

**CLEARWATER**  
G R O U P  
*Environmental Services*

May 9, 2006

**RECEIVED**

*By lopprojectop at 9:32 am, May 10, 2006*

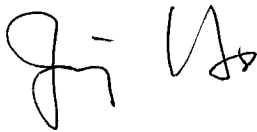
Mr. Jerry Wickham, Hazardous Materials Specialist  
Alameda County Environmental Health Services  
Environmental Protection Division  
1131 Harbor Bay Parkway, Suite 250  
Alameda, CA 94502-6577

**Re: Activated Carbon and Organoclay (EC-300) Bench Test Report**  
Eagle Gas Station  
4301 San Leandro Street  
Oakland, California 94601  
LOP Site ID# 2118  
USTCF Claim No. 014551  
Clearwater Project No. ZP046D

Dear Mr. Wickham:

Attached is the subject letter report for the bench scale test for the Granulated Activated Carbon and the Organoclay (EC-300). Should you have any questions, please do not hesitate to call me at 510-307 9943 ext 231.

Sincerely,  
**Clearwater Group**



Jim Ho, Ph.D., P.E.  
Principal Engineer

Cc: Mr. Muhammad Jamil  
40092 Davis Street  
Fremont, CA 94538

**RECEIVED**

By loprojectop at 9:32 am, May 10, 2006

Mr. Jerry Wickham  
Hazardous Materials Specialist  
Alameda County Health Care Services Agency  
Environmental Health Services  
Environmental Protection  
1131 Harbor Bay Parkway, Suite 250  
Alameda, CA 94502

RE: Eagle Gas Station  
4301 San Leandro Street  
Oakland, California 94601  
LOP SID# 2118  
Fuel Leak Case No. R0000096  
USTCF Claim No. 014551  
Clearwater Group Project # ZP046D

Dear Mr. Wickham,

As the legally authorized representative of the above-referenced project location I have reviewed the *Activated Carbon and Organic Clay Bench Test Report* prepared by my consultant of record, Clearwater Group, Inc. I declare, under penalty of perjury, that the information and/or recommendations contained in this report are true and correct to the best of my knowledge.

Sincerely,



Mr. Muhammad Jamil



May 9, 2006

**RECEIVED**

By lopprojectop at 9:32 am, May 10, 2006

Mr. Jerry Wickham, Hazardous Materials Specialist  
Alameda County Environmental Health Services  
Environmental Protection Division  
1131 Harbor Bay Parkway, Suite 250  
Alameda, CA 94502-6577

**Re: Activated Carbon and Organoclay (EC-300) Bench Test Report**

Eagle Gas Station  
4301 San Leandro Street  
Oakland, California 94601  
LOP Site ID# 2118  
USTCF Claim No. 014551  
*Clearwater Project No. ZP046D*

Dear Mr. Wickham:

Clearwater Group (Clearwater) is pleased to submit this *Activated Carbon and Organoclay (EC-300) Bench Test Report* for the subject site. The purpose of this bench scale test was to evaluate the feasibility of using Granulated Activated Carbon (GAC) and the Organoclay (EC-300) to treat the groundwater under the subject site. This report presents the test method, test results, findings, and recommendations.

**BACKGROUND**

Sampling results obtained from the quarterly groundwater monitoring events indicate that groundwater under the site has relatively high MTBE and TBA concentrations, although petroleum hydrocarbons are not the major concern for the subject site. For the design of a site interim remedial system requested in Alameda County Environmental Health Services' (ACEH) May 26, 2005 letter, a cost-efficient groundwater treatment technology had to be selected based on bench testing. Clearwater has performed a bench test for using Advanced Oxidation (AO) technology. The AO bench test results, findings, and recommendations are included in a summary report submitted to the ACEH on March 27, 2006. Based on the low groundwater yield at the site and low treatment efficiency of the AO technology, Clearwater recommended a bench-scale test to confirm the effectiveness of GAC and Organoclay EC-300 for the groundwater extracted from the subject site. ACEH's April 13, 2006 letter approved this recommendation.

