GW - 23

MONITORING REPORTS

DATE:

1989 - 1988

New Mexico Health and Environment Department

GARREY CARRUTHERS
Governor

DENNIS BOYD
Secretary

MICHAEL J. BURKHART
Deputy Secretary

RICHARD MITZELFELT
Director

October 25, 1989

Mr. Dave Boyer
Oil Conservation Division
State Land Office Bldg.
P.O. Box 2088
Santa Fe, NM 87504

Dear Mr. Boyer:

Enclosed for your information are copies of EPA's Comprehensive Groundwater Monitoring Reports for the four Phillips Gas Plants - Artisia, Eunice, Lee and Lusk. These reports have not been reviewed by the Hazardous Waste Program and are to be considered as draft reports. At this time no further action is expected on the reports to finalize them.

If you have any questions, or need additional information please call me at 827-0170.

Sincerely,

V. Suzanne Moore-Mayne

Suzanne Moore-Mayne
Water Resource Specialist II
Hazardous Waste Program

SMM/vga

Encl.

— ENVIRONMENTAL IMPROVEMENT DIVISION —
Harold Runnels Building
1190 St. Francis Dr.
Santa Fe, New Mexico 87503

PHILLIPS 66 NATURAL GAS COMPANY
A SUBSIDIARY OF PHILLIPS PETROLEUM COMPANY

ODESSA, TEXAS 79762
4001 PENBROOK

April 5, 1989

Groundwater Monitoring Analyses
Artesia, Eunice, Lee and Lusk Plants

Mr. Dave Boyer
Environmental Bureau Chief
New Mexico Oil Conservation Division
P. O. Box 2088
Santa Fe, New Mexico 87501

Dear Mr. Boyer:

Per your request, attached please find copies of the fourth quarter groundwater monitoring analyses for the above referenced plants.

If you should have any questions regarding this information, please contact me at (915) 367-1316.

Very truly yours,

Michael D. Ford

Michael D. Ford
Environmental Analyst

MDF

Attachments

See "Analyses" for copies

copy for Hobbs office

File

New Mexico Health and Environment Department

OIL CONSERVATION DIVISION
RECEIVED
'89 OCT 30 AM 11 12

Dennis Boyd
Secretary

MICHAEL J. BURKHART
Deputy Secretary

RICHARD MITZELFELT
Director

September 13, 1989

William F. Ballard, Manager
Phillips Petroleum Company
12 A4 Phillips Bldg.
Bartlesville, OK 74004

RE: RCRA status Artesia, Eunice, Lee and Lusk Plants-
NMD000709667, NMD000709634, NMD000709675, NMD000709659

Dear Mr. Ballard:

The New Mexico Environmental Improvement Division (NMEID), accepts Phillips Petroleum Company's (Phillips') position presented in their May 17, 1989 correspondence that the four Phillips facilities in New Mexico, Artesia, Eunice, Lee and Lusk are exempt from RCRA regulation based upon EPA's Regulatory Determination of July 6, 1988 Federal Register. NMEID also accepts Phillips' Certificate of No Hazardous Waste Activity included in the May 17, 1989 correspondence.

NMEID's acceptance of Phillips' position does not remove Phillips from regulation under the Hazardous Waste Management Regulations, (HWMR-5, as amended 1989) and the New Mexico Hazardous Waste Act, New Mexico Statutes Annotated 1978, (1989, Supp.), if Phillips transports, treats, stores or disposes of hazardous wastes in the future. To the extent that Phillips generates hazardous wastes, Phillips is subject to the generator requirements of HWMR-5.

If NMEID receives any new information that indicates that Phillips has been or may be regulated under RCRA, enforcement actions will be initiated. With NMEID's acceptance of Phillips' position, compliance with the April 19, 1988 Compliance Order/Schedule is determined to be resolved. However, Phillips may still be subject to EPA enforcement actions.

— ENVIRONMENTAL IMPROVEMENT DIVISION —
Harold Runnels Building
1190 St. Francis Dr.
Santa Fe, New Mexico 87503

A copy of EPA's response to NMEID's request to provide an interpretation of the oil and gas exemption in the July 6, 1988 Federal Register is enclosed for Phillips' information.

If you have any questions or need additional information, please call me at (505) 827-2926.

Sincerely,

Boyd Hamilton
Program Manager
Hazardous Waste Program

BH/SMM/smm

Encl.

cc: Lynn Prince, EPA Region 6
Tracy Hughes, Office of General Counsel, EID
Knut Am, Phillips Petroleum Company
Reese B. Copeland, Phillips Petroleum Company

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS, TEXAS 75202

July, 18, 1989

Mr. Boyd Hamilton
Program Manager
Hazardous Waste Program
New Mexico Health and Environment Department
Harold Runnels Building
1190 St. Francis Drive
Santa Fe, New Mexico 87503

Dear Mr. Hamilton:

On June 8, 1989, you requested that the Environmental Protection Agency (EPA) provide an interpretation of the so called oil and gas exemption to the Resource Conservation and Recovery Act (RCRA) as delineated in the Regulatory Determination in the July 6, 1988, Federal Register (FR). Specifically, you asked if the exemption applied to four gas plants operated by Phillips Petroleum Company (Phillips) in eastern New Mexico. This request was prompted by Phillips' assertion, in a letter dated May 17, 1989, that the surface impoundments in question are not RCRA regulated units based on that regulatory determination. Phillips supported this position with a certificate of no hazardous waste activity for the four plants.

In EPA's regulatory determination, on Page 25454, cooling tower blowdown is specifically included in the wastes exempted from RCRA regulation. However, gas plant cooling tower cleaning wastes are specifically excluded from the exemption. These determinations are based on the three criteria included as an attachment to the June 6, 1989, letter from Dan Derkics, (Chief, Large Volume Waste Section EPA Headquarters) to Julie Wanslow, a copy of which was included in your letter to me of June 15, 1989. Mr. Derkics letter states that cooling tower blowdown "... is comprised only of water, scale or other wastes generated by the actual operation of the cooling tower ... included as part of the functional operation of the cooling tower." The Region interprets this to mean that corrosion inhibitors and biological control agents are included in cooling tower blowdown.

Mr. Derkics also clarifies the meaning of cooling tower cleaning wastes as those wastes which, may be generated by any cooling tower and includes "...solvents, scrubbing agents or other cleaning materials introduced

into the process solely to remove buildup or otherwise clean the equipment, and are not included as part of the functional operation of the cooling tower." Such wastes are not intrinsically derived from primary field operations for natural gas production. The Region interprets this to mean that the wastes generated during the periodic cleaning are not exempt.

In their No Hazardous Waste Activity Certificate, Phillips states that both chromate and non-chromate chemicals have been used in the cooling towers since November 19, 1980, as corrosion inhibitors at these sites. They further state that cooling towers must be cleaned on a periodic basis (approximately once every five years) and that this cleaning consists of removing the sludge by vacuum truck from the basin and removing scale from the cooling coil heads and laterals by sandblasting. Phillips also asserts that these materials have been tested and are not hazardous wastes.

One of the reasons that cleaning waste from a cooling tower may be RCRA hazardous waste is due to the chemicals added to the system for corrosion inhibition or control of biological agents. Chromate compounds have been widely used in this application as they have at the Phillips gas plants. Discarded materials generated in the cooling tower would be hazardous waste, as that term is defined in 40 CFR §261.3, when the chromium concentration reaches 5.0 mg/l when tested using the procedures for EP toxicity.

If the waste generated during the periodic cleaning exceeds a concentration of 5.0 mg/l for chromium, then the waste is hazardous waste. Phillips claims the waste is tested in their certificate but they do not provide enough information for a determination of the adequacy of the testing. Should this waste be EP Toxic and should it be placed in the same surface impoundments as the cooling tower blowdown, then the units are RCRA regulated regardless of the exemption for cooling tower blowdown. If on the other hand these conditions are not met, then the material is not hazardous waste. At the very least, the coil heads and laterals have the potential of having significant levels of chromium waste/scale which must be sandblasted off. It is this cooling tower cleaning waste that may make the units regulated, however, such a determination is not possible from the information provided in the certificate.

Some discussion is necessary about a mixture of an exempted waste and a non-exempted waste. EPA has in the past exempted some such mixtures as in the case of ash waste and flue gas emission control waste generated primarily from the combustion of coal and fossil fuels. [40 CFR 261.4(b)(4)] However, the wastes which are co-disposed and also exempt are those materials generated in conjunction with the exempted wastes. The waste materials are not segregated from the combustion wastes. Wastes which

are segregated and disposed of or treated separately from combustion wastes and otherwise meet the definition of a hazardous waste are regulated under RCRA. This determination was made in 1981 in response to the Utility Solid Waste Activities Group.

The clearest exposition of EPA's stand regarding the applicability of the mixture rule when an exempted waste is mixed with a hazardous waste is found in the proposed rule published in the Federal Register on April 17, 1989, for mining waste.

> "EPA has decided, however, that it is appropriate to revise the proposed regulatory status of some mixtures of non-excluded 'characteristic' wastes and Bevill wastes. In these instances, the mixture will be considered a hazardous waste if it exhibits one or more of the same hazardous characterisitcs that are exhibited by the non-excluded waste. If the mixture exhibits one or more hazardous characteristics that are exhibited by the Bevill waste but <u>not</u> by the non-excluded characteristic waste, then the mixture is <u>not</u> hazardous waste.
>
> EPA wishes to make clear, however that in any case, mixing a characteristic hazardous waste with a Bevill waste would require a RCRA treatment, storage or disposal permit.... "

Although this interpretation applies to a <u>proposed</u> mining waste rule, EPA's Office of General Counsel has assured the Region that the same idea applies in the petroleum exclusion.

Clearly, if at any time the cooling tower cleaning waste meets the definition of hazardous waste and it is mixed with the exempted waste, the unit wnere mixing takes place is a regulated unit.

The interpretations of the exemption contained in this letter are consistent with those of EPA's Office of General Counsel.

I would suggest that EID review Phillip's analysis and all available information to determine if the cooling tower cleaning waste is EP-toxic for chromium or is not. You should also determine what quantity of waste is generated and if this waste is/was placed in the surface impoundments after 1980.

Although further investigation/evidence is required to conclusively determine the regulatory status of these sites, I hope the information provided above will prove useful to your staff. If your staff has any questions, please have them call Court Fesmire at (214) 655-6775.

Sincerely,

Randall E. Brown, Chief
RCRA Enforcement Branch

ADDED 4TH PAGE TO 3RD PAGE SINCE IT WAS SHORT ENOUGH.

cc: Tracy Huges
Office of General Counsel
NMEID

= cc: Hobbs: [redacted] Eddie Seay 505-393-6161
Jerry Sexton

PHILLIPS 66
PHILLIPS PETROLEUM COMPANY
BARTLESVILLE, OKLAHOMA 74004 918 661-6600

LEGAL

June 27, 1989

Mr. Randall E. Brown
Chief, Enforcement Branch
U.S. EPA Region VI 6H-C
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202

Dear Mr. Brown:

I have read with interest the letter from Dan Derkics, Chief, Large Volume Waste Section, to Julie Wanslow, which was forwarded to you with Mr. Boyd Hamilton's letter of June 15, 1989, for your use in determining the regulatory status of the four Phillips Petroleum Company natural gas plants requested in Mr. Hamilton's June 8, 1989 letter.

Obviously, it is Phillips's view that Mr. Derkic's letter, read in conjunction with the matters contained in Phillips' letter of May 17, 1989, and the attachments to it, establishes that Phillips' facilities are not subject to RCRA hazardous waste regulations as a result of cooling tower blowdown being directed to the surface impoundments at the plants during normal operation of the plant and cooling towers.

If you have any questions concerning the foregoing or require anything further from Phillips Petroleum Company, please advise.

Very truly yours,

Reese B. Copeland

Reese B. Copeland
Attorney
1297 Adams Building
Bartlesville, Ok 74004
(918) 661-3758

RBC:am:599

cc: Boyd Hamilton - New Mexico Health & Env. Dept.
Lynn Prince - EPA Region VI, 6H-HS
Mike Fitzpatrick - EPA Headquarters, Washington DC
Tracy Hughes - Office of General Counsel, EID
Cindy Smith - Phillips Petroleum Company, Bartlesville, OK
Knut Åm - Phillips Petroleum Company, Odessa, TX

New Mexico Health and Environment Department

MARALYN BUDKE
Acting Secretary

CARLA L. MUTH
Deputy Secretary

MICHAEL J. BURKHART
Deputy Secretary

RICHARD MITZELFELT
Director

June 15, 1989

Randall E. Brown Chief, Enforcement Branch
U.S. EPA Region VI 6H-C
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202

Dear Mr. Brown:

I am enclosing a copy of a letter to Julie Wanslow of our staff from Dan Derkics, Chief, EPA Headquarters concerning the the oil field RCRA exemption and clarifying the differences between gas plant cooling tower wastes and cooling tower blowdown. I believe this will be useful to you in your determination of the regulatory status of the four Phillips Petroleum Company facilities as we requested in our June 8, 1989 letter.

If you have any questions or need additional information, please feel free to contact me at (505) 827-2928.

Sincerely,

Boyd Hamilton

Boyd Hamilton
Program Manager
Hazardous Waste Program

cc: Lynn Prince, EPA Region VI, 6H-HS
Mike Fitzpatrick, EPA Headquarters
Knut Am, Manager, Permian Basin Region,
Phillips Petroleum Company
Reese B. Copeland, Attorney for Phillips Petroleum Company
Tracy Hughes, Office of General Counsel, EID

Enclosure

BH/SMM/smm

— ENVIRONMENTAL IMPROVEMENT DIVISION —
Harold Runnels Building
1190 St. Francis Dr.
Santa Fe, New Mexico 87503

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

JUN 6 1989

OFFICE OF
SOLID WASTE AND EMERGENCY R

Julie Wanslow
Hazardous Waste Section
NMEID
1190 Saint Francis Street
Santa Fe, N.M. 87503

RECEIVED
JUN 12 1989
HAZARDOUS WASTE SECTION

Dear Ms. Wanslow:

In response to your phone conversation of March 22, 1989, with Mike Fitzpatrick of my staff, we have prepared the following explanations to clarify the boundaries of the oil field RCRA exemption as discussed in the December 1987 EPA Report to Congress (RTC) and given final definition in the July 1988 regulatory determination.

The scope of the exemption as defined in the RTC and regulatory determination is based on the legislative history and Sections 3001(b)(2)(A) and 8002(m) of RCRA. Using these sources the Agency has identified three separate criteria to be used when defining specific waste streams that are exempt. These criteria are listed on pages II-18 and II-19 of the RTC (enclosed.)

In regard to pipeline or gathering line-related wastes, the following excerpts from the criteria in the RTC may prove helpful:

> "Primary field operations encompass those activities occurring at or near the well head, but prior to the transport of oil from an individual field facility or a centrally located facility to a carrier (i.e., pipeline or trucking concern) for transport to a refinery or to a refiner.... Waste generated by the transportation process itself are not exempt because they are not intrinsically associated with primary field operations.... Transportation for the oil and gas industry may be for short or long distances." [emphasis added].

According to the Manual of Oil and Gas Terms (sixth edition) there are many terms in common usage within the industry and applied to the various pipelines associated with oil and gas production and transportation (see enclosed definition of "pipeline"). Feeder lines may or may not be exempt depending on the point of custody transfer or other

site-specific factors relating to transportation from the primary field operation as defined in the RTC. Although the Agency used the term "gathering line" in the RTC in reference to a generally small diameter pipe within a primary field operation, the term "gathering line" itself should not be used as the determining factor in defining the scope of the exemption. Rather, the applicability of the criteria in the RTC to the particular line in question should be used in determining the scope of the exemption.

