

#103

ENVIRONMENTAL
PROTECTION



Chevron

99 JUL -1 AM 9:45

June 28, 1999

Chevron Products Company
6001 Bollinger Canyon Road
Building L, Room 1080
PO Box 6004
San Ramon, CA 94583-0904

Mr. Barney Chan
Alameda County Health Care Services
Department of Environmental Health
1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502-6577

Philip R. Briggs
Project Manager
Site Assessment & Remediation
Phone 925 842-9136
Fax 925 842-8370

Still v. high conc of BTEX in C2+04

Re: Chevron Service Station #9-0076
4265 Foothill Blvd.
Oakland, California

Dear Mr. Chan:

Enclosed is the Evaluation of Intrinsic Bioremediation, dated June 8, 1999, that was prepared by Urmas Kelmser of Chevron's CRTC group. Also enclosed, are copies of bio-parameter charts that were prepared to make a determination of the presence of intrinsic bioremediation within the hydrocarbon plume at the above noted site.

In general the indicator trends over distance from the source are very similar to the March 1998 trends. The significant difference from last year's data is the near source BTEX levels are considerably lower as are the overall sulfate and nitrate levels. This is consistent with the expected consumption of nitrates and sulfates during the biodegradation of the BTEX.

The observed trend of the indicator parameters of alkalinity and dissolved iron (ferrous) are consistent with the occurrence of intrinsic bioremediation in the groundwater at this site. The observed trend for sulfate suggests that intrinsic bioremediation is occurring at this site, while nitrate is an indicator parameter for intrinsic bioremediation.

The plots of the indicator parameters versus total BTEX for the site wells indicates the potential for intrinsic bioremediation occurring in the groundwater plume associated with this site. The effect of this process will be to stabilize the containment plume and reduce the size of the plume as the source area concentrations are reduced.

June 24, 1999
Mr. Barney Chan
Chevron Service Station #9-0076
Page 2

The dissolved oxygen (DO) and oxygen reduction potential (ORP) bioparameters were inadvertently left off of CRTC evaluations. I have prepared and included copies of the bioparameter charts for these two indicators. The observed trend for DO suggests that intrinsic bioremediation is occurring at this site, while ORP is an indicator parameter for intrinsic bioremediation.

If you have any questions or comments, call me at (925) 842-9136.

Sincerely,
CHEVRON PRODUCTS COMPANY



Philip R. Briggs
Site Assessment and Remediation Project Manager

Enclosure

CC. Mr. Alex Perez
Shell Oil Company
PO Box 8080
Matinez, CA 94553

Mr. David Dewitt
Tosco Oil Company
Environmental Remediation Management
2000 Crow Canyon Place, Suite 400
San Ramon, CA 94583

American Stores Properties, Inc.
299 South Main Street
Salt Lake City, UT 84111-2203
Attn. Barbara Russell

Mr. Bill Scudder, Chevron

MEMORANDUM

June 8, 1998
Richmond, California

**Evaluation of Intrinsic Bioremediation
Chevron Service Station #9-0076
4265 Foothill Boulevard
Oakland, California**

Mr. Phil Briggs:
San Ramon, California

We have reviewed the analytical data collected during the March 31, 1999 groundwater-sampling event for this site in order to make a determination of the presence of intrinsic bioremediation within the hydrocarbon plume at this site. Based on the attached plots of total BTEX versus indicator parameter, it is likely that intrinsic bioremediation is occurring within the hydrocarbon plume at this site. The effect of this process will be to stabilize the plume and reduce the plume as the source area is depleted.

Background

The demonstration of intrinsic bioremediation requires multiple lines of evidence, including analytical data which suggest that bioremediation is actually occurring in the field. The evaluation of indicator parameters across a dissolved contaminant plume can be used in the demonstration of intrinsic bioremediation. One or more trends observed across a dissolved plume (with increasing contaminant concentration) would suggest the potential occurrence of intrinsic bioremediation.