## TEST METHOD

Approximately two to three gallons of groundwater were extracted from the monitoring wells MW-2, MW-4, MW-5, MW-8, IS-3, IS-6, and EW-1 before the bench test. These wells were selected for groundwater extraction because elevated MTBE and TBA concentrations were sampled in those wells and reported in the First Quarter 2006 Groundwater Monitoring Report dated April 14, 2006. The extracted groundwater was stored in a 5-gal sealed bucket and placed in a cool room. The extracted groundwater in the bucket was sampled 4 minutes before being mixed with the absorbents.

Approximately 900 mL (Note: the reported volume was visually determined) of GAC and EC-300 granules were individually placed in PYREX beakers. Since this was not an isotherm experiment, the absorbents were not weighted. After that, approximately 750 and 700 mL of extracted groundwater mentioned above was, respectively, added into the beakers that contained GAC and EC-300 so that the absorbent was completely under the water in the beaker. Each beaker, then, was gently stirred for 10 minutes. This action was to minimize the loss of volatiles into the air and also to simulate the anticipated water flow within the GAC or EC-300 treatment vessels. Thereafter, the treated water in the beakers was, individually, sampled at approximately 14 to 17 minutes after water was added into the beakers. All the water samples before and after treatment were stored in a chilled cooler with a chain-of-custody documented. The above samples were sent to the Kiff Analytical Laboratory of Davis, California, approximately five hours after the bench test.

## TEST RESULTS

The test results are summarized in the following table:

Contaminants	Baseline	EC-300		GAC	
	Concentration (µg/L)	Concentration After Treatment (µg/L)	Treatment Efficiency (%)	Concentration After Treatment (µg/L)	Treatment Efficiency (%)
MTBE	540,000	2,100	99.61	240	99.96
TBA	61,000	1,500	97.54	380	99.38
TPH-g	<20,000	<400	est. 98	<50	est. 99.8
Benzene	<200	<4.0	not est.	<0.50	not est.
Toluene	<200	<4.0	not est.	<0.50	not est.
Ethylbenzene	<200	<4.0	not est.	<0.50	not est.
Total xylenes	210	<4.0	not est.	<0.50	not est.

The laboratory report is included in Appendix A.

## FINDINGS

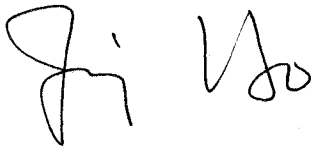
- The treatment efficiency of GAC is slightly higher than the EC-300.
- Both absorbents are capable of treating groundwater to be extracted from the subsurface during the operation of the interim remedial system.
- Based on the bench test data, if the influent contaminant concentrations remain at the same level sampled in the baseline, the expected MTBE, TBA, and TPH-g concentrations in the discharge after passing three EC-300 treatment vessels will be 0.03, 0.91, and 0.16 µg/L, respectively.
- If the influent concentration remains at the same level samples in the baseline, the expected MTBE, TBA, and TPH-g concentrations in the discharge after passing three GAC treatment vessels will be < 0.01, 0.01, and < 0.01 µg/L, respectively.

## RECOMMENDATIONS

According to the isotherm data provided by the patent holder of the EC-300 (see Appendix B), the absorption capacity of EC-300 is approximately five times higher than GAC for the MTBE treatment. Although the treatment efficiency of EC-300 is slightly lower than the GAC, it is still cost-effective to include EC-300 in the treatment system. Thus, the designed system will include one 200-lb and one 2,000-lb GAC vessel and one 2,000-lb EC-300 vessel. The EC-300 vessel will be installed in between the GAC vessels. The 200-gal GAC vessels will be used for bioaccumulation or filtering purposes. It will be changed more frequently compared with other two 2,000-vessels. The change out frequency of the 200-lb vessel will be determined based on the field sampling results.

Should you have questions regarding this letter report, please contact the undersigned at (510) 307-9943 ext. 231.

Sincerely,  
**Clearwater Group**



Jim Ho, Ph.D., P.E.  
Principal Engineer

Cc: Mr. Muhammad Jamil  
40092 Davis Street  
Fremont, CA 94538

## **Appendix A**

### Laboratory Report



Report Number : 49653

Date : 05/01/2006

Jim Ho  
Clearwater Group, Inc.  
229 Tewksbury Avenue  
Point Richmond, CA 94801

Subject : 3 Water Samples  
Project Name : NAZ Eagle Gas Station  
Project Number : ZP046D

Dear Mr. Ho,

Chemical analysis of the samples referenced above has been completed. Summaries of the data are contained on the following pages. Sample(s) were received under documented chain-of-custody. US EPA protocols for sample storage and preservation were followed.