As for gas plant cooling tower wastes, the July 6, 1988, regulatory determination identifies "cooling tower blowdown" as exempt and "gas plant cooling tower cleaning wastes" as non-exempt. The difference between the two is that blowdown is comprised only of water, scale or other wastes generated by the actual operation of the cooling tower; whereas cleaning wastes include any solvents, scrubbing agents or other cleaning materials introduced into the process solely to remove buildup or otherwise clean the equipment and are not included as part of the functional operation of the cooling tower. Since these cleaning wastes can come from any cooling tower, they are not intrinsically derived from primary field operations for natural gas production. The determining factor for defining the exemption is not the frequency with which the cooling tower is blown down, either with or without cleaning agents, but whether the resulting waste is solely derived from the normal operation of the tower for natural gas production or from any added cleaning materials.

I trust these explanations will enable you to better determine the scope of the RCRA exemption as applied to the specific waste streams within your jurisdiction. If you have any further questions please contact Mike Fitzpatrick at (202) 475-6783.

Sincerely,

Dan Derkics
Chief
Large Volume Waste Section

Enclosure

cc: Mike Fitzpatrick
Ivy Main, Office of General Counsel

OIL AND GAS TERMS

Sixth Edition

Annotated Manual of
Legal
Engineering
Tax Words and Phrases

by

HOWARD R. WILLIAMS

Robert E. Paradise Professor of Natural Resources Law, Stanford University

Stella W. and Ira S. Lillick Professor of Law, Stanford University

and

CHARLES J. MEYERS

Formerly Richard E. Lang Professor of Law and Dean, Stanford University

1984

MATTHEW
BENDER

235 E. 45TH STREET, NEW YORK, N. Y. 10017
450 SANSOME STREET, SAN FRANCISCO, CALIF. 94111

Displaced gas

TRANSPORTATION GAS (*q.v.*) which has been displaced by the carrier in order to deliver CONSUMER GAS (*q.v.*) and which is delivered at a later time when capacity becomes available.

Disposal well

A well employed for the reinjection of salt water produced with oil into an underground formation.

Disqualified transferor

For purposes of the CRUDE OIL WINDFALL PROFIT TAX ACT OF 1980 (*q.v.*), this term means, with respect to any quarter, any person who: (1) had qualified production for such quarter which exceeded such person's independent producer amount for such quarter, or (2) was not an independent producer for such quarter. Internal Revenue Code § 4992.

Disrepute clause

A clause said to be included in all Petromin contracts with foreign government oil purchasers which enables the Saudi government entity to terminate the contract if the Saudis conclude that the other government acts in a manner which brings discredit to the Saudi government. Conant, "Government-to-Government Agreements," *Energy Law 1981*, Seminar of the International Bar Association Committee on Energy and Natural Resources at p. 8 (1981).

See also, CONCESSION.

Dissolved gas drive

[illegible] energy, derived from expansion of solution gas, used in the production of oil. *Syn.:* Solution-gas expansion. Gas escapes from solution within the oil upon reduction of pressure and drives the oil from the reservoir into the well. This form of drive is characterized by rapidly declining pressure and an increasing amount of gas necessary to produce a barrel of oil, with rapidly increasing gas-oil ratios.

See also, RESERVOIR ENERGY.

Distillate

Liquid hydrocarbons, usually colorless and of high API gravity (above 60 degrees), recovered from wet gas by a separator that condenses the liquid out of the gas. This is the older name for the substance; generally at present the term NATURAL GASOLINE (*q.v.*) or CONDENSATE (*q.v.*) is used.

Any product separated, or purified, or identified by distillation. See Asiatic Petroleum Corp. v. United States, 183 F. Supp. 275, 12 *O.&G.R.* 841 (Customs Court 1959).

Distillate fuel oil

A term subject to a variety of definitions. Sometimes the definition is based on the method of production (distillation), but other definitions are based on boiling range, viscosity, or use. See RESIDUAL FUEL OIL. Most commonly the term is used in connection with diesel oil and the light fuel oils used for residential heating. See Hammond, Metz, and Maugh, *Energy and the Future* 159 (1973). Distillates are classified in grades, called Number 1, 2, 3, 4, 5, and 6 fuels. The specific gravity of fuel oils range from 0.92 to 0.99.

As distinguished from residual fuel oils which are leftovers of refining processes, distillate fuel oils are products of distillation and are lighter. They are used for a variety of purposes, including diesel fuel and for space heating. Residual fuel oils are used under boilers in ships and in power plants. See Zimmermann, *Conservation in the Production of Petroleum* 85 (1957).

Distribution line

A pipeline other than a GATHERING LINE (*q.v.*) or TRANSMISSION LINE (*q.v.*). 49 C.F.R. § 192.3 (1982). See Hamman v. Southwestern Gas Pipeline, Inc., 721 F.2d 140, 78 *O.&G.R.* 552 (5th Cir. 1983) (concerned with classification of pipeline in order to determine whether it was subject to regulation under the NATURAL GAS PIPELINE SAFETY ACT (NGPSA) (*q.v.*).

Distribution system

". . . [T]he mains which are provided primarily for distributing gas within a distribution area, together with land, structures, valves, regulators, services and measuring devices, including the mains for transportation of gas from production plants or points of receipt located within such distribution area to other points therein. The distribution system owned by companies having no transmission facilities connected to such distribution system begins at the inlet side of the distribution system equipment which meters or regulates the entry of gas into the distribution system and ends with and includes property on the customer's premises. For companies which own both

e station

A location at which gas changes ownership, from one party to an-ıer, neither of which is the ultimate consumer. Also referred to as TY GATE (*q.v.*) station, town border station. American Gas Asso-tion Bureau of Statistics. *Glossary for the Gas Industry* 26.

thering facilities

Pipe lines and other facilities used to collect gas from various wells d bring it by separate and individual lines to a central point where is delivered into a single line. In the Matter of Barnes Transporta-n Co., 18 F.P.C. 369, 7 *O.&G.R.* 1527 (1957).

the g gas

The first taking or the first retaining of possession of gas for trans-ission through a pipe line, after the severance of such gas, and after e passage of such gas through any separator, drip, trap or meter at may be located at or near the well. In the case of gas containing soline or liquid hydrocarbons that are removed or extracted in mmercial quantities at a plant by scrubbing, absorption, compres-n, or any similar process, the term means the first taking or the st retaining of possession of such gas for transmission through a pe line after such gas has passed through the outlet of such plant. he act of collecting gas after it has been brought from the earth. ıturn Oil & Gas Co. v. Federal Power Comm'n, 250 F.2d 61, 8 *&G.R.* 365 (10th Cir. 1957), *cert. denied,* 355 U.S. 956, 8 *O.&G.R.* 13 (1958).

thering line

Pipes used to transport oil or gas from the lease to the main pipe-ne in the area. In the case of oil, the lines run from lease tanks to a ntral pump station at the beginning of the main pipeline. In the ıse of gas, the flow is continuous from the well head to the ultimate onsumer, since gas cannot be stored.

Gathering lines collect gas under fluctuating pressures which are hen regulated by regulating stations before the gas is introduced ıto trunk or transmission lines. Smith v. Inland Gas & Oil Co., 14 V.W. R. 558, 4 *O.&G.R.* 937 (Sup. Ct. of Alberta 1955).

For purposes of regulation of a pipeline under the Natural Gas ipeline Safety Act, classification of the line as a gathering line, DIS-RIBUTION LINE (*q.v.*) or TRANSMISSION LINE (*q.v.*) may be of signifi-

cance. See Hamman v. Southwestern Gas Pipeline, Inc., 721 F.2d 140 (5th Cir. 1983) (holding that the gathering line exception in the Act must be restricted to those pipelines that connect a transmission line to a gas well).

See also, PIPELINE.

Gathering station

A compressor station at which gas is gathered from wells by means of suction because pressure is not sufficient to produce the desired rate of flow into a transmission or distribution system. American Gas Association Bureau of Statistics, *Glossary for the Gas Industry* 26

Gathering system

The GATHERING LINES (*q.v.*), pumps, auxiliary tanks (in the case of oil), and other equipment used to move oil or gas from the well site to the main pipeline for eventual delivery to the refinery or consumer, as the case may be. In the case of gas, the gathering system includes the processing plant (if any) in which the gas is prepared for the market.

See also, COLLECTING SYSTEM; DISTRIBUTION SYSTEM.

Gathering tax

A tax laid on the process of gathering gas. The Gas Gathering Tax of the State of Texas was declared unconstitutional in Michigan-Wisconsin Pipe Line Co. v. Calvert, 347 U.S. 157 (1954), as a tax on interstate commerce.

Gauge pressure

See PSIG.

Gauger

A person who measures the quantity and quality of oil and/or gas produced.

Gauging a well

Measurement of such characteristics of a well as potential for purposes of prorationing.

ıase-in crude

The share of PARTICIPATION CRUDE (*q.v.*) which the host nation *ıay* sell and which the operating oil company *must* accept. "This rovision, in effect, offers the governments an assured dump market hile they develop their own crude outlets." See "The Economics of nergy and Natural Resource Pricing," Committee Print, A Compiıtion of Reports and Hearings of the Ad Hoc Committee on the)omestic and International Monetary Effect of Energy and Other latural Resource Pricing, House Committee on Banking, Currency nd Housing, 94th Cong., 1st Sess. March 1975, at p. 100.

See also, BRIDGING CRUDE; BUYBACK OIL; CONCESSION.

ilippines National Oil Company (PNOC)

A s[illegible] owned oil company. See Chandler, "Current Developents ı Oil and Gas Law: The ASEAN Countries," International Bar ıss'n, 1 *Energy Law 1981* at p. 217.

ysical depletion

See DEPLETION.

ysical waste

Operational losses in the production of oil and gas. There are two ıain divisions of loss of oil and gas, namely, surface loss and underround loss. Surface loss of oil is due principally to evaporation and urface loss of gas is due principally to burning at field flares or lowing into the atmosphere. Underground loss is due to failure to ecover the maximum quantity which theoretically could be proıuce[illegible] by dissipation of reservoir pressure.

"[T]he loss or destruction of oil or gas after recovery thereof such s to prevent proper utilization and beneficial use thereof, and the ıss of oil or gas prior to recovery thereof by isolation or entrapıent, by migration; by premature release of natural gas from solutın in oil, or in any other manner such as to render impracticable the ecovery of such oil or gas." 30 C.F.R. § 221.2(n)(1) (1980).

See also, WASTE.

AP

The PETROLEUM IMPORT ADJUSTMENT PROGRAM (*q.v.*)

Pick-up oil

Oil which has escaped from a well or storage tank by overflow or seepage recovered by a PICK-UP STATION (*q.v.*).

Pick-up station

A surface pit or other type of trap utilized to gather oil which has escaped from a well or storage tank by overflow or seepage.

Pig

A scraping device for cleaning and testing petroleum and natural gas pipelines.

Piled steel platform

A conventional drilling and production platform for offshore drilling and production operations. A steel jacket enclosing conductor pipes is pinned to the sea bed by long steel piles and is surmounted by a steel deck on which is located housing, a drilling rig, and other installations.

Pincher Creek Decision

The decision of the Public Utilities Board of Alberta, pursuant to an application under Section 9 of The Gas Utilities Act, relating to charges and deductions to be allowed for processing costs in determining the value of gas for royalty purposes. See Rae, "Royalty Clauses in Oil and Gas Leases," 4 *Alberta L. Rev.* 323 at 346 (1965); Muir, "Utilization of Alberta Gas," 13 *Alberta L. Rev.* 64 (1975).

Pinch out

A trap formed by the disappearance or wedging out of a porous, permeable rock between two layers of impervious rock.

PIP

PETROLEUM INCENTIVES PROGRAM (*q.v.*).

Pipeline

A tube or system of tubes used for the transportation of oil or gas. Types of oil pipelines include: lead lines, from pumping well to a storage tank; flow lines, from flowing well to a storage tank; lease lines, extending from the wells to lease tanks; gathering lines, extend-

ing from lease tanks to a central accumulation point; feeder lines, extending from leases to trunk lines; and trunk lines, extending from a producing area to refineries or terminals.

In the case of gas, the GATHERING SYSTEM (*q.v.*) delivers the gas to the main pipeline which takes the gas directly to the distributor at the place of consumption.

Static capacity of a pipeline is calculated by multiplying the square of the pipe diameter (in inches) by .0009714 to give barrels of oil per lineal foot or by multiplying the square of pipe diameter (in inches) by .005454 to give cubic feet of gas per lineal foot. The quantity passing through the line in a given period will depend on initial pressure, flow characteristics, ground elevation, density, delivery pressure, and the booster stations employed.

For a detailed analysis of the pipeline industry see Wolbert, *U. S. Oil Pipe Lines* (1979). "Today there are over 227,000 miles of operating crude and products lines (including gathering lines) in the United States, exceeding by nearly 40 percent the total miles of mainline railroad right-of-way." *Id.* at 26.

For a detailed examination of the history of pipeline regulation and an order prescribing new criteria for the derivation of maximum permissible rates of return, see Williams Pipe Line Co., 23 F.P.S. 5-685 (F.E.R.C. Opinion No. 154, Nov. 30, 1982).

See also the following:

Pierce, "Reconsidering the Roles of Regulation and Competition in the Natural Gas Industry," 97 Harv. L. Rev. 345 (1983) (arguing that the natural gas market would function more efficiently if Congress deregulated gas pipeline companies and required them to compete against one another);

Malet, "Oil Pipelines as Common Carriers: Issues of Form and Substance," 20 *Houston L. Rev.* 801 (1983);

Fisher, "Access to Submarine Pipelines and Tariffs: The Legal Framework," [1982] 1 *OGLTR* 9;

Adams and Brock, "Deregulation or Divestiture: The Case of Petroleum Pipelines," 19 *Wake Forest L. Rev.* 705 (1983) (a detailed argument for requiring divestiture of pipeline ownership by integrated oil companies);

Mitchell (ed.), *Oil Pipelines and Public Policy* (American Enterprise Institute, 1979), discussing proposals for industry reform and reorganization.

See also, AGREEMENT ON PRINCIPLES; ALASKA NATURAL GAS PIPELINE FINANCING ACT; ANGTA; ANGTS; BIG INCH PIPELINE; DISTRIBUTION LINE; FLOW LINE; GATHERING LINE; HEPBURN ACT; HIGH-VOLUME SYSTEM; HINSHAW PIPELINE; INDEPENDENT PIPELINE; INTERMEDIATE-VOLUME SYSTEM; LINE LOSS; LINE PACK GAS; LITTLE BIG INCH PIPELINE; LOOP; LOOPING; LOOP LINES; LOW-VOLUME SYSTEM; MANDATORY CONTRACT CARRIAGE; MOTHER HUBBARD CASE; MINIMUM TENDER; NATURAL GAS PIPELINE SAFETY ACT (NGPSA); NORTHERN TIER PIPELINE CO.; PARTIAL LOOPING; PIPELINE CONSENT DECREE OF 1941; PRUDENT PIPELINE STANDARD; QUALITY BANK; SERVICE LINE; TAPLINE; TAPS AGREEMENT; THROUGHPUT AND DEFICIENCY AGREEMENT; TRANS-ALASKA PIPELINE AUTHORIZATION ACT; TRANSIT PIPELINE TREATY; TRANSMISSION LINE; TRANSMISSION SYSTEM; TRUNK LINE; TURNED INTO THE LINE; UNCONNECTED WELL; UNDIVIDED INTEREST PIPELINE; YAMBURG-URENGOI PIPELINE.

