Units	bbls liters	bbls liters	mg/L	mg/L
Input Data	Data	5000.00 794,920.00	820.00 130,366.88	84.00	180,000.00 mg/L
	Input Parameter	Volume of Fresh Water Released	Volume of Released Brine	Chloride concentration in Fresh Water Chloride concentration in	Brine

## 83.74 percent CI removed

## ATTACHMENT 2 LAB RESULTS AND CHAIN OF CUSTODY

FROM : DCOTILLO

FAX NO. : 5253936374

Feb. 17 2006 07:58PM P3



PHONE (326) 873-7001 . 2111 BEECHWOOD . ABILENE, TX 79803

PHONE (606) 353-2326 . 101 E. MARLAND . HOBBS, NM 88240

ANALYTICAL RESULTS FOR OCOTILLO ENVIRONMENTAL ATTN: JERRY BRIAN 414 N. TURNER **HOBBS, NM 88240** FAX TQ: (505) 393-6374

Receiving Date: 09/09/05 Reporting Date: 09/13/05 Project Number: BP-05-003 Project Name: FLOUNDER #1

Sampling Date: 09/08/05 Sample Type: SOIL

Project Location: LEA COUNTY, NM

Sample Condition: COOL & INTACT

Sample Received By: AH

Analysis Date: 09/12/05

Analyzed By: AH

CF

LAB NUMBER	SAMPLE ID	(mg/L)
H10173-1	8H #1-15' BGS	48
H10173-2	BH #1-20' BG\$	96
H10173-3	BH #1-25' BGS	64
H10173-4	8H #1-30' BGS	112
H10173-5	BH #1=35' BGS	80
H10173-6	BH #1-40' BGS	96
H10173-7	BH #1-45' BG\$	98
H10173-8	BH #1-50' BGS	64
H10173-9	BH #1-55' BGS	64
H10173-10	BH #1-60' BGS	80
H10173-11	BH #3-15'BGS	1104
H10173-12	BH #3-20 BGS	336
H10173-13	BH #3-25'BGS	240
H10173-14	8H #3-80 BGS	96
H10173-15	BH #3-35'BG\$	64
Quality Control	Mark to the second of	1000
True Value QC		1000
% Recovery	, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	100
Relative Percent	Oifference	0

METHOD: Standard Methods

Note: Analyses performed on 1:4 w/v aqueous extracts.

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FROM : OCOTILLO

FAX NO. :5053936374

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PHONE (325) 673-7001 - 2111 BEECHWOOD - ABILENE TX 79803

PHONE (508) 398-2326 - 101 E. MARLAND . HOBBS, NM 88240

ANALYTICAL RESULTS FOR OCOTILLO ENVIRONMENTAL ATTN: JERRY BRIAN 414 N, TURNER HOBBS, NM 88240 FAX TO: (505) 393-6374

Receiving Date: 09/09/05 Reporting Date: 09/13/05 Project Number: BP-05-003 Project Name: FLOUNDER #1

Project Location: LEA COUNTY, NM

Analysis Date: 09/12/05 Sampling Date: 09/06/05 Sample Type: SOIL

Sample Condition: COOL & INTACT

Sample Received By: AH

Analyzed By: AH ^\_

LAB NUMBER	SAMPLE ID	(mg/L)
H10173-16	BH #3-40' BGS	128
H10173-17	BH #3-45' BGS	32
H10173-18	BH #3-50' BGS	80
H10173-19	BH #3-55' BGS	80
H10173-20	BH #3_60' BGS	64
H10173-21	BH #5-15' BGS	112
· H10173-22	BH #5-20" BGS	48
H10173-23	BH #5-25' BGS	32
H10173-24	BH #5-30' BGS	32
H10173-25	BH #5-35' BGS	48
H10173-26	8H #5-40' 8GS	32
H10173-27	BH #5-45' 9G\$	32
H10173-28	BH #5-50' BGS	32
H10173-29	BH #5-55' BGS	32
H10173-30	BH #5-60' BGS	48
Quality Control		1000
True Value QC		1000
% Recovery		100
Relative Percent [	)ifference	0

METHOD: Standard Methods

Note: Analyses performed on 1:4 w:v aqueous extracts.