With increasing BTEX concentrations, the expected trend in indicator parameter concentrations would be:

<u>Relative Decrease In:</u>	<u>Relative Increase In:</u>
Dissolved Oxygen	Dissolved Iron (Ferrous)
Oxidation- Reduction Potential (Redox)	Alkalinity
Nitrate	
Sulfate	

In the attached plots, the sampled wells are presented on the X-axis from the upgradient wells to downgradient wells through the contaminant plume. The resulting order of the wells is C-1, C-2, C-4, C-6, C-8 and C-9 through the plume. Data was collected for all site wells and was not plotted for wells C-3, C-5 and C-7 because of their location with respect to the hydrocarbon plume. The sum of the BTEX results for each well for the 3/31/99 sampling event and the indicator parameter analytical result for each well are plotted on the Y-axis to create the attached plots. The plots are then evaluated by observation for apparent trends in the data.

Results

In general the indicator trends over distance from the source are very similar to the March 1998 trends. The significant difference from last year's data is the near source BTEX levels are considerably lower as are the overall sulfate and nitrate levels. This is consistent with the expected consumption of nitrates and sulfates during the biodegradation of the BTEX.

The nitrate versus BTEX plot indicates that with increasing BTEX concentrations, nitrate is not present in the plume. As the BTEX concentration decreases downgradient of the site, nitrate concentration increase, indicating the presence of intrinsic bioremediation in the core of the hydrocarbon plume. Therefore, nitrate is an indicator parameter for intrinsic bioremediation at this site for this sampling event.

The sulfate versus BTEX plot indicates that sulfate is present where BTEX concentrations are low and reduced when BTEX concentrations are elevated. This is an expected trend for sulfate in the presence of BTEX and intrinsic bioremediation. Therefore, the observed sulfate trend through the plume suggests that intrinsic bioremediation is occurring in the groundwater at this site.

The alkalinity versus BTEX plot indicates that the upgradient waters and the interior plume at this site are elevated in alkalinity and the downgradient waters are lower in alkalinity. An increase in alkalinity across a contaminant plume is a potential indicator of biologic activity. Therefore, the observed trend for alkalinity is consistent with the occurrence of intrinsic bioremediation in the groundwater at this site.

The dissolved (ferrous) iron versus BTEX plot indicates that higher concentrations of ferrous iron are present in the higher BTEX waters of the contaminant plume. An increase of ferrous iron in the interior of a plume is a potential indicator of biologic activity at the site. Therefore, the observed trend for ferrous iron is consistent with the occurrence of intrinsic bioremediation in the groundwater at this site.

The plots of indicator parameter versus total BTEX for site wells indicates the potential for intrinsic bioremediation occurring in the groundwater plume associated with this site. The effect of this process will be to stabilize the contaminant plume and reduce the size of the plume as the source area concentrations are reduced.

Please contact me at 242-5953 with questions or comments regarding this review.

Sincerely,



Urmaz Kelmser
Senior Hydrogeologist

Attachments:

- Data Table
- Nitrate vs. BTEX
- Sulfate vs. BTEX
- Alkalinity vs. BTEX
- Ferrous Iron vs. BTEX

#9-0076 - 3/31/99 IB Parameter Plots

Well	Alkalinity mg/L	Ferrous Iron mg/L	Nitrate mg/L	Sulfate mg/L	B mg/L	T mg/L	E mg/L	X mg/L	BTEX mg/L	BTEX mg/L	DO	ORP
C-1	382	2.52	0.418	8.23	0.776	0.00589	0.005	0.00515	0.79204	0.79204	1.8	89
C-2	456	2.1	0.118	19.7	4.8	1.11	1.52	5.45	12.88	12.88	1.6	157
C-4	492	1.56	0.191	1	4.45	0.443	1	2.13	8.023	8.023	2.2	176
C-6	534	0.5	0.849	45.3	0.092	0.001	0.0066	0.001	0.1006	0.1006	8.4	168
C-8	264	0.5	17	71	0.0005	0.0005	0.0005	0.0005	0.002	0.002	1.5	132
C-9	236	0.5	18	72.7	0.0005	0.0005	0.0005	0.0005	0.002	0.002	2.3	142