Pipeline consent decree of 1941

The agreement entered into by the Department of Justice, 20 major oil companies, and 59 pipeline companies stipulating that dividends paid by the pipeline companies to their shipper-owners would not be unlawful rebates if they did not exceed 7 percent of the Interstate Commerce Commission's valuation of the pipelines' properties. Since the dividend limit was based on valuation rather than on equity in the pipelines, debt capital has been resorted to for much of the cost of constructing pipelines, thus leading to a high rate of return on equity capital. See Report to the Congress by the Comptroller General, *Petroleum Pipeline Rates and Competition* 14 (July 13, 1979). Debt financing of construction costs has been facilitated by THROUGHPUT AND DEFICIENCY AGREEMENTS (*q.v.*). The result has been debt-equity of 90:10 or higher.

For a discussion of this decree see Adams and Brock, "Deregulation or Divestiture: The Case of Petroleum Pipelines," 19 *Wake Forest L. Rev.* 705 at 729 (1983).

Pipeline gas

A term used to describe gas which has sufficient pressure to enter the high pressure lines of the purchaser for distribution to its customers without further compression and which is sufficiently dry so that the liquid hydrocarbons therefrom will not drop out in the transmission lines. Greenshields v. Warren Petroleum Corp., 241 F.2d 61, 8 *O.&G.R.* 937 (10th Cir. 1957), *cert. denied*, 355 U.S. 907 (1957).

and for shutting in wells producing from a gas cap, called GAS CAP ALLOWABLE (*q.v.*).

It was held in Tidewater Oil Co. v. United States, 339 F.2d 633, 21 *O.&G.R.* 695 (Ct. Cl. 1964), that the transferor did not have an economic interest in the oil produced by the transferee of a salt-water shut-in allowable and hence the transferee and not the transferor was entitled to the depletion allowance on the oil produced. See "Depletion on Transferred Allowables," 14 *O.&G. Tax Q.* 133 (1965).

Marlin Oil Corp. v. Corporation Comm'n, 562 P.2d 851, 58 *O.&G.R.* 225 (Okla. 1977), sustained the power of the Commission to protect correlative rights by ordering the transfer to a new well drilled on a spacing unit the accumulated underages of a prior well on the unit which were due partly to the failure of the purchaser to take sufficient gas from the well but due largely to the inability of the prior well to produce its full allowable.

See "Transferred Allowables and Substitute Royalties," 5 *O.&G. Tax Q.* 59 (1956). For discussion of subject with reference to Louisiana law, see Hussey, "Conservation Developments of the Year," 4 *L.S.U. Min. L. Inst.* 148 at 161–165 (1956).

See also, FLUID INJECTION WELL; OBSERVATION WELL; SUBSTITUTE ROYALTY; UNIT SURPLUS WELL.

Transfer rule

The rule designed to prevent proliferation of the so-called independent producers exemption in Section 613A of the Internal Revenue Code. Under this exemption, independent producers continued to be entitled to percentage depletion on a limited quantity of oil. The transfer rule provides that (with limited exceptions) when an interest in oil and gas in proved oil and gas property is transferred, the independent producers exemption will not apply to the transferee with respect to oil or gas produced from that property. See Linden, "An Analysis of the 'Transfer Rule' of the Proposed Regs. on Oil and Gas Depletion," 45 *J. Taxation* 112 (1976).

See also, DEPLETION, PERCENTAGE.

Transition zone

An area where the wells produce both free oil and free gas. Union Texas Petroleum v. Corporation Comm'n, 651 P.2d 652 at 665 (Okla. 1981) (dissenting opinion).

Transit Pipeline Treaty

The Agreement Between the Government of the United States of America and the Government of Canada Concerning Transit Pipelines, 28 U.S.T. 7449, T.I.A.S. No. 8720.

See also, AGREEMENT ON PRINCIPLES; PIPELINE.

Transmission line

A pipe line extending from a producing area to a refinery or terminal. *Syn.:* TRUNK LINE.

See also, DISTRIBUTION LINE; GATHERING LINE; PIPELINE.

Transmission system

". . . the land, structures, mains, valves, meters, boosters, regulators, tanks, compressors, and their driving units and appurtenances, and other equipment used primarily for transmitting gas from a production plant, delivery point of purchased gas, gathering system, storage area, or other wholesale source of gas to one or more distribution areas. The transmission system begins at the outlet side of the valve at the connection to the last equipment in a manufactured gas plant, the connection to gathering lines or delivery point of purchased gas, and includes the equipment at such connection that is used to bring the gas to transmission pressure, and ends at the outlet side of the equipment which meters or regulates the entry of gas into the distribution system or into a storage area. It does not include storage land or structures." 18 C.F.R. Part 201, Definitions 26B (1980).

Transportation costs

The costs of transporting oil or gas to a market. The operator of a lease upon gaining production will seek to secure a pipe line connection at the well or lease and to make delivery of the oil or gas at such pipeline connection to the purchaser of the oil or gas. Prior to the extension of pipe lines to the lease by a purchaser, the operator of the well or lease may find it necessary to transport the product to a distant pipe line connection or to a railroad or refinery by truck or by his own pipe line.

The lessor is entitled to a royalty free and clear of costs at the wellhead; if the product cannot be disposed of at the wellhead to a purchaser, then the lessor must normally share in the expenses of transporting the product to market. Molter v. Lewis, 156 Kan. 544, 134 P.2d 404 (1943); TREATISE §§ 645–645.3. An occasional lease

Trespass

See BAD FAITH TRESPASSER; GEOPHYSICAL TRESPASS; GOOD FAITH TRESPASSER; SUBSURFACE TRESPASS.

Tribal lands

See INDIAN LANDS.

Trip tank

A small calibrated tank used to measure the volume of drilling fluid required to fill the hole while pulling pipe from a well. Alberta Energy Resources Conservation Board, *Inquiry Report* 78–8, page 9 (June 9, 1978).

Truman proclamation

The Proclamation of September 1945 by President Truman claiming for the United States the natural resources of the subsoil and seabed of the continental shelf beneath the high seas but contiguous to the coasts of the United States as appertaining to the United States, subject to its jurisdiction and control. United States Department of State Bulletin, No. 327 (Sept. 30, 1945), p. 485.

See also, OUTER CONTINENTAL SHELF.

Trunk line

A pipe line for the transportation of oil or gas from producing areas to refineries or terminals. *Syn.:* TRANSMISSION LINE.

Trust

See LANDOWNERS' ROYALTY POOL; ROYALTY TRUST.

Tubing

A string of pipe set into a well through which oil is produced. *Syn.:* OIL STRING.

Tubing a well

Setting and sealing into the well a string of pipe, called tubing, after perforations have been made in the casing or the well has been drilled to the desired total depth. The oil or gas is produced through the tubing which may have screens at the level of the producing stratum to strain out sand and other foreign matter.

Tubing pressure

See SHUT-IN PRESSURE.

Tubular goods

Well casing and tubing, drill pipe, standard pipe, line pipe, *etc.*

Turbodrilling

A method of drilling wells in which "the bit is turned not by rotation of the drill string, as in rotary drilling, but by a downhole turbine, driven by the fluid pumped down through the drill stem. The turbodrill can thus be thought of as using a hydraulic transmission system that gets power to the bottom of the hole in contrast to the rotary drilling system's dependence on mechanical transmission." Campbell, *The Economics of Soviet Oil and Gas* 108 (1968). For a discussion of the development and use of this method of drilling see *Id.* at 108–120.

See also, CABLE TOOL DRILLING; ROTARY DRILLING.

Turkish National Petroleum Co. (TPAO)

For a discussion of this company see Shwadran, *The Middle East, Oil and the Great Powers* 491 (3d ed. revised and enlarged, 1973).

Turned into the line

A pipeline has begun to run oil from field tanks into which a well's production first goes, so that the well's production is being marketed. Ball, Ball, and Turner, *This Fascinating Oil Business* 109 (2d ed. 1965).

Turning to the right

A colloquialism for actual drilling of a well. Peterson, "Extensions and Suspensions of Federal Oil and Gas Leases," *Rocky Mt. Min. L Fdn. Inst. on The Overthrust Belt—Oil and Gas Legal and Land Issues 12-1 at 12-7 (1980).*

Turnkey contract

A contract in which an independent drilling contractor undertakes to furnish all materials and labor and to do all the work required to complete a well in a workmanlike manner, place it on production

1. Exempt wastes must be associated with measures (1) to locate oil or gas deposits, (2) to remove oil or natural gas from the ground, or (3) to remove impurities from such substances, provided that the purification process is an integral part of primary field operations.[5]

2. Only waste streams intrinsic to the exploration for, or the development and production of, crude oil and natural gas are subject to exemption. Waste streams generated at oil and gas facilities that are not uniquely associated with the exploration, development, or production activities are not exempt. (Examples would include spent solvents from equipment cleanup or air emissions from diesel engines used to operate drilling rigs.)

   Clearly those substances that are extracted from the ground or injected into the ground to facilitate the drilling, operation, or maintenance of a well or to enhance the recovery of oil and gas are considered to be uniquely associated with primary field operations. Additionally, the injection of materials into the pipeline at the wellhead which keep the lines from freezing or which serve as solvents to prevent paraffin accumulation is intrinsically associated with primary field operations. With regard to injection for enhanced recovery, the injected materials must function primarily to enhance recovery of oil and gas and must be recognized by the Agency as being appropriate for enhanced recovery. An example would be produced water. In this context, "primarily functions" means that the main reason for injecting the materials is to enhance recovery of oil and gas rather than to serve as a means for disposing of those materials.

3. Drilling fluids, produced waters, and other wastes intrinsically derived from primary field operations associated with the exploration, development, or production of crude oil, natural gas, or geothermal energy are subject to exemption. Primary field operations encompass production-related activities but not transportation or manufacturing activities. With respect to oil production, primary field operations encompass those activities occurring at or near the wellhead, but prior to the transport of oil from an individual field facility or a centrally located facility to a carrier (i.e., pipeline or trucking concern) for transport to a refinery or to a refiner. With respect to natural gas production, primary field operations are those activities occurring at or near the wellhead or at the gas plant but prior to that point at which the gas is transferred from an individual field facility, a centrally located facility, or a gas plant to a carrier for transport to market.

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[5] Thus, wastes associated with such processes as oil refining, petrochemical-related manufacturing, or electricity generation are not exempt because those processes do not occur at the primary field operations.

Primary field operations may encompass the primary, secondary, and tertiary production of oil or gas. Wastes generated by the transportation process itself are not exempt because they are not intrinsically associated with primary field operations. An example would be pigging waste from pipeline pumping stations.

Transportation for the oil and gas industry may be for short or long distances. Wastes associated with manufacturing are not exempt because they are not associated with exploration, development, or production and hence are not intrinsically associated with primary field operations. Manufacturing (for the oil and gas industry) is defined as any activity occurring within a refinery or other manufacturing facility the purpose of which is to render the product commercially saleable.

Using these definitions, Table II-1 presents definitions of exempted wastes as defined by EPA for the purposes of this study. Note that this is a partial list only. Although it includes all the major streams that EPA has considered in the preparation of this report, others may exist. In that case, the definitions listed above would be applied to determine their status under RCRA.

Waste Volume Estimation Methodology

Information concerning volumes of wastes from oil and gas exploration, development, and production operations is not routinely collected nationwide, making it necessary to develop methods for estimating these volumes by indirect methods in order to comply with the Section 8002(m) requirement to present such estimates to Congress. For this study, estimates were compiled independently by EPA and by the American Petroleum Institute (API) using different methods. Both are discussed below.

Estimating Volumes of Drilling Fluids and Cuttings

EPA considered several different methodologies for determining volume estimates for produced water and drilling fluid.

New Mexico Health and Environment Department

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K. D. Para, Inspector

MARALYN BUDKE
Acting Secretary

CARLA L. MUTH
Deputy Secretary

MICHAEL J. BURKHART
Deputy Secretary

RICHARD MITZELFELT
Director

Approved 6-12-89
ehg

June 8, 1989

PHILLIPS PETROLEUM CO.

RECEIVED

Randall E. Brown
Chief, Enforcement Branch
U.S. EPA Region VI, 6H-C
1445 Ross Avenue, Suite 1200
Dallas, TX 75202

Dear Mr. Brown:

The New Mexico Hazardous Waste Program is requesting an EPA interpretation of the July 6, 1988 Federal Register because the interpretation rendered will, or at least could, affect all states within Region VI. This interpretation is requested by June 30, 1989 in order for the state to determine if the facilities which raised the issue, are or are not in violation of a state issued compliance order. It should be noted that these facilities were required by the 1984 EPA consent agreements to submit to the state RCRA closure plans for review and processing which may suggest EPA involvement.

The Hazardous Waste Program met with Phillips Petroleum Company on May 1, 1989 to discuss Phillip's non-compliance with the April 19, 1988 Compliance Order issued by the EID. The purpose of the meeting with Phillips was to outline our concerns at each of the four facilities Artesia, Eunice, Lee and Lusk. Our primary concerns are that the groundwater monitoring systems at each facility are inadequate and the analytical results for the October 1988 CME indicate elevated levels of total chromium in the groundwater at all four facilities. Organic constituents such as benzene, toluene, and ethylbenzene are also present in the groundwater at all the facilities except Lusk. Phillips indicated during the meeting that they did not believe they were subject to RCRA based upon the regulatory determination published in the Federal Register for July 6, 1988, 53 Federal Register 25,446 which exempts cooling tower blowdown. Phillips also indicated that they were working with the New Mexico Oil Conservation Division to close the surface impoundments (RCRA units) as solid waste disposal units.

— ENVIRONMENTAL IMPROVEMENT DIVISION —
Harold Runnels Building
1190 St. Francis Dr.
Santa Fe, New Mexico 87503

As a result of this meeting Phillips was asked to provide a letter stating their position and a statement of their past activities at the surface impoundments (RCRA units). We have received their information and are forwarding it to you with this letter.

At the time of the meeting with Phillips the Hazardous Waste Program's position was that the chromium waste that was being regulated under RCRA was the result of gas plant cooling tower cleaning wastes and therefore would not be exempt. Staff has had several conversations with Mike Fitzpatrick with U.S. EPA Headquarters (contact person for the oil and gas exemption), both before and after the meeting with Phillips. Prior to the May 1, 1989 meeting our staff's understanding of the July 6, 1988 Federal Register, the Report to Congress, and conversations with Mike Fitzpatrick was that cooling tower blowdown was a material that had not been altered by any additives or cleaning agents and that gas plant cooling tower cleaning wastes were cooling tower blowdown that had been altered by the addition of cleaning agents such as solvents or chromium.

Upon further conversations with Mike Fitzpatrick after the meeting with Phillips, and after explaining the process Phillips uses at the gas plant cooling towers, it seems that cooling tower blowdown can have additives in it which enable the gas plant to operate. If the plant is shut down for cleaning or for cleaning agents to be added to the cooling tower water, then those wastes generated from the cleaning process would be considered gas plant cooling tower cleaning wastes.

Staff has reviewed the information packet provided by Phillips which includes the discussion explaining their position and the Certificate of No Hazardous Waste Activity. At this time EID believes that the chromium in the impoundments is exempt from RCRA and therefore the four Phillips facilities Artesia, Eunice, Lee and Lusk are not regulated under RCRA.