PLEASE NOTE: \*\*Liability and Demages. Continuit's stockiny and client's excusive remedy for any claim nicking, whether bessed in contract or surf, shall be itended in the annual path by such as a property of the surface of the surf

FROM : OCOTILLO

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Feb. 17 2006 07:59PM P6



PHONE (\$25) 673-7001 - 2111 BEECHWOOD - ABILENE, TX 79603

PHONE (505) 803-2926 - 101 E. MARLAND - 110885, NM 88240

ANALYTICAL RESULTS FOR OCOTILLO ENVIRONMENTAL ATTN: JERRY BRIAN 414 N. TURNER **HOBBS, NM 88240** FAX TO: (505) 393-6374

Receiving Date: 09/09/05

Reporting Date: 09/13/05 Project Number: BP-05-003

Project Name: FLOUNDER #1

Project Location: LEA COUNTY, NM

Analysis Date: 09/12/05

Sampling Date: 09/07/05 Sample Type: SOIL

Sample Condition: COOL & INTACT

Sample Received By: AH

Analyzed By: AH

	**************************************	CI
Lab Number	SAMPLE ID	(mg/L)
H10173-31	BH #6-75' BGS	32
H10173-32	BH #6-80' BGS	48
H10173-33	BH #6-85' BGS	32
H10173-34	BH #6-90' BGS	64
H10178-35	BH #6-120' BG\$	48
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Quality Control		1000
True Value QC		1000
% Recovery		100
Relative Percent	Difference	0

METHOD: Standard Methods

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Note: Analyses performed on 1:4 wiv aqueous extracts.

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101 East Mariand, Hobbs, NM 88240

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ANALYTICAL RESULTS FOR OCOTILLO ENVIRONMENTAL ATTN: JERRY BRIAN 414 N. TURNER HOBBS, NM 88240

FAX TO: (505) 393-6374

Receiving Date: 09/07/05

Reporting Date: 09/08/05

Project Number: BP-05-003 Project Name: FLOUNDER #1

Project Location: LEA COUNTY, NM

Analysis Date: 09/07/05

Sampling Date: 09/08/05

Sample Type: SOIL

Sample Condition: COOL & INTACT

Sample Received By: NF

Analyzed By: HM

CI

LAB NUMBER	SAMPLE ID	(mg/Kg)
H10158-1	BH #4-5'BG\$	80
H10158-2	BH #4-10'BGS	16
H10158-3	BH #4-15'BGS	32
H10158-4	BH #4-20'BGS	32
H10158-5	BH #4-25'BGS	16
H10158-6	BH #4-30'BGS	48
H10158-7	BH #4-35'BGS	16
H10158-8	BH #4-40'BGS	32
H10158-9	BH #4-45'BG\$	48
H10158-10	BH #4-50'BGS	16
H10158-11	BH #4-55'BGS	32
H10158-12	BH #4-60'BGS	32
H10158-13	BH #4-65'BGS	16
H10158-14	BH #4-70'BGS	48
Quality Control		1000
True Value QC		1000
% Recovery		100
Relative Percent	Difference	2.0

METHOD: Standard Methods

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Note: Analyses performed on 1:4 w:v aqueous extracts.

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† Cardiffal cannot accept verbal changes. Please fax written changes to 915-573-7020.



PHONE (505) 393-2326 • 101 E. MARLAND • HOBBS, NM 88240

ANALYTICAL RESULTS FOR OCOTILLO ENVIRONMENTAL ATTN: JERRY BRIAN 414 N. TURNER HOBBS, NM 88240 FAX TO: (505) 393-6374

Receiving Date: 11/23/05

Reporting Date: 11/28/05

Project Owner: BP AMERICA
Project Name: FLOUNDER #1

Project Location: LEA COUNTY, NM

Analysis Date: 11/28/05

Sampling Date: 11/22/05

Sample Type: GROUNDWATER Sample Condition: COOL & INTACT

Sample Received By: BC

Analyzed By: HM

		CI
LAB NUMBER	SAMPLE ID	(mg/L)
H10446-1	BH#4 -TMW#2	100
H10446-2	BH#2 - <b>TM</b> W#1	120
Quality Control		980
True Value QC		1000
% Recovery		98
Relative Percent	Difference	2.0
ETHOD: Standard	d Methods	4500-ClB

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Date :