Kiff Analytical is certified by the State of California (# 2236). If you have any questions regarding procedures or results, please call me at 530-297-4800.

Sincerely,

A handwritten signature in black ink, appearing to read "Joel Kiff".

Joel Kiff



Report Number : 49653

Date : 05/01/2006

Subject : 3 Water Samples  
Project Name : NAZ Eagle Gas Station  
Project Number : ZP046D

## Case Narrative

Repeat analysis yielded inconsistent results for sample ORC. The concentrations appear to vary between the bottles. Two of the three bottles were similar to each other so results from one of those two similar bottles are reported.

Repeat analysis yielded inconsistent results for sample GAC. The concentrations appear to vary between the bottles. The highest concentration results are reported.

Samples ORC and GAC were analyzed by EPA Method 8260B using bottles that contained headspace bubbles greater than 1/4 inch in diameter. All vials provided for testing had headspace bubbles greater than a 1/4 inch in diameter.

Matrix Spike/Matrix Spike Duplicate Results associated with samples ORC and B for the analytes Benzene and Methyl-t-butyl ether were affected by the analyte concentrations already present in the un-spiked sample.

Samples ORC and GAC appear to contain carbon particles.

Approved By: \_\_\_\_\_

A handwritten signature in black ink, appearing to read "Joe Kiff", is written over a horizontal line. The signature is stylized and somewhat cursive.

Joe Kiff





Report Number : 49653

Date : 05/01/2006

Project Name : **NAZ Eagle Gas Station**

Project Number : **ZP046D**

Sample : **B**

Matrix : Water

Lab Number : 49653-01

Sample Date :04/25/2006

Parameter	Measured Value	Method Reporting Limit	Units	Analysis Method	Date Analyzed
<b>Benzene</b>	<b>&lt; 200</b>	200	ug/L	EPA 8260B	04/27/2006
<b>Toluene</b>	<b>&lt; 200</b>	200	ug/L	EPA 8260B	04/27/2006
<b>Ethylbenzene</b>	<b>&lt; 200</b>	200	ug/L	EPA 8260B	04/27/2006
<b>Total Xylenes</b>	<b>210</b>	200	ug/L	EPA 8260B	04/27/2006
<b>Methyl-t-butyl ether (MTBE)</b>	<b>540000</b>	900	ug/L	EPA 8260B	04/27/2006
<b>Tert-Butanol</b>	<b>61000</b>	5000	ug/L	EPA 8260B	04/27/2006
<b>TPH as Gasoline</b>	<b>&lt; 20000</b>	20000	ug/L	EPA 8260B	04/27/2006
Toluene - d8 (Surr)	96.8		% Recovery	EPA 8260B	04/27/2006
4-Bromofluorobenzene (Surr)	113		% Recovery	EPA 8260B	04/27/2006

Approved By:

Joel Kiff



Report Number : 49653

Date : 05/01/2006

Project Name : **NAZ Eagle Gas Station**

Project Number : **ZP046D**

Sample : **ORC**


Matrix : Water

Lab Number : 49653-02

Sample Date :04/25/2006

Parameter	Measured Value	Method Reporting Limit	Units	Analysis Method	Date Analyzed
<b>Benzene</b>	<b>&lt; 4.0</b>	4.0	ug/L	EPA 8260B	04/28/2006
<b>Toluene</b>	<b>&lt; 4.0</b>	4.0	ug/L	EPA 8260B	04/28/2006
<b>Ethylbenzene</b>	<b>&lt; 4.0</b>	4.0	ug/L	EPA 8260B	04/28/2006
<b>Total Xylenes</b>	<b>&lt; 4.0</b>	4.0	ug/L	EPA 8260B	04/28/2006
<b>Methyl-t-butyl ether (MTBE)</b>	<b>2100</b>	8.0	ug/L	EPA 8260B	04/26/2006
<b>Tert-Butanol</b>	<b>1500</b>	40	ug/L	EPA 8260B	04/26/2006
<b>TPH as Gasoline</b>	<b>&lt; 400</b>	400	ug/L	EPA 8260B	04/28/2006
Toluene - d8 (Surr)	101		% Recovery	EPA 8260B	04/26/2006
4-Bromofluorobenzene (Surr)	98.6		% Recovery	EPA 8260B	04/26/2006