We believe this is an extremely important issue. If gas plant cooling tower cleaning wastes includes cooling tower blowdown with hazardous constituent additives, then several hundred additional facilities would potentially be added to the RCRA system in New Mexico. If however these gas plants are exempt then several hundred facilities are potentially not being regulated for the presence of possible EP Tox levels of chromium in their surface impoundments.

Should you have any questions, please feel free to contact me at (505) 827-2928.

Sincerely,

Boyd Hamilton

Boyd Hamilton
Program Manager
Hazardous Waste Program

cc: Lynn Prince, EPA Region IV, 6H-HS
Mike Fitzpatrick, EPA Headquarters
Knut Am, Manager, Permian Basin Region,
Phillips Petroleum Company
Reese B. Copeland, Attorney for Phillips Petroleum Company
Tracy Hughes, Office of General Counsel, EID

Enclosures

BH/SMM/smm

PHILLIPS PETROLEUM COMPANY

May 17, 1989

RECEIVED

MAY 22 1989

OIL CONSERVATION DIV.
SANTA FE

Mr. Boyd Hamilton
Program Manager
Hazardous Waste Program
New Mexico Health and
Environment Department
1190 St. Francis Drive
Santa Fe, New Mexico 87503

Re: RCRA Status Artesia, Eunice, Lusk and Lee Gas Plants - NMD000709667, NMD000709634, NMD000709675, NMD000709659

Dear Mr. Hamilton:

At the meeting held May 1, 1989 in Santa Fe, between yourself, your staff and Phillips Petroleum Company (Phillips) representatives, you requested that Phillips furnish you a written statement of its position concerning the status of the above-referenced facilities, given the EPA's Regulatory Determination of June 29, 1988 (RD); the earlier Consent Agreement and Final Order's pertaining to the facilities entered in EPA Dockets numbered RCRA VI-311-H, RCRA VI-312-H, RCRA VI-313-H, RCRA VI-314-H; and the facts concerning the operation of the cooling towers with the discharge to the surface impoundments at each of the facilities.

Phillips has reviewed the matter internally. Its position is that under the RD (Attachment I), cooling tower blowdown is expressly declared to be within the category of wastes exempted from regulation as Subtitle C wastes under Section 3001(b)(2)(A) of the 1980 Amendments to RCRA, 42 USC 6921(b)(2)(A), 53 F.R. 25453-25454.

The only waste streams directed to the surface impoundments at the four plants after November 19, 1980, which could have made the impoundments RCRA units were the cooling tower blowdown streams. The cooling tower blowdown streams would not contain chemical or other cleaning wastes (see Attachment II, Certificate No Hazardous Waste Activity Cooling Tower Usage, Artesia, Eunice, Lee and Lusk Gas Plants). Therefore, none of the surface impoundments are RCRA units, nor are they subject to regulation by the EID, but rather are solid waste disposal facilities subject to the jurisdiction of the OCD.

The Consent Agreement and Final Orders (Order) applicable to their respective plants (Attachments III, IV, V, and VI), do not alter this result. Each order recites that its effects are limited to that particular proceeding and that neither the findings of fact nor conclusions of law may be used for any other purpose or in any other proceedings except for the purposes of computing penalties for any alleged violations which represent a continuation or repetition of alleged violations contained in the findings of fact and conclusions of law in each Order. Thus, any future violation, even if a continuation or repetition, would need to be proved up independently of the Order and the recited findings of fact and conclusions of law, and all facts, including jurisdictional facts, would have to be proved up without recourse to the Order.

The Order pertaining to Lusk recites that it is specifically understood by EPA that Respondent (Phillips) is in the process of seeking to obtain closure approval for this facility from the State of New Mexico. The Orders pertaining to Artesia, Lee and Eunice, each recite that Phillips has submitted a closure plan and a post-closure plan to EPA and the State of New Mexico. These statements of fact were correct. These statements do not operate to extend the effects of the Orders to closure proceedings, because the Orders recite that the fact findings and conclusions of law are limited to the individual enforcement proceeding, as stated above, and because New Mexico had acquired interim authorization to administer the RCRA program with regard to interim status closure prior to the entry of the Orders, in late August or early September 1984. Thus, interim status closure was New Mexico's responsibility, not EPA's. If anything, these recitations imply an approval by EPA of the interim status closure and post-closure plans which were submitted by Phillips, (see letter dated February 15, 1984, to Frank Collis from William H. Taylor, Jr., Attachment VII, concerning the Lusk Plant).

Finally, Phillips' position is that the record reflects it effected closure in conformity with the interim status closure plans submitted. Thus, any obligations which might be improperly inferred from these factual recitations have been discharged.

Phillips has submitted the groundwater monitoring data gathered at these plants over the past year to OCD in order to close the impoundments at all four plants with such groundwater cleanup as is appropriate. It appears that groundwater cleanup will be required at Lee and perhaps Eunice plants. The cleanup does not appear to be required because of disposal activity connected to the surface impoundment at either plant.

It is Phillips' understanding that you desire this written statement of Phillips' position in order to submit it with a write-up of your own position to Region VI of EPA to obtain EPA's view of the status of these facilities under the RD, the Orders and the facts concerning the operation of the cooling towers and the cooling tower blowdown discharges to the surface impoundments at each of the plants. It is Phillips' view that the matter is so clear on its face that no interpretation by EPA is necessary, but Phillips is willing to cooperate in seeking it. Phillips does not agree that it will accept without further resort to the courts or other legal process a determination by EPA that these surface impoundments are subject to Subtitle C regulation under RCRA. It is Phillips' understanding that you will furnish it a complete copy of the submittal when it is forwarded to EPA.

Phillips' position, summarized above, is discussed below in greater detail with respect to the development of the RD.

The Report to Congress (Report), compiled in response to Section 8002(m) of the Resource Conservation and Recovery Act (RCRA), 42 USC 6982(m) was submitted in December of 1987. EPA, in a Federal Register Notice, advised the public of the availability of the Report and especially invited public comment on the scope of the exemption as stated in the Report, as well as another subject not relevant to this discussion. 53 F.R. 81.

The Report presented EPA's tentative definition of the scope of the exemption for oil and gas drilling fluids, produced waters and other wastes associated with the exploration, development or production of crude oil or natural gas. (II-16-II-19).

The Report tentatively concluded that the "other wastes associated" meant that the wastes must be intrinsically derived from "primary field operations associated with the exploration, development or production of crude oil or natural gas", and that primary field operations, with respect to natural gas production, were those activities occurring at or near the wellhead or at the gas plant, but prior to that point at which the gas is transferred from an individual field facility, a centrally located facility, or a gas plant to a carrier for transport to market. The Report also tentatively concluded inter alia that exempt wastes must be associated with measures to remove impurities from oil or gas, provided this was an integral part of primary field operations. (Ibid.)

Table II-1 of the Report contained a partial list of exempt and non-exempt wastes. Neither cooling tower blowdown nor

gas plant cooling tower cleaning wastes are mentioned in either list.

Volume III of the Report, in its Glossary of Terms, contains the following definitions:

Blowdown:	The emptying or depressuring of a material from a vessel. The material thus discarded.
Cooling Tower:	A structure in which air contact is used to cool a stream of water that has been heated by circulating through a system. The air flows counter- or cross-currently to the water.
Gas Plant:	An installation in which natural gas is processed to prepare it for sale to consumers. A gas plant separates desirable hydrocarbon components from impurities in natural gas.

Many members of the oil and gas industry accepted EPA's invitation to comment on the scope of the exemption, as did State and Federal authorities, the environmental community and numerous individuals.

Among the submissions available to and presumably relied upon by EPA in issuing the subsequent RD is a document titled "Production Waters Associated With The Production, Processing, Transmission and Storage of Natural Gas: A Literature Survey" which EPA characterized as technical support material in the administrative record for the RD (Certified List of Documents Comprising the Adminstrative Record, Alaska Center for the Environment v. Thomas, Case No. 88-1715, U.S. Ct. of App. DC Cir. F-88-OGRA-SO528).

This document gives a detailed description of the waters generated from gas processing including cooling tower blowdown. It is noted in the discussion of the chemical composition of such waters that they typically contain chromium, zinc, and phosphate as corrosion inhibitors, and that chlorines and small concentrations of biocides may be added to these waters. (SO528 pp. 5-69 - 5-76).

Among comments the Agency received on the scope of the exemption, the Gas Processors Association urged that all gas related associated wastes, such as contaminated glycol, iron sponge, and amines should be exempt from federal regulations. The Agency, in its response, noted that as explained in the RD, certain types of gas production associated wastes have remained exempt from RCRA Subtitle C. (F-88-OGRA-SO707 p. 24).

The Interstate Natural Gas Association urged that all wastes generated by natural gas treatment and processing operations should be exempt. Waste iron sponge, glycol, corrosion inhibitors and all other associated waste should be exempt. The Agency acknowledged the comments and pointed out that, as explained in the RD, certain types of gas treatment and production associated wastes have remained exempt from RCRA Subtitle C. (SO707 p. 27).

The Rocky Mountain Oil and Gas Association commented that the waste exemption should be much broader than the EPA defined. The Agency's response was that the waste exemption has been defined in the RD. (SO707 p. 28).

The RD's list of exempt wastes lists cooling tower blowdown, 53 FR 25454. It is submitted that the conclusion is inescapable that on this record, cooling tower blowdown from gas plants containing treating levels of corrosion inhibitor and small concentrations of biocides is an exempt waste.

I certify, under penalty of law, that I have personally examined and am familiar with the information submitted in the foregoing five pages, and the attachments hereto, and based upon my inquiry of those individuals immediately responsible for obtaining the information, I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Very truly yours,

PHILLIPS PETROLEUM COMPANY

Knut Am
apc Manager,
Permian Basin Region
4001 Penbrook
Odessa, Texas 79762

KA:RBC:am:535

Enclosures

CERTIFICATE
NO HAZARDOUS WASTE ACTIVITY
COOLING TOWER USAGE
ARTESIA, EUNICE, LEE AND LUSK GAS PLANTS

At all times during plant operations from November 19, 1980 to present, cooling towers at the above mentioned gas plants have been used to cool gas streams, gas treating solutions and, at Eunice and Lee, engine jacket water. This activity occurred prior to the point at which gas is transferred from the plant to a carrier for transport to market. Water in the towers is continuously recirculated and evaporated, which causes total dissolved solids and chloride content to steadily increase.

Total dissolved solids and chloride levels are controlled by "blowing down" or removing a portion of the total water volume in the tower and then making up the blowdown volume with fresh water; the process is one of continuous displacement. Chemicals used to control corrosion and maintain proper pH are added to the basin with the fresh water make-up. The tower is also periodically "shocked" with biocides to control algae and fungus growth to enhance the corrosion inhibition within the system. It should be noted the blowdown is normally shut in while biocides are in use. The biocides are spent before blowdown is resumed.

Blowdown water typically has a high concentration of total dissolved solids and chlorides. It will also contain the

treating level of chemicals used for corrosion inhibition. Both chromate and non-chromate corrosion inhibitors have been used since November 19, 1980. Cooling tower blowdown rates currently average 25 gallons per minute at the Artesia, Eunice and Lee Plants. Lusk is presently shut down and has been for some time.

Cooling towers must be cleaned on a periodic basis for proper operation (approximately once every five years). Cleaning consists of removing the sludge from the basin and removing scale from the cooling coil heads and laterals. Sludge is removed manually or by vacuum truck for proper disposal. The cooling coils and laterals are mechanically cleaned by sandblasting. Typically, the operations are done together. The materials have been tested and have not tested as hazardous waste.

Cooling tower basins and cooling coil heads and laterals have not been chemically cleaned in this region or at any of these plants.

Given the Regulatory Determination of June 29, 1989, which declares cooling tower blowdown to be an exempt waste and therefore not subject to regulation under Subtitle C of RCRA, there has been no hazardous waste generated, stored or disposed of at the Artesia, Eunice, Lee and Lusk natural gas plants since November 19, 1980.

I certify, under penalty of law, that I have personally examined and am familiar with the information submitted in this Certificate, and based upon my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Dated: May 17, 1989.

Knut Åm
Manager,
Permian Basin Region
PHILLIPS PETROLEUM COMPANY
4001 Penbrook
Odessa, Texas 79762

PHILLIPS PETROLEUM COMPANY
BARTLESVILLE, OKLAHOMA 74004 918 661-6600

LEGAL

May 5, 1989

Mr. Boyd Hamilton
New Mexico Health and
Environmental Department
1190 St. Francis Drive
Santa Fe, New Mexico 87503

Re: May 1, 1989 Meeting - Lusk, Lee, Eunice, and Artesia Natural Gas Processing Plants

Dear Mr. Hamilton:

At the May 1, 1989 meeting, Phillips agreed to furnish you a written statement of its position with respect to the cooling tower blowdown production waste exemption as it applies to the above four plants. It is Phillips' understanding that you desired this statement in order to submit the same to Region VI of the United States Environmental Protection Agency, together with your position statement on those issues, in order to obtain a determination from Region VI, U.S. EPA, whether the plants are within or without the subtitle C regulations because of the chromate containing cooling tower blowdown water at the plants and the rather long and tortured procedural history involving these four plants.

It is Phillips' understanding that until the regulatory determination is received, the NOV's previously issued concerning the groundwater monitoring system will remain in abeyance.

You made it clear that if the EPA decides that the plants contain regulated units, your agency will be vigorous with respect to the groundwater monitoring program.

Phillips has agreed to furnish the statement of its position, in writing, and will do so. However, it is Phillips' position that the regulatory determination of EPA as published in the Federal Register for July 6, 1988, 53 Fed. Reg. 25,446, is clear on its face and requires no agency interpretation. In fact, if the Agency were to conclude otherwise, it is Phillips' position it would be required to go through Notice and Rulemaking.

You should have Phillips' written position statement in hand within the time frame originally agreed upon, ten working days from May 1, 1989.

Thank you again for the courtesy extended to us by you and your staff.

Very truly yours,

Reese B. Copeland

Reese B. Copeland
1297 Adams Building
Bartlesville, OK 74004
(918) 661-3758

RBC:am:525

NEW MEXICO
HEALTH AND ENVIRONMENT
DEPARTMENT

1190 St. Francis Drive
Santa Fe, New Mexico 87503

GARREY CARRUTHERS
Governor

LARRY A. MUTH
Secretary

MICHAEL J. BURKHART
Deputy Secretary

RECEIVED
APR 24 1989
OIL CONSERVATION DIV.
SANTA FE

April 4, 1989

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

ENVIRONMENT
CONTROL
APR 10 1989

Mr. William F. Ballard, Manager
Phillips Petroleum Company
12 A4 Phillips Building
Bartlesville, OK 74004

RE: Phillips Plants Artesia, Eunice, Lee, and Lusk
NMD000709667, NMD000709675, NMD000709659, NMD000709634

Dear Mr. Ballard:

A Compliance Order was issued to Phillips Petroleum Company (Phillips) on April 19, 1988. The Compliance Order required Phillips to install by May 1, 1988, an adequate groundwater monitoring system.

The Environmental Improvement Division (EID) of the New Mexico Health and Environment Department has determined that the groundwater monitoring systems are inadequate at the Artesia, Eunice, Lee and Lusk facilities based upon a review of four quarters of water elevation data and the site maps. Groundwater flow directions change seasonally and therefore, three wells are not always located downgradient of the RCRA units. Downgradient wells are not always located to immediately detect a release from the RCRA units. The seasonally variable groundwater flow directions indicate that the upgradient wells at some of the Phillips facilities may be affected by the facility.

In addition, EID has noted that Phillips is filtering the metals samples. The New Mexico Hazardous Waste Section requires analysis of total metals, not filtered metals. All future metal samples must be unfiltered and analyzed for total metals.