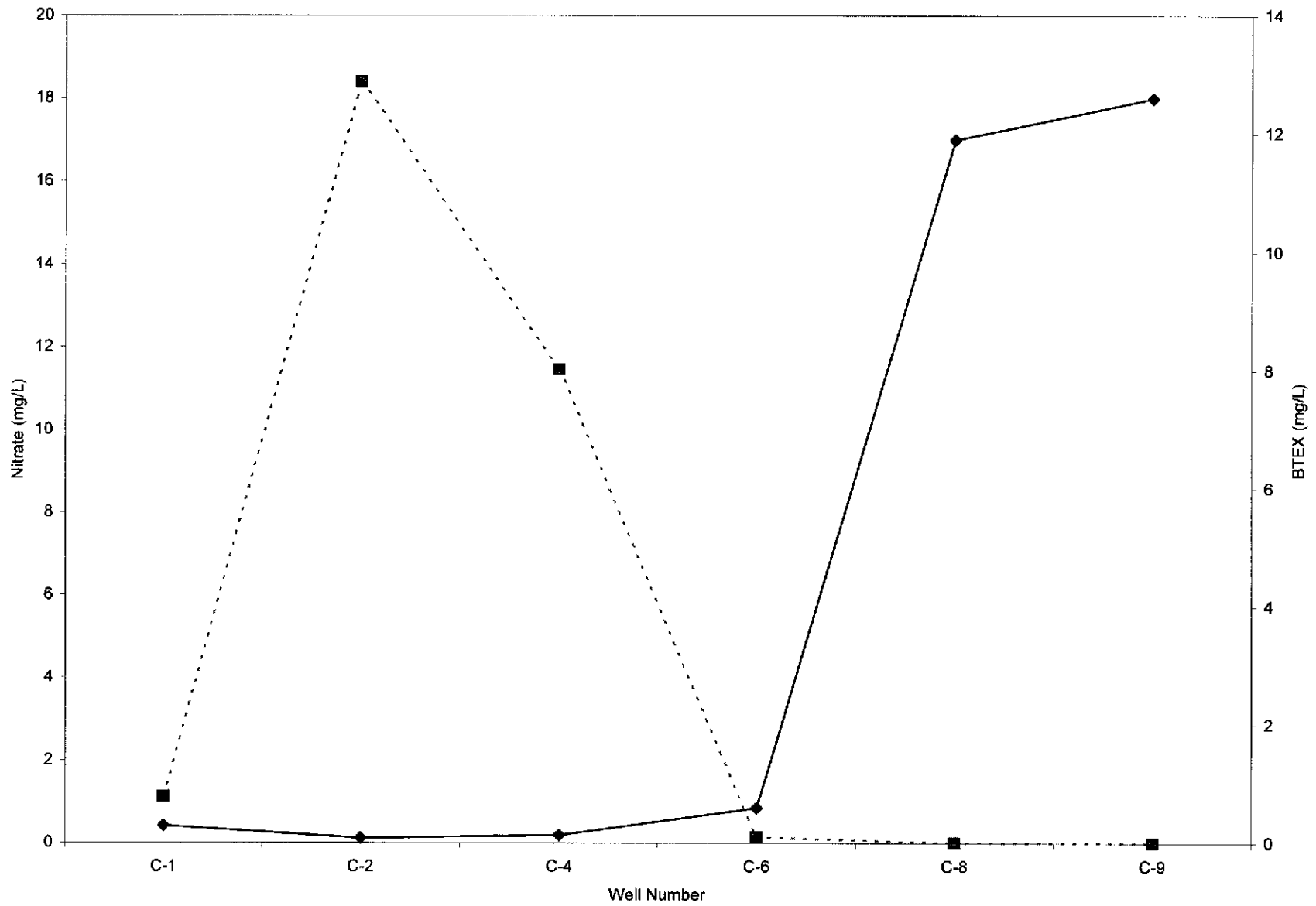


ORC

ORC

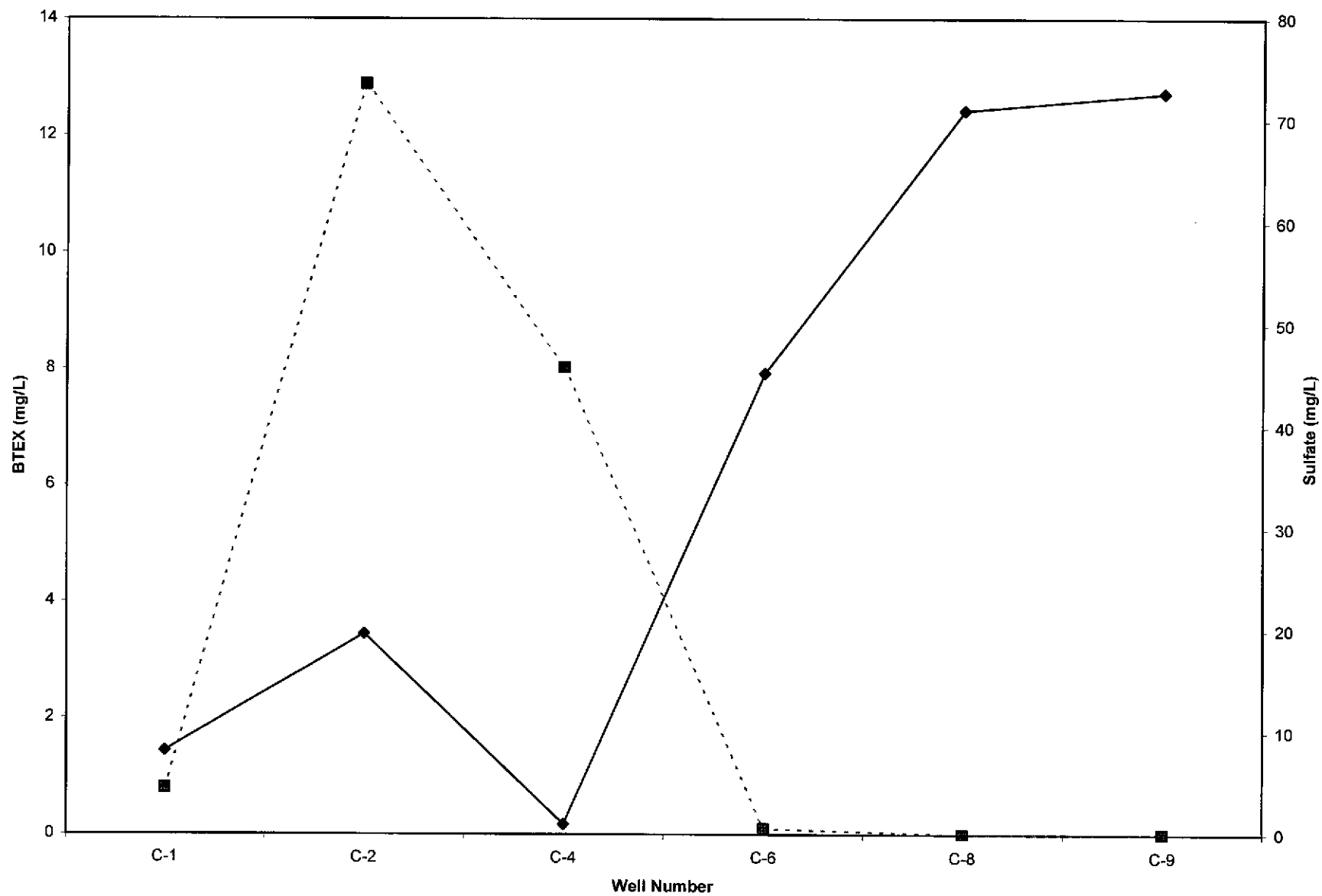
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Chevron Station #9-0076
Nitrate vs. BTEX - 3/31/99