Approved By:

  
Joel Kiff



Report Number : 49653

Date : 05/01/2006

Project Name : **NAZ Eagle Gas Station**

Project Number : **ZP046D**

Sample : **GAC**

Matrix : Water

Lab Number : 49653-03

Sample Date :04/25/2006

Parameter	Measured Value	Method Reporting Limit	Units	Analysis Method	Date Analyzed
<b>Benzene</b>	<b>&lt; 0.50</b>	0.50	ug/L	EPA 8260B	04/27/2006
<b>Toluene</b>	<b>&lt; 0.50</b>	0.50	ug/L	EPA 8260B	04/27/2006
<b>Ethylbenzene</b>	<b>&lt; 0.50</b>	0.50	ug/L	EPA 8260B	04/27/2006
<b>Total Xylenes</b>	<b>&lt; 0.50</b>	0.50	ug/L	EPA 8260B	04/27/2006
<b>Methyl-t-butyl ether (MTBE)</b>	<b>240</b>	0.50	ug/L	EPA 8260B	04/27/2006
<b>Tert-Butanol</b>	<b>380</b>	5.0	ug/L	EPA 8260B	04/27/2006
<b>TPH as Gasoline</b>	<b>&lt; 50</b>	50	ug/L	EPA 8260B	04/27/2006
Toluene - d8 (Surr)	103		% Recovery	EPA 8260B	04/27/2006
4-Bromofluorobenzene (Surr)	93.4		% Recovery	EPA 8260B	04/27/2006

Approved By:

Joel Kiff

Report Number : 49653


Date : 05/01/2006

**QC Report : Matrix Spike/ Matrix Spike Duplicate**

Project Name : **NAZ Eagle Gas Station**

Project Number : **ZP046D**

Parameter	Spiked Sample	Sample Value	Spike Level	Spike Dup. Level	Spiked Sample Value	Duplicate Spiked Sample Value	Units	Analysis Method	Date Analyzed	Spiked Sample Percent Recov.	Duplicate Spiked Sample Percent Recov.	Relative Percent Diff.	Spiked Sample Percent Recov. Limit	Relative Percent Diff. Limit
Benzene	49642-10	270	40.0	39.9	284	275	ug/L	EPA 8260B	4/26/06	44.8	21.5	70.3	70-130	25
Toluene	49642-10	35	40.0	39.9	73.4	71.1	ug/L	EPA 8260B	4/26/06	96.4	90.7	6.00	70-130	25
Tert-Butanol	49642-10	36	200	200	238	248	ug/L	EPA 8260B	4/26/06	101	106	4.65	70-130	25
Methyl-t-Butyl Ether	49642-10	160	40.0	39.9	179	200	ug/L	EPA 8260B	4/26/06	47.4	102	72.8	70-130	25
Benzene	49704-05	<0.50	39.8	40.0	39.2	39.5	ug/L	EPA 8260B	4/28/06	98.5	98.8	0.237	70-130	25
Toluene	49704-05	<0.50	39.8	40.0	37.7	37.7	ug/L	EPA 8260B	4/28/06	94.6	94.3	0.318	70-130	25
Tert-Butanol	49704-05	<5.0	199	200	192	188	ug/L	EPA 8260B	4/28/06	96.3	94.2	2.18	70-130	25
Methyl-t-Butyl Ether	49704-05	8.9	39.8	40.0	54.0	53.8	ug/L	EPA 8260B	4/28/06	113	112	0.618	70-130	25
Benzene	49663-09	<0.50	40.0	40.0	40.8	39.5	ug/L	EPA 8260B	4/26/06	102	98.7	3.22	70-130	25
Toluene	49663-09	<0.50	40.0	40.0	44.3	41.5	ug/L	EPA 8260B	4/26/06	111	104	6.46	70-130	25
Tert-Butanol	49663-09	52	200	200	268	260	ug/L	EPA 8260B	4/26/06	108	104	3.73	70-130	25
Methyl-t-Butyl Ether	49663-09	29	40.0	40.0	68.4	67.4	ug/L	EPA 8260B	4/26/06	98.4	96.1	2.40	70-130	25
Benzene	49667-02	<0.50	40.0	40.0	42.3	38.8	ug/L	EPA 8260B	4/27/06	106	97.0	8.59	70-130	25
Toluene	49667-02	<0.50	40.0	40.0	39.7	36.8	ug/L	EPA 8260B	4/27/06	99.2	92.0	7.52	70-130	25
Tert-Butanol	49667-02	<5.0	200	200	204	193	ug/L	EPA 8260B	4/27/06	102	96.4	5.63	70-130	25
Methyl-t-Butyl Ether	49667-02	<0.50	40.0	40.0	41.0	39.2	ug/L	EPA 8260B	4/27/06	102	98.0	4.44	70-130	25