The groundwater monitoring data, including the quarterly water elevation data and the groundwater analyses, are currently being reviewed in reference to Phillips' closure plans.

Turbidity values for most wells are in excess of the recommended turbidity value of 5 nephelometric turbidity units (NTUs) for ensuring the collection of representative samples. Most of the wells have become increasingly turbid since they were installed. EID strongly suggests Phillips redevelop the wells which have turbidity values exceeding 5 NTUs. Developed water that contains hazardous constituents must be disposed of in a RCRA unit or drummed and shipped offsite.

EID requests that Phillips meet with EID staff as soon as possible and provide in writing to EID within thirty (30) days of receipt of this letter, Phillips' plans to comply with the April 19, 1988 Compliance Order.

Please contact Suzanne Moore-Mayne at (505) 827-0170 to schedule a meeting and to answer any questions or provide additional information.

Sincerely,

Boyd Hamilton

Boyd Hamilton
Program Manager
Hazardous Waste Program

BH/SMM/smm

cc: Janie Hernandez, U.S. EPA - Region VI
Gary McCaslin, EID District IV
Tracy Hughes, HED

Groundwater Monitor Wells

Static Water Levels

Plant ARTESIA

monitor well Number	MW-1	MW-2	MW-3	MW-4			
Elev. to top of casing (2")	3611.47	3605.23	3603.38	3606.13			
8/17/88	3550.56	3550.80	3550.96	3550.50			
9/7/88	3550.56	3550.55	3550.58	3550.32			
10/26/88	3550.43	3550.47	3550.47	3550.29			
2/8/89	3550.04	3549.85	3549.81	3549.66			

Groundwater Monitor Wells

Static Water Levels

Plant EUNICE

Monitor Well Number	MW-1	MW-2	MW-3	MW-4			
Elev. to top of casing (2")	3562.63	3561.74	3561.64	3561.87			
8/31/88	3447.28	3443.69	3443,86	3444.15			
11/2/88	3447,45	3443.67	3443,84	3444.10			
2/1/89	3447,31	3443,61	3443,69	3443,96			

Groundwater Monitor Wells

Static Water Levels

Plant LEE

monitor well Number	MW-1	MW-2	MW-3	MW-4			
Elev. to top of casing (2")	3979.27	3980.59	3980.37	3980.29			
8/29/88	3884.69	3883.77	3883.75	3883.75			
10/31/88	3884.43	3883.57	3883.56	3883.57			
1/30/89	3885.24	3883.52	3883.50	3883.51			

Groundwater Monitor Wells

Static Water Levels

Plant LUSK

Monitor Well Number	MW-1	MW-2	MW-3	MW-4			
Elev. to top of casing (2")	3571.61	3566.99	3565.77	3565.86			
8/15/88	3531.33	3526.88	3524.36	3525.83			
10/24/88	3531.43	3529.22	3525.01	3526.58			
2/13/89	3531.46	3526.33	3524.71	3526.05			

PHILLIPS 66 NATURAL GAS COMPANY
A SUBSIDIARY OF PHILLIPS PETROLEUM COMPANY

ODESSA, TEXAS 79762
4001 PENBROOK

April 5, 1989

Groundwater Monitoring Analyses
Artesia, Eunice, Lee and Lusk Plants

Mr. Dave Boyer
Environmental Bureau Chief
New Mexico Oil Conservation Division
P. O. Box 2088
Santa Fe, New Mexico 87501

Dear Mr. Boyer:

Per your request, attached please find copies of the fourth quarter groundwater monitoring analyses for the above referenced plants.

If you should have any questions regarding this information, please contact me at (915) 367-1316.

Very truly yours,

Michael D. Ford

Michael D. Ford
Environmental Analyst

MDF

Attachments

RADIAN CORPORATION

Page 1 RAS - Austin REPORT Work Order # 89-02-119
Received: 02/10/89 03/09/89 16:16:17

REPORT Phillips Petroleum
TO Radian
Bl.1
Austin
ATTEN Linda Bendele

CLIENT PHILLIPS P SAMPLES 3
COMPANY Phillips Petroleum
FACILITY Odessa, TX

WORK ID Artesia
TAKEN MF
TRANS UPS
TYPE
P.O. #
INVOICE under separate cover

PREPARED Radian Analytical Services
BY 8501 Mo-pac Bl.
PO Box 201088
Austin, TX 78720-1088
ATTEN
PHONE 512-454-4797

CERTIFIED BY

CONTACT BENDELE

Unknown compounds present in both GC samples.

SAMPLE IDENTIFICATION

01 Artesia MW-1
02 Artesia MW-2
03 reagent blank

2/89 - 4th Quarter

TEST CODES and NAMES used on this report

AG E	Silver, ICPES
ALPHA	Gross alpha radiation
AS G	Arsenic, graphite AA
BA E	Barium, ICPES
BETA	Gross beta radiation
CD E	Cadmium, ICPES
CL IC	Chloride, IC
COLI T	Total coliform
CR E	Chromium, ICPES
DG3020	Digestion, method 3020
DG6010	Digestion, method 6010
EPA602	EPA method 602
FE E	Iron, ICPES
F IC	Fluoride, IC
HG C	Mercury, cold vapor
MHO	Specific conductance
MN E	Manganese, ICPES
NA E	Sodium, ICPES
NO3	Nitrate, colorimetric
PB G	Lead, graphite AA
PH	pH
PHEN	Total phenolics
RA 226	Radium 226
SE G	Selenium, graphite AA
SO4 IC	Sulfate, IC
TOC	Total organic carbon
TOX	Total organic halides
TURB	Turbidity
XYLENE	Xylenes, EPA 602

RADIAN CORPORATION

Received: 02/10/89 Results By Test

SAMPLE Sample Id	Test: AG E ug/ml	Test: ALPHA pCi/	Test: AS G ug/ml	Test: BA E ug/ml	Test: BETA pCi/
01 Artesia MW-1	<0.03	15.7(1.4) pCi/L	0.013	0.07	15.9(1.2) pCi/L
02 Artesia MW-2	<0.03	21.7(2.5) pCi/L	0.039	2.0	32.2(2.9) pCi/L

SAMPLE Sample Id	Test: CD E ug/ml	Test: CL IC mg/L	Test: COLI T colonies/100 mL	Test: CR E ug/ml	Test: DG3020 date complete
01 Artesia MW-1	<0.005	160	<20	<0.03	02/23/89
02 Artesia MW-2	<0.005	660	210	<0.03	02/23/89

SAMPLE Sample Id	Test: DG6010 date complete	Test: FE E ug/ml	Test: F IC mg/L	Test: MHO umhos/cm	Test: MN E ug/ml
01 Artesia MW-1	02/22/89	<0.04	1.9	1400	0.09
				1400	
				1400	
				1400	
02 Artesia MW-2	02/22/89	1.5	2.7	3700	1.9
				3600	

RADIAN CORPORATION

SAMPLE Sample Id	Test: DG6010 date complete	Test: FE E ug/ml	Test: F IC mg/L	Test: MHO umhos/cm	Test: MN E ug/ml
				3600	
				3600	

SAMPLE Sample Id	Test: NA E ug/ml	Test: NO3 mg/L as N	Test: PB G ug/ml	Test: PH pH units	Test: PHEN mg/L as phenol
01 Artesia MW-1	110	<0.02@	0.003*	6.87	<0.005
				6.98	
				7.12	
				6.99	
02 Artesia MW-2	330	<0.02	<0.001	6.91	0.008*
				6.91	
				6.91	
				6.92	

RADIAN CORPORATION

Received: 02/10/89 Results By Test

SAMPLE Sample Id	Test: RA 226 pCi/	Test: SE G ug/ml	Test: SO4 IC mg/L as SO4	Test: TOC mg/L	Test: TOX mg/L
01 Artesia MW-1	0.52(.04) pCi/L	<0.004	83	13	0.04*
				13	0.03*
				14	0.04*
				14	0.04*
02 Artesia MW-2	2.14(.08) pCi/L	<0.004	14	34	0.05*
				43	0.04*
				40	0.05*
				37	0.05

RADIAN CORPORATION

Page 5 RAS - Austin REPORT Work Order # 89-02-119
Received: 02/10/89 Results by Sample

SAMPLE ID Artesia MW-1 FRACTION 01J TEST CODE EPA602 NAME EPA method 602
Date & Time Collected 02/09/89 Category

VERIFIED DMV

ANALYST JB FILE #
INSTRMT G INJECTED 02/13/89 UNITS ug/L

CAS#	COMPOUND	RESULT	DET LIMIT
71-43-2	Benzene	16	0.20
108-88-3	Toluene	0.7*	0.20
100-41-4	Ethylbenzene	1.7	0.30
108-90-7	Chlorobenzene-A	ND	0.30
106-46-7	1,4-Dichlorobenzene	ND	0.30
541-73-1	1,3-Dichlorobenzene	ND	0.40
95-50-1	1,2-Dichlorobenzene	ND	0.40

SURROGATES

98-08-8 a,a,a-Trifluorotoluene 130 Q% recovery

(1)See Appendix A for glossary of report and data flag definitions.

RADIAN CORPORATION

Received: 02/10/89 Results by Sample

SAMPLE ID Artesia MW-1 FRACTION 01I TEST CODE HG C NAME Mercury, cold vapor
Date & Time Collected 02/09/89 Category

VERIFIED RHH

ANALYST KCP
INSTRMT 403 ANALYZED 02/22/89 UNITS ug/ml

ANALYTE	RESULT	DET LIMIT
Mercury	ND	0.0002

(1)See Appendix A for glossary of report and data flag definitions.

SAMPLE ID Artesia MW-1 FRACTION 01A TEST CODE TURB NAME Turbidity
Date & Time Collected 02/09/89 Category

VERIFIED LM

ANALYST LKM
INSTRMT HACH ANALYZED 02/10/89 UNITS NTU

ANALYTE	RESULT	DET LIMIT
Turbidity	21	1.0

(1)See Appendix A for glossary of report and data flag definitions.

RADIAN CORPORATION

Page 7 RAS - Austin REPORT Work Order # 89-02-119
Received: 02/10/89 Results by Sample

SAMPLE ID Artesia MW-1 FRACTION 01J TEST CODE XYLENE NAME Xylenes, EPA 602
Date & Time Collected 02/09/89 Category

VERIFIED CL

ANALYST JB FILE #
INSTRMT G INJECTD 02/13/89 UNITS ug/L

CAS #	COMPOUND	RESULT	DET LIMIT
1330-20-7	Total xylenes	3.1	0.20

SURROGATES

98-08-8 a,a,a-Trifluorotoluene 130 G% recovery

(1)See Appendix A for glossary of report and data flag definitions.

RADIAN CORPORATION

Page 8 RAS - Austin REPORT Work Order # 89-02-119
Received: 02/10/89 Results by Sample

SAMPLE ID Artesia MW-2 FRACTION 02J TEST CODE EPA602 NAME EPA method 602
Date & Time Collected 02/09/89 Category

VERIFIED DMV

ANALYST JB FILE #
INSTRMT G INJECTED 02/13/89 UNITS ug/L

CAS#	COMPOUND	RESULT	DET LIMIT
71-43-2	Benzene	15	1.0
108-88-3	Toluene	2.7*	1.0
100-41-4	Ethylbenzene	66	1.5
108-90-7	Chlorobenzene-A	ND	1.5
106-46-7	1,4-Dichlorobenzene	ND	1.5
541-73-1	1,3-Dichlorobenzene	ND	2.0
95-50-1	1,2-Dichlorobenzene	ND	2.0

SURROGATES

98-08-8 a,a,a-Trifluorotoluene 132 Q% recovery

(1)See Appendix A for glossary of report and data flag definitions.

SAMPLE ID Artesia MW-2 FRACTION 02I TEST CODE HG C NAME Mercury, cold vapor
Date & Time Collected 02/09/89 Category

VERIFIED RHH

ANALYST KCP
INSTRMT 403 ANALYZED 02/22/89 UNITS ug/ml

ANALYTE	RESULT	DET LIMIT
Mercury	ND	0.0002

(1)See Appendix A for glossary of report and data flag definitions.

SAMPLE ID Artesia MW-2 FRACTION 02A TEST CODE TURB NAME Turbidity
Date & Time Collected 02/09/89 Category

VERIFIED LM

ANALYST LKM
INSTRMT HACH ANALYZED 02/10/89 UNITS NTU

ANALYTE	RESULT	DET LIMIT
Turbidity	26	1.0

(1)See Appendix A for glossary of report and data flag definitions.

RADIAN CORPORATION

Page 10 RAS - Austin REPORT Work Order # 89-02-119
Received: 02/10/89 Results by Sample

SAMPLE ID Artesia MW-2 FRACTION 02J TEST CODE XYLENE NAME Xylenes, EPA 602
Date & Time Collected 02/09/89 Category

VERIFIED CL

ANALYST JB FILE #
INSTRMT G INJECTD 02/13/89 UNITS ug/L

CAS #	COMPOUND	RESULT	DET LIMIT
1330-20-7	Total xylenes	6.6	0.20

SURROGATES

98-08-8 a,a,a-Trifluorotoluene 144 G% recovery

(1)See Appendix A for glossary of report and data flag definitions.

RADIAN CORPORATION

Received: 02/10/89 Results by Sample

SAMPLE ID reagent blank FRACTION 03A TEST CODE EPA602 NAME EPA method 602
Date & Time Collected not specified Category

VERIFIED CL

ANALYST JB FILE #
INSTRMT G INJECTED 02/13/89 UNITS ug/L

CAS#	COMPOUND	RESULT	DET LIMIT
71-43-2	Benzene	ND	0.20
108-88-3	Toluene	ND	0.20
100-41-4	Ethylbenzene	ND	0.30
108-90-7	Chlorobenzene-A	ND	0.30
106-46-7	1,4-Dichlorobenzene	ND	0.30
541-73-1	1,3-Dichlorobenzene	ND	0.40
95-50-1	1,2-Dichlorobenzene	ND	0.40

SURROGATES

98-08-8	a,a,a-Trifluorotoluene	N/A% recovery

(1)See Appendix A for glossary of report and data flag definitions.

RADIAN CORPORATION

Received: 02/10/89 Results by Sample

SAMPLE ID reagent blank FRACTION 03A TEST CODE XYLENE NAME Xylenes, EPA 602
Date & Time Collected not specified Category

VERIFIED CL

ANALYST JB FILE #
INSTRMT G INJECTD 02/13/89 UNITS ug/L

CAS #	COMPOUND	RESULT	DET LIMIT
1330-20-7	Total xylenes	ND	0.20

SURROGATES

98-08-8	a,a,a-Trifluorotoluene	N/A% recovery

(1)See Appendix A for glossary of report and data flag definitions.

TEST CODE ALPHA NAME Gross alpha radiation

The value in parentheses is a + or - one sigma value. Results are thus expressed as: value (+ or - 1 sigma). One sigma = one standard deviation, 68% confidence level.

TEST CODE BETA NAME Gross beta radiation

The value in parentheses is a + or - one sigma value. Results are thus expressed as: value (+ or - 1 sigma). One sigma = one standard deviation, 68% confidence level.

TEST CODE RA 226 NAME Radium 226

The value in parentheses is a + or - one sigma value. Results are thus expressed as: value (+ or - one sigma). One sigma = one standard deviation, 68% confidence level.