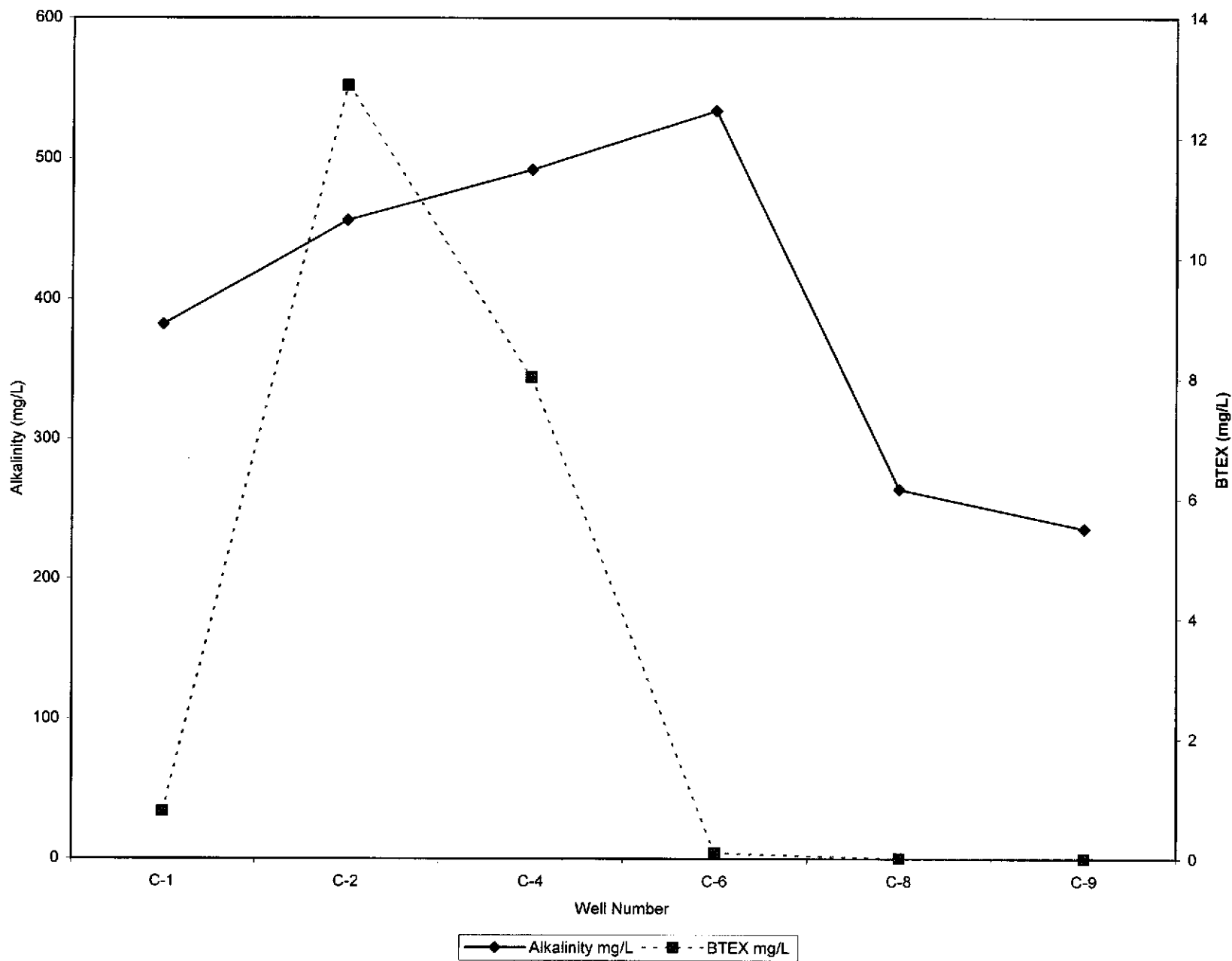
—◆— Nitrate mg/L - - ■ - - BTEX mg/L

Chevron Station #9-0076
Sulfate vs. BTEX - 3/31/99

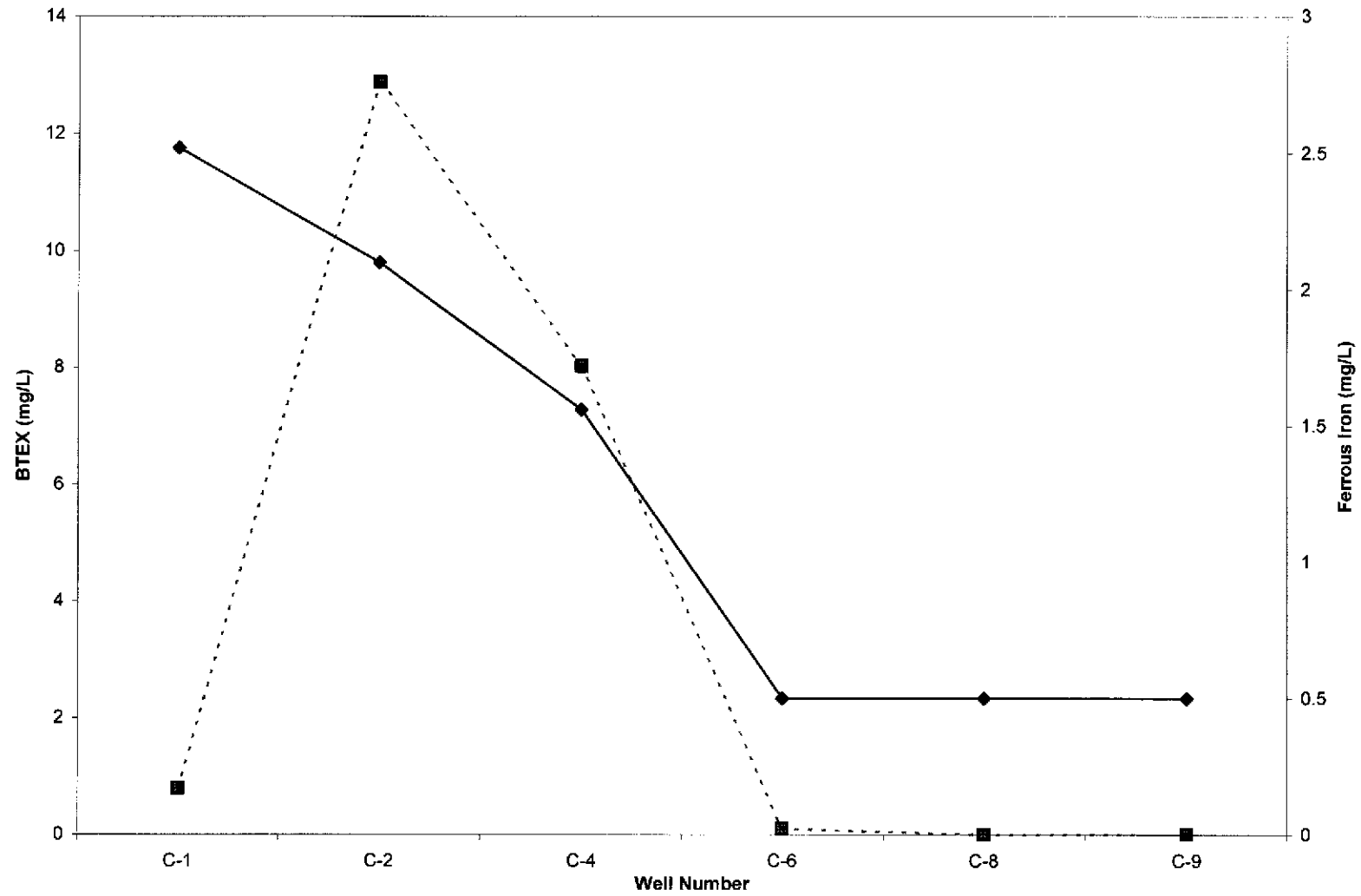