Approved By:  Joel Kiff

KIFF ANALYTICAL, LLC

2795 2nd St, Suite 300 Davis, CA 95616 530-297-4800

Report Number : 49653

Date : 05/01/2006

**QC Report : Laboratory Control Sample (LCS)**

Project Name : **NAZ Eagle Gas Station**

Project Number : **ZP046D**

Parameter	Spike Level	Units	Analysis Method	Date Analyzed	LCS Percent Recov.	LCS Percent Recov. Limit
Benzene	40.0	ug/L	EPA 8260B	4/26/06	107	70-130
Toluene	40.0	ug/L	EPA 8260B	4/26/06	105	70-130
Tert-Butanol	200	ug/L	EPA 8260B	4/26/06	100	70-130
Methyl-t-Butyl Ether	40.0	ug/L	EPA 8260B	4/26/06	117	70-130
Benzene	40.0	ug/L	EPA 8260B	4/28/06	97.8	70-130
Toluene	40.0	ug/L	EPA 8260B	4/28/06	93.6	70-130
Tert-Butanol	200	ug/L	EPA 8260B	4/28/06	93.8	70-130
Methyl-t-Butyl Ether	40.0	ug/L	EPA 8260B	4/28/06	114	70-130
Benzene	40.0	ug/L	EPA 8260B	4/26/06	95.6	70-130
Toluene	40.0	ug/L	EPA 8260B	4/26/06	106	70-130
Tert-Butanol	200	ug/L	EPA 8260B	4/26/06	105	70-130
Methyl-t-Butyl Ether	40.0	ug/L	EPA 8260B	4/26/06	98.6	70-130
Benzene	40.0	ug/L	EPA 8260B	4/27/06	101	70-130
Toluene	40.0	ug/L	EPA 8260B	4/27/06	96.4	70-130
Tert-Butanol	200	ug/L	EPA 8260B	4/27/06	98.1	70-130
Methyl-t-Butyl Ether	40.0	ug/L	EPA 8260B	4/27/06	102	70-130

KIFF ANALYTICAL, LLC

Approved By:

Joel Kiff

2795 2nd St, Suite 300 Davis, CA 95616 530-297-4800

QC Report : Method Blank Data

Project Name : NAZ Eagle Gas Station

Project Number : ZP046D

Parameter	Measured Value	Method Reporting Limit	Units	Analysis Method	Date Analyzed
Benzene	< 0.50	0.50	ug/L	EPA 8260B	04/26/2006
Toluene	< 0.50	0.50	ug/L	EPA 8260B	04/26/2006
Ethylbenzene	< 0.50	0.50	ug/L	EPA 8260B	04/26/2006
Total Xylenes	< 0.50	0.50	ug/L	EPA 8260B	04/26/2006
Methyl-t-butyl ether (MTBE)	< 0.50	0.50	ug/L	EPA 8260B	04/26/2006
Tert-Butanol	< 5.0	5.0	ug/L	EPA 8260B	04/26/2006
TPH as Gasoline	< 50	50	ug/L	EPA 8260B	04/26/2006
Toluene - d8 (Surr)	98.2		%	EPA 8260B	04/26/2006
4-Bromofluorobenzene (Surr)	107		%	EPA 8260B	04/26/2006
Benzene	< 0.50	0.50	ug/L	EPA 8260B	04/28/2006
Toluene	< 0.50	0.50	ug/L	EPA 8260B	04/28/2006
Ethylbenzene	< 0.50	0.50	ug/L	EPA 8260B	04/28/2006
Total Xylenes	< 0.50	0.50	ug/L	EPA 8260B	04/28/2006
TPH as Gasoline	< 50	50	ug/L	EPA 8260B	04/28/2006
Benzene	< 0.50	0.50	ug/L	EPA 8260B	04/26/2006
Toluene	< 0.50	0.50	ug/L	EPA 8260B	04/26/2006
Ethylbenzene	< 0.50	0.50	ug/L	EPA 8260B	04/26/2006
Total Xylenes	< 0.50	0.50	ug/L	EPA 8260B	04/26/2006
Methyl-t-butyl ether (MTBE)	< 0.50	0.50	ug/L	EPA 8260B	04/26/2006
Tert-Butanol	< 5.0	5.0	ug/L	EPA 8260B	04/26/2006
TPH as Gasoline	< 50	50	ug/L	EPA 8260B	04/26/2006
Toluene - d8 (Surr)	105		%	EPA 8260B	04/26/2006
4-Bromofluorobenzene (Surr)	98.2		%	EPA 8260B	04/26/2006