RADIAN CORPORATION

Page 1 RAS - Austin REPORT Work Order # 89-02-120
Received: 02/10/89 03/09/89 16:32:02

REPORT Phillips Petroleum
TO Radian
Bl. 1
Austin
ATTEN Linda Bendele

PREPARED Radian Analytical Services
BY 8501 Mo-pac Bl.
PO Box 201088
Austin, TX 78720-1088
ATTEN
PHONE 512-454-4797

CERTIFIED BY

CONTACT BENDELE

CLIENT PHILLIPS P SAMPLES 5
COMPANY Phillips Petroleum
FACILITY Odessa, TX

WORK ID Artesia
TAKEN MF
TRANS UPS
TYPE
P.O. #
INVOICE under separate cover

SAMPLE IDENTIFICATION

01 Artesia MW-3
02 Artesia MW-4
03 Artesia MW-4 duplicate
04 trip blank
05 reagent blank

2-89 - 4th Quarter

TEST CODES and NAMES used on this report

AG E	Silver, ICPES
ALPHA	Gross alpha radiation
AS G	Arsenic, graphite AA
BA E	Barium, ICPES
BETA	Gross beta radiation
CD E	Cadmium, ICPES
CL IC	Chloride, IC
COLI T	Total coliform
CR E	Chromium, ICPES
DG3020	Digestion, method 3020
DG6010	Digestion, method 6010
EPA602	EPA method 602
FE E	Iron, ICPES
F IC	Fluoride, IC
HG C	Mercury, cold vapor
MHO	Specific conductance
MN E	Manganese, ICPES
NA E	Sodium, ICPES
NO3	Nitrate, colorimetric
PB G	Lead, graphite AA
PH	pH
PHEN	Total phenolics
RA 226	Radium 226
SE G	Selenium, graphite AA
SO4 IC	Sulfate, IC
TOC	Total organic carbon
TOX	Total organic halides
TURB	Turbidity
XYLENE	Xylenes, EPA 602

RADIAN CORPORATION

Received: 02/10/89 Results By Test

SAMPLE Sample Id	Test: AG E ug/ml	Test: ALPHA pCi/	Test: AS G ug/ml	Test: BA E ug/ml	Test: BETA pCi/
01 Artesia MW-3	<0.03	22.7(2.4) pCi/L	0.079	<0.01	21.6(2.3) pCi/L
02 Artesia MW-4	<0.03	16.8(2.1) pCi/L	0.013	<0.01	14.4(2.3) pCi/L

SAMPLE Sample Id	Test: CD E ug/ml	Test: CL IC mg/L	Test: COLI T colonies/100 mL	Test: CR E ug/ml	Test: DG3020 date complete
01 Artesia MW-3	<0.005	160	<20	<0.03	02/23/89
02 Artesia MW-4	<0.005	250	20	<0.03	02/23/89
03 Artesia MW-4 du				<0.03	

SAMPLE Sample Id	Test: DG6010 date complete	Test: FE E ug/ml	Test: F IC mg/L	Test: MHO umhos/cm	Test: MN E ug/ml
01 Artesia MW-3	02/24/89	<0.04	2.2	2500	2.1
				2500	
				2500	
				2400	
02 Artesia MW-4	02/24/89	<0.04	2.1	2300	<0.01

RADIAN CORPORATION

SAMPLE Sample Id	Test: DG6010 date complete	Test: FE E ug/ml	Test: F IC mg/L	Test: MHO umhos/cm	Test: MN E ug/ml
				2400	
				2300	
				2300	
03 Artesia MW-4 du	02/24/89				

SAMPLE Sample Id	Test: NA E ug/ml	Test: NO3 mg/L as N	Test: PB G ug/ml	Test: PH pH units	Test: PHEN mg/L as phenol
01 Artesia MW-3	92	<0.02	<0.001	6.90	<0.005
				6.83	
				6.82	
				6.84	
02 Artesia MW-4	85	0.35	<0.001	6.75	<0.005
				6.89	
				6.95	

RADIAN CORPORATION

SAMPLE Sample Id	Test: NA E ug/ml	Test: NO3 mg/L as N	Test: PB G ug/ml	Test: PH pH units	Test: PHEN mg/L as phenol
				6.99	

SAMPLE Sample Id	Test: RA 226 pCi/	Test: SE G ug/ml	Test: SO4 IC mg/L as SO4	Test: TOC mg/L	Test: TOX mg/L
01 Artesia MW-3	0.48(.04) pCi/L	<0.004	670	22	0.09
				25	0.09
				24	0.10
				23	0.10
02 Artesia MW-4	0.40(.04) pCi/L	<0.004	580	9	0.10
				10	0.09
				12	0.09
				11	0.09

RADIAN CORPORATION

Received: 02/10/89 Results by Sample

SAMPLE ID Artesia MW-3 FRACTION 01J TEST CODE EPA602 NAME EPA method 602
Date & Time Collected 02/09/89 Category

VERIFIED CL

ANALYST JB FILE #
INSTRMT G INJECTED 02/13/89 UNITS ug/L

CAS#	COMPOUND	RESULT	DET LIMIT
71-43-2	Benzene	ND	0.20
108-88-3	Toluene	ND	0.20
100-41-4	Ethylbenzene	0.8*	0.30
108-90-7	Chlorobenzene-A	ND	0.30
106-46-7	1,4-Dichlorobenzene	ND	0.30
541-73-1	1,3-Dichlorobenzene	ND	0.40
95-50-1	1,2-Dichlorobenzene	ND	0.40

SURROGATES

98-08-8	a,a,a-Trifluorotoluene	113% recovery

(1)See Appendix A for glossary of report and data flag definitions.

RADIAN CORPORATION

Page 6 RAS - Austin REPORT Work Order # 89-02-120
Received: 02/10/89 Results by Sample

SAMPLE ID Artesia MW-3 FRACTION 01I TEST CODE HG C NAME Mercury, cold vapor
Date & Time Collected 02/09/89 Category

VERIFIED RHH

ANALYST KCP
INSTRMT 403 ANALYZED 02/22/89 UNITS ug/ml

ANALYTE	RESULT	DET LIMIT
Mercury	ND	0.0002

(1)See Appendix A for glossary of report and data flag definitions.

SAMPLE ID Artesia MW-3 FRACTION 01A TEST CODE TURB NAME Turbidity
Date & Time Collected 02/09/89 Category

VERIFIED LM

ANALYST LKM
INSTRMT HACH ANALYZED 02/10/89 UNITS NTU

ANALYTE	RESULT	DET LIMIT
Turbidity	46	1.0

(1)See Appendix A for glossary of report and data flag definitions.

RADIAN CORPORATION

Page 7 RAS - Austin REPORT Work Order # 89-02-120
Received: 02/10/89 Results by Sample

SAMPLE ID Artesia MW-3 FRACTION 01J TEST CODE XYLENE NAME Xylenes, EPA 602
Date & Time Collected 02/09/89 Category

VERIFIED CL

ANALYST JB FILE #
INSTRMT G INJECTD 02/13/89 UNITS ug/L

CAS #	COMPOUND	RESULT	DET LIMIT
1330-20-7	Total xylenes	ND	0.20

SURROGATES

98-08-8 a,a,a-Trifluorotoluene 113% recovery

(1)See Appendix A for glossary of report and data flag definitions.

RADIAN CORPORATION

Received: 02/10/89
Results by Sample

SAMPLE ID Artesia MW-4 FRACTION 02J TEST CODE EPA602 NAME EPA method 602
Date & Time Collected 02/09/89 Category

VERIFIED CL

ANALYST JB
INSTRMT G INJECTED 02/13/89 FILE # UNITS ug/L

CAS#	COMPOUND	RESULT	DET LIMIT
71-43-2	Benzene	2.6	0.20
108-88-3	Toluene	0.9*	0.20
100-41-4	Ethylbenzene	0.6*	0.30
108-90-7	Chlorobenzene-A	ND	0.30
106-46-7	1,4-Dichlorobenzene	ND	0.30
541-73-1	1,3-Dichlorobenzene	ND	0.40
95-50-1	1,2-Dichlorobenzene	ND	0.40

SURROGATES

98-08-8	a,a,a-Trifluorotoluene	116% recovery

(1)See Appendix A for glossary of report and data flag definitions.

RADIAN CORPORATION

Received: 02/10/89 Results by Sample

SAMPLE ID Artesia MW-4 FRACTION 02I TEST CODE HG C NAME Mercury, cold vapor
Date & Time Collected 02/09/89 Category

VERIFIED RHH

ANALYST KCP
INSTRMT 403 ANALYZED 02/22/89 UNITS ug/ml

ANALYTE	RESULT	DET LIMIT
Mercury	ND	0.0002

(1)See Appendix A for glossary of report and data flag definitions.

SAMPLE ID Artesia MW-4 FRACTION 02A TEST CODE TURB NAME Turbidity
Date & Time Collected 02/09/89 Category

VERIFIED LM

ANALYST LKM
INSTRMT HACH ANALYZED 02/10/89 UNITS NTU

ANALYTE	RESULT	DET LIMIT
Turbidity	28	1.0

(1)See Appendix A for glossary of report and data flag definitions.

RADIAN CORPORATION

Received: 02/10/89 Results by Sample

SAMPLE ID Artesia MW-4 FRACTION 02J TEST CODE XYLENE NAME Xylenes, EPA 602
Date & Time Collected 02/09/89 Category

VERIFIED CL

ANALYST JB FILE #
INSTRMT G INJECTD 02/13/89 UNITS ug/L

CAS #	COMPOUND	RESULT	DET LIMIT
1330-20-7	Total xylenes	ND	0.20

SURROGATES

98-08-8 a,a,a-Trifluorotoluene 116% recovery

(1)See Appendix A for glossary of report and data flag definitions.

RADIAN CORPORATION

Received: 02/10/89 Results by Sample

SAMPLE ID Artesia MW-4 duplicate FRACTION 03B TEST CODE EPA602 NAME EPA method 602
Date & Time Collected 02/09/89 Category

VERIFIED CL

ANALYST JB FILE #
INSTRMT G INJECTED 02/13/89 UNITS ug/L

CAS#	COMPOUND	RESULT	DET LIMIT
71-43-2	Benzene	2.6	0.20
108-88-3	Toluene	ND	0.20
100-41-4	Ethylbenzene	ND	0.30
108-90-7	Chlorobenzene-A	ND	0.30
106-46-7	1,4-Dichlorobenzene	ND	0.30
541-73-1	1,3-Dichlorobenzene	ND	0.40
95-50-1	1,2-Dichlorobenzene	ND	0.40

SURROGATES

98-08-8	a,a,a-Trifluorotoluene	109% recovery

(1)See Appendix A for glossary of report and data flag definitions.

RADIAN CORPORATION

Page 12 RAS - Austin REPORT Work Order # 89-02-120
Received: 02/10/89 Results by Sample

SAMPLE ID Artesia MW-4 duplicate FRACTION 03B TEST CODE XYLENE NAME Xylenes, EPA 602
Date & Time Collected 02/09/89 Category

VERIFIED CL

ANALYST JB FILE #
INSTRMT G INJECTD 02/13/89 UNITS ug/L

CAS #	COMPOUND	RESULT	DET LIMIT
1330-20-7	Total xylenes	2.0	0.20

SURROGATES

98-08-8 a,a,a-Trifluorotoluene 108% recovery

(1)See Appendix A for glossary of report and data flag definitions.

RADIAN CORPORATION

Received: 02/10/89 Results by Sample

SAMPLE ID trip blank FRACTION Q4A TEST CODE EPA602 NAME EPA method 602

Date & Time Collected not specified Category

VERIFIED CL

ANALYST JB FILE #

INSTRMT G INJECTED 02/13/89 UNITS ug/L

CAS#	COMPOUND	RESULT	DET LIMIT
71-43-2	Benzene	ND	0.20
108-88-3	Toluene	ND	0.20
100-41-4	Ethylbenzene	ND	0.30
108-90-7	Chlorobenzene-A	ND	0.30
106-46-7	1,4-Dichlorobenzene	ND	0.30
541-73-1	1,3-Dichlorobenzene	ND	0.40
95-50-1	1,2-Dichlorobenzene	ND	0.40

SURROGATES

98-08-8	a,a,a-Trifluorotoluene	110% recovery

(1)See Appendix A for glossary of report and data flag definitions.

RADIAN CORPORATION

RAS - Austin REPORT Work Order # 89-02-120
Received: 02/10/89 Results by Sample

SAMPLE ID trip blank FRACTION 04A TEST CODE XYLENE NAME Xylenes, EPA 602
Date & Time Collected not specified Category

VERIFIED CL

ANALYST JB FILE #
INSTRMT G INJECTD 02/13/89 UNITS ug/L

CAS #	COMPOUND	RESULT	DET LIMIT
1330-20-7	Total xylenes	ND	0.20

SURROGATES

98-08-8	a,a,a-Trifluorotoluene	110% recovery

(1)See Appendix A for glossary of report and data flag definitions.

RADIAN CORPORATION

 RAS - Austin REPORT Work Order # 89-02-120
Received: 02/10/89 Results by Sample

SAMPLE ID reagent blank FRACTION 05A TEST CODE EPA602 NAME EPA method 602
Date & Time Collected not specified Category

VERIFIED CL

ANALYST JB FILE #
INSTRMT G INJECTED 02/13/89 UNITS ug/L

CAS#	COMPOUND	RESULT	DET LIMIT
71-43-2	Benzene	ND	0.20
108-88-3	Toluene	ND	0.20
100-41-4	Ethylbenzene	ND	0.30
108-90-7	Chlorobenzene-A	ND	0.30
106-46-7	1,4-Dichlorobenzene	ND	0.30
541-73-1	1,3-Dichlorobenzene	ND	0.40
95-50-1	1,2-Dichlorobenzene	ND	0.40

SURROGATES

98-08-8	a,a,a-Trifluorotoluene	N/A% recovery

(1)See Appendix A for glossary of report and data flag definitions.

RADIAN CORPORATION

Received: 02/10/89 Results by Sample

SAMPLE ID reagent blank FRACTION 05A TEST CODE XYLENE NAME Xylenes, EPA 602
Date & Time Collected not specified Category

VERIFIED CL

ANALYST JB FILE #
INSTRMT G INJECTD 02/13/89 UNITS ug/L

CAS #	COMPOUND	RESULT	DET LIMIT
1330-20-7	Total xylenes	ND	0.20

SURROGATES

98-08-8 a,a,a-Trifluorotoluene N/A% recovery

(1)See Appendix A for glossary of report and data flag definitions.

TEST CODE ALPHA NAME Gross alpha radiation

The value in parentheses is a + or - one sigma value. Results are thus expressed as: value (+ or - 1 sigma). One sigma = one standard deviation, 68% confidence level.

TEST CODE BETA NAME Gross beta radiation

The value in parentheses is a + or - one sigma value. Results are thus expressed as: value (+ or - 1 sigma). One sigma = one standard deviation, 68% confidence level.

TEST CODE RA 226 NAME Radium 226

The value in parentheses is a + or - one sigma value. Results are thus expressed as: value (+ or - one sigma). One sigma = one standard deviation, 68% confidence level.

RADIAN CORPORATION

Client: Phillips Petroleum
Radian
Bl.1
Austin
EPA METHOD 8080

01B ARTESIA MW-1
02B ARTESIA MW-2
03B ARTESIA MW-3
04B ARTESIA MW-4

Lab No: 89-02-122

RESULTS IN ug/L

CAS #	COMPOUND	01B	02B	03B	04B
58-89-9	gamma-BHC,(Lindane)	0.16*	<0.038	<0.019	<0.039
72-20-8	Endrin	<0.038	<0.038	<0.019	<0.039
8001-35-2	Toxaphene	<1.9	<1.9	<0.95	<2.0
72-43-5	Methoxychlor	<0.19	<0.19	<0.095	<0.20

SURROGATE RECOVERIES (results in % recovery)

Dibutylchlorendate	110	111	102	112
2,4,5,6-Tetrachloro-m-xylene	121	113	96	139

(1) See Appendix A glossary of report and data flag definitions.