- - ■ - - BTEX mg/L —◆— Sulfate mg/L

Chevron Station #9-0076
Alkalinity vs. BTEX - 3/31/99

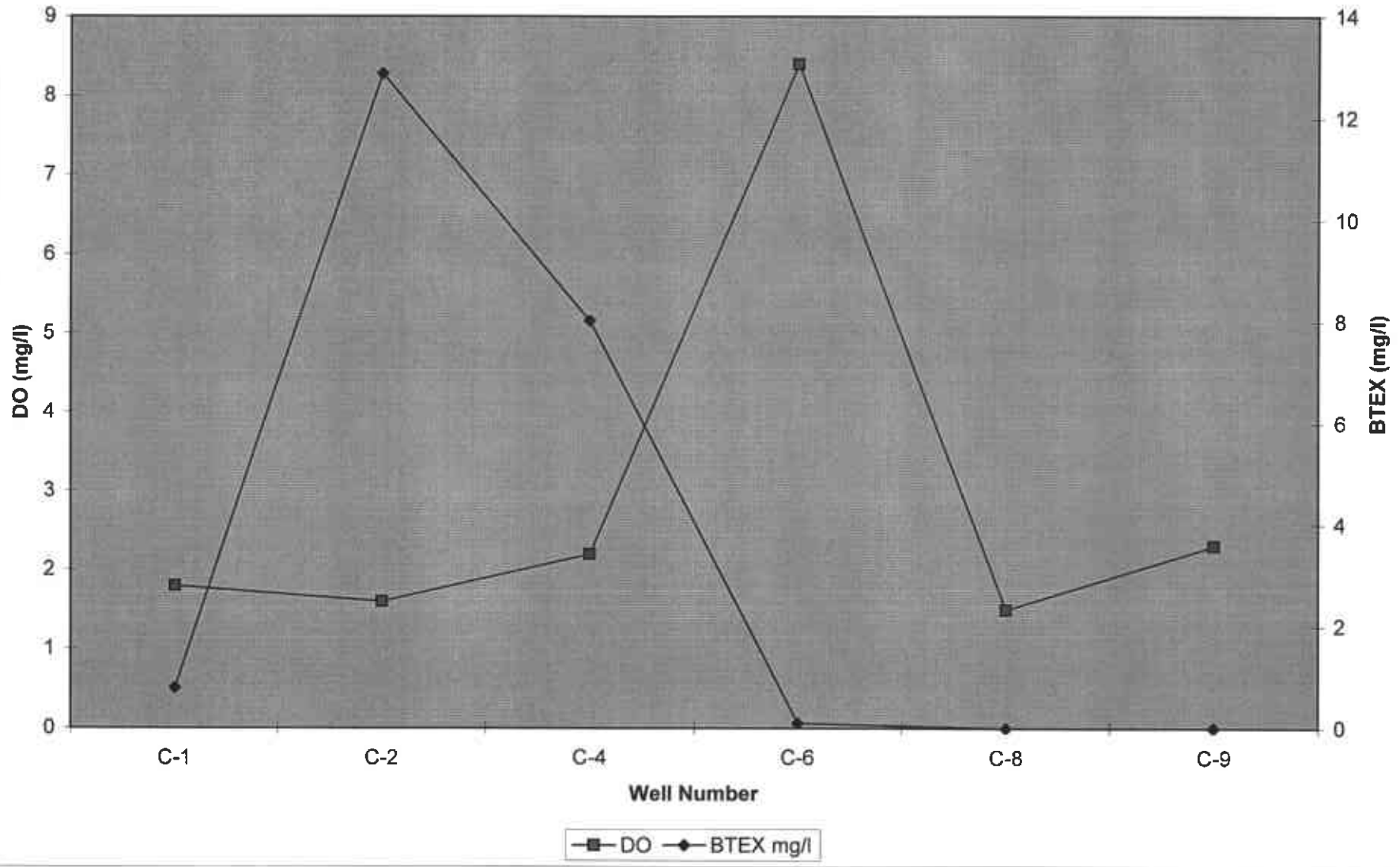


Chevron Station #9-0076
Ferrous Iron vs. BTEX - 3/31/99



- - ■ - - BTEX mg/L —◆— Ferrous Iron mg/L

Chevron Station #9-0076 Dissolved Oxygen vs. BTEX - 3/31/99



Chevrin Station #9-0076 ORP vs. BTEX - 3/31/99