Parameter	Measured Value	Method Reporting Limit	Units	Analysis Method	Date Analyzed
Methyl-t-butyl ether (MTBE)	< 0.50	0.50	ug/L	EPA 8260B	04/27/2006
Tert-Butanol	< 5.0	5.0	ug/L	EPA 8260B	04/27/2006

KIFF ANALYTICAL, LLC

2795 2nd St, Suite 300 Davis, CA 95616 530-297-4800

Approved By:  Joel Kiff



2795 2nd Street, Suite 300  
 Davis, CA 95616  
 Lab: 530.297.4800  
 Fax: 530.297.4808

Lab No. 49653 Page 1 of 1

Project Contact (Hardcopy or PDF To): Jim Ho California EDF Report?  Yes  No

**Chain-of-Custody Record and Analysis Request**

Company/Address: Clearwater Group  
229 Tewksbury Ave.  
 Phone No.: 510-307-9943 FAX No.: 510-232-2823  
 Project Number: 29046D P.O. No.:

Recommended but not mandatory to complete this section:  
 Sampling Company Log Code: CWGD  
 Global ID: T-0-6-0-5-3-0-0-2-1-9  
 EDF Deliverable To (Email Address):

**Analysis Request**

Project Name: NAZ Eagle Gas Station

Sampler Signature: [Signature]

Project Address: 4301 Searleands St.  
Oakland, CA

Sampling	Container	Preservative	Matrix	
			WATER	SOIL
	40 ml VOA			
	SLEEVE	HCl HNO <sub>3</sub> ICE NONE		

BTEX (8021B)	BTEX/TPH Gas/MTBE (8021B/M8015)	TPH as Diesel (M8015)	TPH as Motor Oil (M8015)	TPH Gas/BTEX/MTBE (8260B)	5 Oxygenates/TPH Gas/BTEX (8260B)	7 Oxygenates/TPH Gas/BTEX (8260B)	5 Oxygenates (8260B)	7 Oxygenates (8260B)	Lead Scav. (1,2 DCA & 1,2 EDB - 8260B)	EPA 8260B (Full List)	Volatile Halocarbons (EPA 8260B)	Lead (7421/239.2)	TOTAL (X) W.E.T. (X)	TAT

**Sample Designation**

B1 }  
 B2 } one sample  
 B3 }  
 ORC1 }  
 ORC2 } one sample  
 ORC3 }  
 GAC1 }  
 GAC2 } one  
 GAC3 } sample

Date	Time	40 ml VOA	SLEEVE	HCl	HNO <sub>3</sub>	ICE	NONE	WATER	SOIL
4/25	5:45								
	5:46								
	5:46								
	6:00								
	6:14								
	6:17								
	6:00								
	6:22								
4/25	6:25								

Sample Receipt  
 Temp °C 13 Therm. ID# 121  
 Initial GH  
 Date 04/25/06 Time 1355  
 Coolant present:  Yes  No

Relinquished by: <u>[Signature]</u>	Date: <u>4/25/06</u>	Time: <u>6:50</u>	Received by: _____
Relinquished by: _____	Date: _____	Time: _____	Received by: _____
Relinquished by: _____	Date: <u>042506</u>	Time: <u>1124</u>	Received by Laboratory: <u>[Signature]</u> Kiff Analytical