Pesticides 2/89
4th Quarter

05B REAGENT BLANK

Client: Phillips Petroleum
Radian
Bl.1
Austin

EPA METHOD 8080

Lab No: 89-02-122

RESULTS IN ug/L

CAS #	COMPOUND	05B
58-89-9	gamma-BHC,(Lindane)	<0.002
72-20-8	Endrin	<0.002
8001-35-2	Toxaphene	<0.10
72-43-5	Methoxychlor	<0.010

SURROGATE RECOVERIES (results in % recovery)

Dibutylchlorendate	116
2,4,5,6-Tetrachloro-m-xylene	83

(1) See Appendix A glossary of report and data flag definitions.

RADIAN CORPORATION

Client: Radian
Bl.1
Austin

01A MW-1 ARTESIA MW-1
02A MW-2 ARTESIA MW-2
03A MW-3 ARTESIA MW-3
04A MW-4 ARTESIA MW-4

EPA METHOD 8150

Lab No: 89-02-122

RESULTS IN ug/L

CAS #	COMPOUND	01A	02A	03A	04A
94-75-7	2,4-D	5.6 C	<1.4	<1.4	<1.4
93-72-1	2,4,5-TP (Silvex)	<0.14	<0.42	<0.42	<0.43

	SURROGATE RECOVERIES (results in % recovery)			
2,4-Dichlorophenyl acetic acid	122	166QC	132	108

NOTES AND DEFINITIONS FOR THIS REPORT.
QC = OUTSIDE CONTROL LIMITS.
* = LESS THAN 5 TIMES THE DETECTION LIMIT.
C = RESULT CONFIRMED BY SECOND COLUMN ANALYSIS.
ND = NOT DETECTED AT DETECTION LIMIT.
NA = NOT ANALYZED.
N\A = NOT AVAILABLE.
NS = NOT SPIKED.

RADIAN CORPORATION

05A REAGENT BLANK

Client: Radian
Bl.l
Austin

EPA METHOD 8150

Lab No: 89-02-122

RESULTS IN ug/L

CAS #	COMPOUND	05A
94-75-7	2,4-D	<0.50
93-72-1	2,4,5-TP (Silvex)	<0.15

SURROGATE RECOVERIES (results in % recovery)

2,4-Dichlorophenyl acetic acid	102

NOTES AND DEFINITIONS FOR THIS REPORT.
QC = OUTSIDE CONTROL LIMITS.
* = LESS THAN 5 TIMES THE DETECTION LIMIT.
C = RESULT CONFIRMED BY SECOND COLUMN ANALYSIS.
ND = NOT DETECTED AT DETECTION LIMIT.
NA = NOT ANALYZED.
N\A = NOT AVAILABLE.
NS = NOT SPIKED.

RADIAN CORPORATION

06A RECOVERY CHECK

Client: Radian
Bl.1
Austin

EPA METHOD 8150

Lab No: 89-02-122

RESULTS IN %

CAS #	COMPOUND	06A
94-75-7	2,4-D	101
93-72-1	2,4,5-TP (Silvex)	99

SURROGATE RECOVERIES	(results in % recovery)
2,4-Dichlorophenyl acetic acid	97

NOTES AND DEFINITIONS FOR THIS REPORT.
QC = OUTSIDE CONTROL LIMITS.
* = LESS THAN 5 TIMES THE DETECTION LIMIT.
C = RESULT CONFIRMED BY SECOND COLUMN ANALYSIS.
ND = NOT DETECTED AT DETECTION LIMIT.
NA = NOT ANALYZED.
N\A = NOT AVAILABLE.
NS = NOT SPIKED.

88-10-142

REPORT FLAGS

R - Indicates that the matrix spike recovery for this analysis is not within acceptable limits indicating an interferent present.

+ - Indicates that the RPD between the percent recoveries of the MS and MSD is not within acceptable limits.

@ - Indicates that the analytical spike recovery for this analysis is not within acceptable limits indicating an interferent present.

B - Sample result was greater than four times the spike added concentration, therefore the spike recovery should not be considered.

^ - Indicates the RPD of the duplicate analysis is not within acceptable limits.

* - Indicates that the value obtained is less than five times the detection limit. Potential error for such low values range between 50 % and 100 %.

E - Indicates that the reported value is estimated due to the presence of an interference.

s - Indicates that a value is determined by Method of Standard Addition.

Q - Daily EPA QC recovery outside 95% confidence limit.

** - Surrogate recovery is not within acceptable limits. This indicates that a possible interference is present.

RADIAN CORPORATION

RAS Perimeter REPORT

Work Order # P8-05-036

Received: 05/12/88

06/14/88 14:02:48

REPORT TO: Mike Selke
Geoscience Consultants, Ltd.
Albequerque, NM 87102

ATTEN: W.S. Dubyk

CLIENT: GEOSCIENCE SAMPLES 15
COMPANY: Geoscience Consultants, Ltd.
FACILITY: 500 Copper NW
Albequerque, NM 87102

WORK ID: Geosciences
TAKEN: W.S. Dubyk
TRANS: Fed Ex (see file for #'s)
TYPE: Aqueous
P.O. #: 88-0190-700
INVOICE: under separate cover

PREPARED BY: Radian Analytical Services
Bldg. 900 Perimeter Park
Morrisville, NC 27560

ATTEN
PHONE: 919-481-0212

CERTIFIED BY

CONTACT M DAY

Previously Reported on 06/13/88.

SAMPLE IDENTIFICATION

01	8805121240	ARTESIA	MW-1
02	8805121042	ARTESIA	MW-2
03	8805111656	ARTESIA	MW-3
04	8805111812	ARTESIA	MW-4
05	8805110958	LUSK	MW-1
06	8805110852	LUSK	MW-2
07	8805110922	LUSK	MW-3
08	8805110938	LUSK	MW-4
09	8805121844	LEE	MW-3
10	8805130903	LEE	MW-2
11	8805130949	LEE	MW-4
12	8805131420	LEE	MW-1
13	Method Blank #2		
15	Method Blank #1		
16	Trip Blank		

TEST CODES and NAMES used on this report

509B	GC of Herbicides
EXT GC	Extraction for GC

TEST CODE default units	Sample 01 (entered units)	Sample 02 (entered units)	Sample 03 (entered units)	Sample 04 (entered units)	Sample 05 (entered units)
EXT_GC date completed	05/18/88	05/18/88	05/17/88	05/17/88	05/17/88

TEST CODE default units	Sample 06 (entered units)	Sample 07 (entered units)	Sample 08 (entered units)	Sample 09 (entered units)	Sample 10 (entered units)
EXT_GC date completed	05/17/88	05/17/88	05/17/88	05/18/88	05/20/88

TEST CODE default units	Sample 11 (entered units)	Sample 12 (entered units)	Sample 13 (entered units)	Sample 15 (entered units)
EXT_GC date completed	05/20/88	05/20/88	05/18/88	05/17/88

RADIAN CORPORATION

RAS Perimeter REPORT

Work Order # P8-05-[illegible]

Received: 05/12/88

Results By Test

SAMPLE Sample Id	Test: EXT GC date completed
01	05/18/88
8805121240 02	05/18/88
8805121042 03	05/17/88
8805111656 04	05/17/88
8805111812 05	05/17/88
8805110958 06	05/17/88
8805110852 07	05/17/88
8805110922 08	05/17/88
8805110938 09	05/18/88
8805121844 10	05/20/88
8805130903 11	05/20/88
8[illegible]5130949 12	05/20/88
8805131420 13	05/18/88
Method Blank #2 15	05/17/88
Method Blank #1	

SAMPLE ID 8805121240 SAMPLE # 01 FRACTIONS: A
Date & Time Collected 05/12/88 Category

EXT_GC 05/18/88
date completed

SAMPLE ID 8805121042 SAMPLE # 02 FRACTIONS: A
Date & Time Collected 05/12/88 Category

EXT GC 05/18/88
date completed

SAMPLE ID 8805111656 SAMPLE # 03 FRACTIONS: A
Date & Time Collected 05/11/88 Category

EXT_GC 05/17/88
date completed

SAMPLE ID 8805111812 SAMPLE # 04 FRACTIONS: A
Date & Time Collected 05/11/88 Category

EXT_GC 05/17/88
date completed

SAMPLE ID 8805110958 SAMPLE # 05 FRACTIONS: A
Date & Time Collected 05/11/88 Category

EXT_GC 05/17/88
date completed

SAMPLE ID 8805110852 SAMPLE # 06 FRACTIONS: A
Date & Time Collected 05/11/88 Category

EXT GC 05/17/88
date completed

SAMPLE ID 8805110922 SAMPLE # 07 FRACTIONS: A
Date & Time Collected 05/11/88 Category

EXT_GC 05/17/88
date completed

SAMPLE ID 8805110938 SAMPLE # 08 FRACTIONS: A
Date & Time Collected 05/11/88 Category

EXT_GC 05/17/88
date completed

SAMPLE ID 8805121844 SAMPLE # 09 FRACTIONS: A
Date & Time Collected 05/12/88 Category

EXT_GC 05/18/88
date completed

SAMPLE ID 8805130903 SAMPLE # 10 FRACTIONS: A
Date & Time Collected 05/13/88 Category

EXT_GC 05/20/88
date completed

SAMPLE ID 8805130949 SAMPLE # 11 FRACTIONS: A
Date & Time Collected 05/13/88 Category

EXT_GC 05/20/88
date completed

SAMPLE ID 8805131420 SAMPLE # 12 FRACTIONS: A
Date & Time Collected 05/13/88 Category

EXT_GC 05/20/88
date completed

SAMPLE ID Method Blank #2 SAMPLE # 13 FRACTIONS: A
Date & Time Collected not specified Category

EXT_GC 05/18/88
date completed

SAMPLE ID Method Blank #2 FRACTION 13A TEST CODE 509B NAME GC of Herbicides
Date & Time Collected not specified Category

ORGANICS ANALYSIS DATA SHEET
HERBICIDES

ANALYST BLACKLEY EXTRCTD 05/18/88 FILE # VERIFIED HK
INSTRMT GC1 INJECTD 05/26/88 UNITS ug/L

CAS #	COMPOUND	RESULT	DET. LIMIT
94-75-7	2,4-D	ND	0.50
93-72-1	2,4,5-TP (Silvex)	ND	0.10
93-76-5	2,4,5-T	ND	0.10

NOTES AND DEFINITIONS FOR THIS REPORT.
DET LIMIT = detection limit.
ND = not detected at specified detection limit.
NR = not required for analysis.
S = compound peak saturated.
J = estimated value less than 3 x minimum detection limit.

SAMPLE ID Method Blank #1 SAMPLE # 15 FRACTIONS: A
Date & Time Collected not specified Category

EXT_GC 05/17/88
date completed

SAMPLE ID Method Blank #1 FRACTION 15A TEST CODE 509B NAME GC of Herbicides
Date & Time Collected not specified Category

ORGANICS ANALYSIS DATA SHEET
HERBICIDES

ANALYST BLACKLEY EXTRCTD 05/17/88 FILE # VERIFIED HK
INSTRMT GC1 INJECTD 05/24/88 UNITS ug/L

CAS #	COMPOUND	RESULT	DET. LIMIT
94-75-7	2,4-D	ND	0.50
93-72-1	2,4,5-TP (Silvex)	ND	0.10
93-76-5	2,4,5-T	ND	0.10

NOTES AND DEFINITIONS FOR THIS REPORT.
DET LIMIT = detection limit.
ND = not detected at specified detection limit.
NR = not required for analysis.
S = compound peak saturated.
J = estimated value less than 3 x minimum detection limit.

FRACTION AND TEST CODES FOR WORK NOT REPORTED ELSEWHERE

16A : HOLD

RADIAN CORPORATION

RAS Perimeter REPORT

Work Order # P8-05-035

Received: 05/12/88 06/13/88 16:14:44

REPORT TO: Mike Selke
Geoscience Consultants, Ltd.
Albequerque, NM 87102

ATTEN: Mike Selke

CLIENT: GEOSCIENCE SAMPLES 14
COMPANY: Geoscience Consultants, Ltd.
FACILITY: 500 Copper NW
Albequerque, NM 87102

WORK ID: PHILLIPS
TAKEN: W.S. Dubuk
TRANS: Fed Ex (see file for #'s)
TYPE: Aqueous
P.O. #: 88-0190-700
INVOICE: under separate cover

PREPARED BY: Radian Analytical Services
Bldg. 900 Perimeter Park
Morrisville, NC 27560

ATTEN:
PHONE: 919-481-0212

CERTIFIED BY

CONTACT M DAY

* = Matrix interference

SAMPLE IDENTIFICATION

01	8805121239	ARTESIA	MW-1
02	8805121041	ARTESIA	MW-2
03	8805111655	ARTESIA	MW-3
04	8805111811	ARTESIA	MW-4
05	8805110955	LUSK	MW-1
06	8805110851	LUSK	MW-2
07	8805110920	LUSK	MW-3
08	8805110936	LUSK	MW-4
09	8805121843	LEE	MW-3
10	8805130902	LEE	MW-2
11	8805130948	LEE	MW-4
12	8805131420	LEE	MW-1
13	Trip Blank		
16	Method Blank		

TEST CODES and NAMES used on this report

8080	Pesticides/PCBs.
EXT GC	Extraction for GC

TEST CODE default units	Sample 01 (entered units)	Sample 02 (entered units)	Sample 03 (entered units)	Sample 04 (entered units)	Sample 05 (entered units)
EXT_GC date completed	05/16/88	05/16/88	05/16/88	05/16/88	05/16/88

TEST CODE default units	Sample 06 (entered units)	Sample 07 (entered units)	Sample 08 (entered units)	Sample 09 (entered units)	Sample 10 (entered units)
EXT_GC date completed	05/16/88	05/16/88	05/16/88	05/16/88	05/16/88

TEST CODE default units	Sample 11 (entered units)	Sample 12 (entered units)	Sample 16 (entered units)
EXT_GC date completed	05/16/88	05/16/88	05/16/88

SAMPLE Sample Id	Test: EXT GC date completed
01 8805121239	05/16/88
02 8805121041	05/16/88
03 8805111655	05/16/88
04 8805111811	05/16/88
05 8805110955	05/16/88
06 8805110851	05/16/88
07 8805110920	05/16/88
08 8805110936	05/16/88
09 8805121843	05/16/88
10 8805130902	05/16/88
11 8805130948	05/16/88
12 8805131420	05/16/88
16 Method Blank	05/16/88

SAMPLE ID 8805121239 SAMPLE # 01 FRACTIONS: A
Date & Time Collected 05/12/88 Category

EXT_GC 05/16/88
date completed

SAMPLE ID 8805121041 SAMPLE # 02 FRACTIONS: A
Date & Time Collected 05/12/88 Category

EXT_GC 05/16/88
date completed

SAMPLE ID B805111655 SAMPLE # 03 FRACTIONS: A
Date & Time Collected 05/11/88 Category

EXT GC 05/16/88
date completed

SAMPLE ID 8805111811 SAMPLE # 04 FRACTIONS: A
Date & Time Collected 05/11/88 Category

EXT_GC 05/16/88
date completed

SAMPLE ID 8805110955 SAMPLE # 05 FRACTIONS: A
Date & Time Collected 05/11/88 Category