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ANALYSIS REQUEST											0	× &	X				Years and Conditions: Interest will be charged on all accounts more (but 30 days part due at the rate of 24% per annum from the original date of imoba, and all costs of collections, including altomey's bes.	O Yes	C Yes C No		
BILL TO	P,O.#:	Company:	Attn:	Address:	city:	State: Zip:	Phone #:	· · · · · · · · · · · · · · · · · · ·	PRESERV. SAMPLING	0F 2E:	ODATE TIME		11/32/05 3:30 Pm				ated to the amount paid by the client for the days effer completes of the supplied by the caper completes of the supplied by arrest by effect, its backeless.		Fax Result: REMARKS:	Jes	Checked 7 By:
() () () ()	SAV.		State: NM Zip: 88240	397	Project Owner: BP Amer 100		28		MATRIX	ЯЗТАWO ЯЗТАМ	<b>ТИОЭ</b> #	8 X X	× Q \				PLASE NOTE: Lubility and Dumagas Laddral's lability and client's exclusive remedy for any clean arisking whether based in confired or lest, shall be limited to the amount paid by the client for the universe. At daton based to the respectable of the subset whether the desired by Chieffeld by Chieffeld and the state overwhen of the label and the defected or consequental desages, besides in the based and the label and the defected or consequental desages, besides the subset of the label and the subset of the defected of the defected of the subset of the subse	17	11 (45) US	Received By: (Lab Stary)	Sample Conference
Company Name: ( Cotillo L	Project Manager:	414 W. Takner	1000 S dalot	373-6371 Fax#:	138-05-60   Proj	Project Name: Flown of #1	Project Location: Lea Control	Sampler Name:	FOR LAB USE ONLY	Lab I.D. Sample I.D.		#MW1- H# 18 17-9:	-1 BH#3- Tmm #				LEASE NOTE: Usability and Damagas Cardinal's liability and client's anciusive remedy for any claim airsing whether hybras. All dakes hadding those for neglected and good of cause whetever that be desemed wided unless made in will show in no worst will cardinal be lable the infedential conceptuated demagas, badding whithout hatheres them theirs or successing without of or related to the orthornouse of services frenched by Gerdent to reflect and demagas.	Sampler Relinquished: Date:	Time	Relinquished By:\	Delivered By: (Circle One)

FROM : DCOTILLO

FAX NO. :5853936374

Feb. 17 2006 07:59PM P2



PHONE (325) 073-7001 - 2111 BEECHWOOD . ABILENE, TX 78803

PHONE (505) 393-2328 - 101 E. MARLAND - HOBBS, NM 88240

ANALYTICAL RESULTS FOR OCOTILLO ENVIRONMENTAL ATTN: J. BRIAN 414 N. TURNER HQBBS, NM 88240 FAX TO: (505) 393-6374

Receiving Date: 01/31/06 Reporting Date: 02/01/06. Project Number: BP-005-001 Project Name: FLOUNDER #1

Project Location: LEA COUNTY, NM

Analysis Date: 02/01/05 Sampling Date: 01/27/08 Sample Type: SOIL

Sample Condition: COOL & INTACT

Sample Received By: BC

Analyzed By: LB

LAB NUMBER	SAMPLE ID	(mg/Kg)
H10682-1	S.P. #1	6638
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Quality Control		460
True Value QC		500
% Recovery		92
Relative Percent	Difference	6.0
ETHOD: Standard	Mathods	4500-CIB

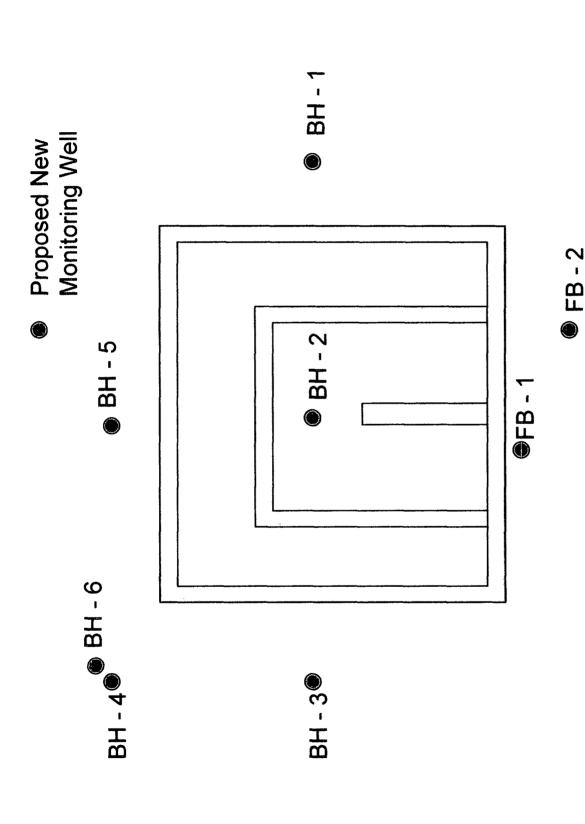
NOTE: Analysis performed on a 1:4 w.v aqueous extract.

H10682

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## ATTACHMENT 3 FLOUNDER STATE #1 PLOT PLAN



Pumping Well Head Unit

BP America Production Company Flounder State #1 Lea County, NM