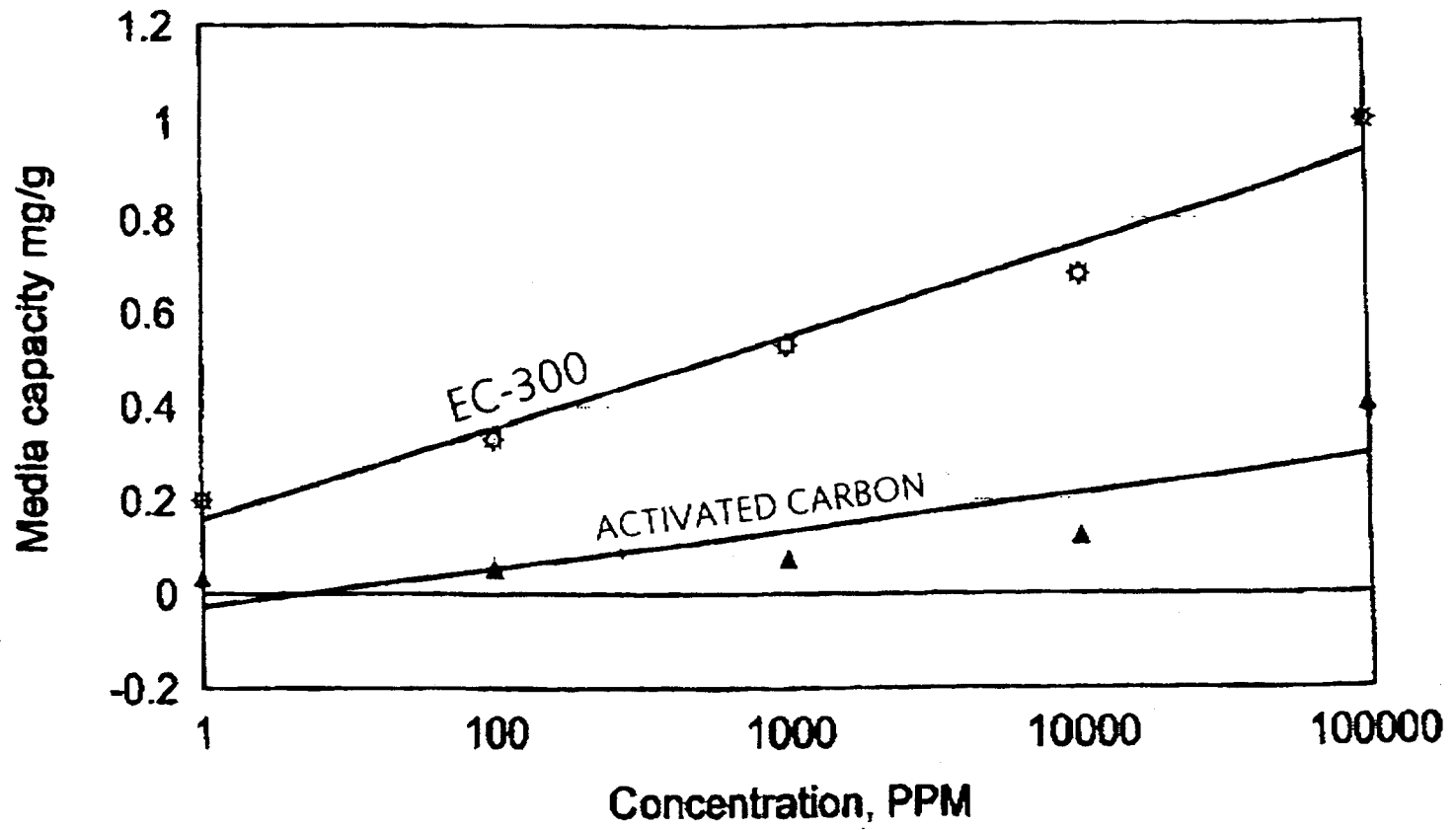
Remarks: only analyze  
BTEX, TPH-g, MTBE, TBA  
\* B1, B2, B3 = B ORC1, ORC2, ORC3 = ORC  
 Bill to: GAC1, GAC2, GAC3 = GAC

## **Appendix B**

Isotherm of EC-300 for MTBE



# MTBE ISOTHERM



3-22-1999