EXT_GC 05/16/88
date completed

SAMPLE ID 8805110851 SAMPLE # 06 FRACTIONS: A
Date & Time Collected 05/11/88 Category

EXT_GC 05/16/88
date completed

SAMPLE ID 8805110920 SAMPLE # 07 FRACTIONS: A
Date & Time Collected 05/11/88 Category

EXT_GC 05/16/88
date completed

SAMPLE ID 8805110936 SAMPLE # 08 FRACTIONS: A
Date & Time Collected 05/11/88 Category

EXT_GC 05/16/88
date completed

SAMPLE ID 8805121843 SAMPLE # 09 FRACTIONS: A
Date & Time Collected 05/12/88 Category

EXT_GC 05/16/88
date completed

SAMPLE ID 8805130902 SAMPLE # 10 FRACTIONS: A
Date & Time Collected 05/13/88 Category

EXT_GC 05/16/88
date completed

SAMPLE ID 8805130948 SAMPLE # 11 FRACTIONS: A
Date & Time Collected 05/13/88 Category

EXT_GC 05/16/88
date completed

SAMPLE ID 8805131420 SAMPLE # 12 FRACTIONS: A

Date & Time Collected 05/13/88 Category

EXT_GC 05/16/88
date completed

SAMPLE ID Method Blank SAMPLE # 16 FRACTIONS: A
Date & Time Collected not specified Category

EXT_GC 05/16/88
date completed

SAMPLE ID Method Blank FRACTION 16A TEST CODE 8080 NAME Pesticides/PCBs.
Date & Time Collected not specified Category

ORGANICS ANALYSIS DATA SHEET
PESTICIDES by METHOD 8080

ANALYST BLACKLEY EXTRCTD 05/16/88 FILE # VERIFIED HK
INSTRMT GC1 INJECTD 06/05/88 UNITS ug/L

CAS #	COMPOUND	RESULT	DET LIMIT
319-84-6	alpha-BHC	ND	0.010
58-89-9	gamma-BHC (lindane)	ND	0.010
319-85-7	beta-BHC	ND	0.010
76-44-8	heptachlor	ND	0.010
319-86-8	delta-BHC	ND	0.010
309-00-02	aldrin	ND	0.010
1024-57-3	heptachlor epoxide	ND	0.010
959-98-8	endosulfan I	ND	0.010
72-55-9	4,4'-DDE	ND	0.010
60-57-1	dieldrin	ND	0.010
72-20-8	endrin	ND	0.010
72-54-8	4,4'-DDD	ND	0.010
33213-65-9	endosulfan II	ND	0.030
50-29-3	4,4'-DDT	ND	0.020
7421-93-4	endrin aldehyde	ND	0.020
1031-07-8	endosulfan sulphate	ND	0.050
57-74-9	chlordane	ND	0.050
8001-35-2	toxaphene	ND	0.50
12674-11-2	PCB-1016	NR	0.10
11104-28-2	PCB-1221	NR	0.20
11141-16-5	PCB-1232	NR	0.20
53469-21-9	PCB-1242	NR	0.10
12672-29-6	PCB-1248	NR	0.10
11097-69-1	PCB-1254	NR	0.20
11096-82-5	PCB-1260	NR	0.20

SAMPLE ID Method Blank FRACTION 16A TEST CODE 8080 NAME Pesticides/PCBs.
Date & Time Collected not specified Category

SURROGATE RECOVERY

COMPOUND	RECOVERY
dibutyl chlorendate	100 %
tetrachlorometaxylene	85 %

NOTES AND DEFINITIONS FOR THIS REPORT:
DET LIMIT = detection limit
ND = not detected at specified detection limit.
NR = not required for analysis.
S = compound peak saturated.
J = estimated value less than 3 x minimum detection limit.

FRACTION AND TEST CODES FOR WORK NOT REPORTED ELSEWHERE

13A 1 HOLD

RADIAN ANALYTICAL SERVICES

QUALITY CONTROL DATA SUMMARY

Form II

Client ID Geoscience Consultants — Compiled Sept 6-29-88

Workorder 88-05-067 — Submitted

INITIAL AND CONTINUING CALIBRATION VERIFICATION[1]

Units mg/ml

Parameter	Run Date	Initial Calib.			Continuing Calibration						
		True	Found	%R	True	Found	%R	Found	%R	Found	%R
Ag	6-13-88	5.00	4.78	96	5.00	4.89	98	4.74	95		
Ba			4.92	98		5.03	101	5.02	100		
Cd			4.91	98		5.00	100	4.91	98		
Cr			4.76	95		4.78	96	4.71	94		
Fe		20.0	19.5	98	20.0	19.6	98	19.3	97		
Mn		5.00	4.78	96	5.00	4.82	96	4.69	94		
Na		20.0	20.4	102	20.0	17.9	90	20.9	105		

1. Control Limits for %R: ICPES _____

AA F _____

RADIAN ANALYTICAL SERVICES

QUALITY CONTROL DATA SUMMARY

Form III

Client ID Geoscience Consultants

Workorder 88-05-067

Compiled sgs 6-29-88

Submitted

Matrix aqueous

BLANKS

Units ug/ml

Parameter	IDL	Initial Calibration Blank Value	Continuing Calibration Blank Value			Preparation Blank Value	
			1	2	3	1	2
Ag	0.003	<0.003	<0.003	<0.003		<0.003	
Ba	0.003	<0.003	<0.003	<0.003		0.003*	
Cd	0.003	<0.003	<0.003	<0.003		<0.003	
Cr	0.003	<0.003	<0.003	<0.003		<0.003	
Fe	0.003	0.016	<0.003	<0.003		0.031	
Mn	0.001	<0.001	<0.001	<0.001		0.002*	
Na	0.021	0.036*	<0.021	<0.021		3.17	

1. IDL = Instrument Detection Limit
* Indicates value is less than 5X the IDL.

QUALITY CONTROL DATA SUMMARY

Form V

Client ID Geoscience Consultants

Workorder 88-05-067

Compiled sgr 6-29-88

Submitted

Matrix Blank Spike aqueous

SPIKED SAMPLE RECOVERY

Spiking method aqueous

Units ug/ml

Parameter	Sample No.	Control Limit of SR	Spiked Sample Result (SSR)	Sample Result (SR)	Spike Added (SA)	D.F.	SR[1]	SR Flag[2]
Ag	Blank	75-125	0.856	(B)	1.00		86	
Ba	↓	↓	0.875	↓	↓		88	
Cd			0.888				89	
Cr			0.856		↓		86	
Fe			8.77		10.0		88	
Mn			0.861		1.00		86	
Na	↓	↓	8.92	↓	10.0		89	

* Indicates value is less than 5X IDL. (IDL=Instrument detection limit)

1. SR = Percent Recovery = [(SSR - SR)/SA] X 100

2. R=For matrix spike: SR was not within control limit, which may indicate matrix interferences.

B=Sample result was greater than 4 times spike added concentration, therefore spike added concentration is considered insignificant.

(B)- Blank result is subtracted out from the samples.

QUALITY CONTROL DATA SUMMARY

Submitted SSA 6-29-88

Compiled

Workorder 88-05-067

Client Geoscience Consultants

Units mg/ml unless otherwise noted

PARAMETER	ANALYSIS DATE	CALIBRATION VERIFICATION STDS. FOUND	TRUE	%R	DUPLICATE ANALYSIS SAMP#	SAMP	DUPL	RPD	SPIKE RECOVERY SAMP#	SSR	SR	SA	%R	BLANKS
As	5-17-88	0.094	0.100	94					3020 5/16 Blank	0.019	—	0.020	95	P) <0.002
IDL=0.002 mg/ml		0.096	0.100	96										3020 5/16 <0.002
		0.112	0.100	112										P) <0.002
														P) <0.002
Coliform	5-30-88													
Reported in	colonies/100 mL													
Cl	6-1-88	7.86	8.00	98	A) DIL 1:10 02	60	60	0	A) 02	7.93	6.00	2.00	97	
		7.48	8.00	94										
		7.60	8.00	95										
F	6-1-88	4.04	4.00	101	A) 02	1.74	1.75	1	A) 02	2.65	1.74	1.00	91	
		3.84	4.00	96										
		3.88	4.00	97										
SO4	6-1-88	39.2	40.0	98	A) 02	46	46	0	A) 02	55.8	46	10.0	98	
		39.3	40.0	98										
		39.1	40.0	98										

RPD = [(|S-D|)/((S+D)/2)] x 100
RPD = Relative Percent Difference
NC = Not calculable due to a value less than five times the IDL

SPIKE %R = [(SSR-SR)/SA] x 100
# = Value is less than five times the instrument detection limit
IDL = Instrument Detection Limit

A = Analytical
P = Predigestion
SSR = Spiked Sample Result
SR = Sample Result
SA = Spiked Added

QUALITY CONTROL DATA SUMMARY

Submitted Sfs 6-29-88

Compiled

Workorder 88-05-067 Client Geoscience Consultants Units mg/ml unless otherwise noted

PARAMETER	ANALYSIS DATE	CALIBRATION VERIFICATION STDS. FOUND	TRUE	%R	DUPLICATE ANALYSIS SAMP#	SAMP	DUPL	RPD	SPIKE RECOVERY SAMP#	SSR	SR	SA	%R	BLANKS
Hg	5-23-88	0.0044	0.0040	110										P) <0.0001
IDL=0.0001 mg/ml		0.0042	0.0040	105										P) <0.0001
		0.0038	0.0040	95										P) <0.0001
MHO	5-17-88	1320	1413	93	A) 01D	1180	1180	0						
Reported in	umhos units	1345	1413	95										
		1337	1413	95										
NO_3	5-24-88	1.35	1.25	108										
IDL=0.02 mg/ml		1.35	1.25	108										
		1.35	1.25	108										
Pb	5-18-88	0.094	0.100	94					3020 5/16 Blank	0.022	—	0.020	110	P) <0.002
IDL=0.002 mg/ml		0.096	0.100	96										3020 5/16 0.003*
		0.104	0.100	104										P) <0.002
														P) <0.002

RPD = [(1S-D1)/((S+D)/2)] x 100
RPD = Relative Percent Difference
NC = Not calculable due to a value less than five times the IDL

SPIKE %R = [(SSR-SR)/SA] x 100
* = Value is less than five times the instrument detection limit
IDL = Instrument Detection Limit

A = Analytical
P = Predigestion
SSR = Spiked Sample Result
SR = Sample Result
SA = Spiked Added

QUALITY CONTROL DATA SUMMARY

Submitted Sgk 6-29-88

Compiled

Workorder 88-05-067 Client Geoscience Consultants Units ug/ml unless Otherwise noted

PARAMETER	ANALYSIS DATE	CALIBRATION VERIFICATION STDS. FOUND	TRUE	%R	DUPLICATE ANALYSIS SAMP#	SAMP	DUPL	RPD	SPIKE RECOVERY SAMP#	SSR	SR	SA	%R	BLANKS
pH	5-17-88	7.00	7.00	100	(A) 01	7.19	7.19	0						
Reported in	pH unit.	7.00	7.00	100										
		7.00	7.00	100										
Phenolics	5-27-88	0.263	0.250	105										(P) <0.005
IDL=0.005 ug/ml		0.276	0.250	110										
		0.275	0.250	110										
Se	5-18-88	0.049	0.050	98					3020 S/16 Blank	0.022	—	0.020	110	(P) <0.003
IDL=0.003 ug/ml		0.049	0.050	98										3020 S/16 <0.003
		0.054	0.050	108										(P) <0.003
														(P) <0.003
TOC	6-6-88	54.0	55.2	98	(P) 01	68.3	66.9	2	MS 01	DIL 1:2 117	67.6	60.0	82	(P) <1.0
IDL=1.0 ug/ml		52.0	55.2	94	MS+MSD 01	117	108	8	MSD 01	DIL 1:2 108	67.6	60.0	67 R	
TOX	5-24-88	0.929	1.00	93										
IDL=0.01 ug/ml		0.841	1.00	84										

RPD = [(S-D)/((S+D)/2)] x 100
RPD = Relative Percent Difference
NC = Not calculable due to a value less than five times the IDL

SPIKE %R = [(SSR-SR)/SA] x 100
R = Value is less than five times the instrument detection limit
IDL = Instrument Detection Limit

A = Analytical
P = Predigestion
SSR = Spiked Sample Result
SR = Sample Result
SA = Spiked Added

QUALITY CONTROL DATA SUMMARY

Submitted Sfr 6-29-88

Compiled

Workorder 88-05-067 Client Geoscience Consultants Units ug/ml unless otherwise noted

PARAMETER	ANALYSIS DATE	CALIBRATION VERIFICATION STDS. FOUND	TRUE	%R	DUPLICATE ANALYSIS SAMP#	SAMP	DUPL	RPD	SPIKE RECOVERY SAMP#	SSR	SR	SA	%R	BLANKS
Turbidity	5-14-88													1.6
														1.6

RPD = [(|S-D|)/((S+D)/2)] x 100
RPD = Relative Percent Difference
NC = Not calculable due to a value less than five times the IDL

SPIKE %R = [(SSR-SR)/SA] x 100
# = Value is less than five times the instrument detection limit
IDL = Instrument Detection Limit

A = Analytical
P = Predigestion
SSR = Spiked Sample Result
SR = Sample Result
SA = Spiked Added

Geoscience Consultants
880 6-29-88

DAILY QUALITY CONTROL
RAS GC LAB

DATE:	5-17-88	SPIKED VALUE (ug/L)	Analyzed Value	% Recovery		Analyzed Value	% Recovery
	INSTRUMENT		D	D		G	G
TEST METHOD	COMPOUND						
EPA 601	EPA WP 483 CONC. 2						
	Chloroform	12.0					
	1,2-Dichloroethane	2.0					
	1,1,1-Trichloroethane	1.4					
	Carbon Tetrachloride	2.6					
	Bromodichloromethane	2.0					
	Trichloroethene	2.9					
	Dibromochloromethane	2.6					
	Bromoform	2.9					
	Tetrachloroethene	1.6					
EPA 602	EPA - WP 879 CONC.1						
	Benzene	30.7	26.2	85		29.4	96
	Toluene	4.1	4.0	98		4.9	120
	Ethylbenzene	11.5	9.1	79		10.4	90
	P-Xylene	19.1	18.6	97		21.9	115
	M-Xylene	42.6	38.5	90		42.3	99
	O-Xylene	10.6	10.5	99		12.6	119
EPA 608		(ug/g)					
	Aroclor 1242	58.7					
	Aroclor 1260	56.8					

VOA RESULTS

LAB # System Blank
CLIENT NAME
SAMPLE ID

EPA METHOD 601	DATE: ANALYST: INSTRUMENT:	EPA METHOD 602	DATE: 5/17/91 ANALYST: G INSTRUMENT:
COMPOUND	**CONCENTRATION (ug/L)**	**COMPOUND**	**CONCENTRATION (ug/L)**
Chloromethane		Benzene	ND
Bromomethane		Toluene	
Vinyl Chloride		Ethyl benzene	
Chloroethane		Chlorobenzene	
Methylene chloride		1,4-Dichlorobenzene	
Trichlorofluoromethane		1,3-Dichlorobenzene	
1,1-Dichloroethene		1,2-Dichlorobenzene	
1,1-Dichloroethane		P-Xylene	
Trans-1,2-Dichloroethene		M-Xylene	
Chloroform		O-Xylene	
1,2-Dichloroethane			
1,1,1-Trichloroethane			
Carbon tetrachloride			
Bromodichloromethane			
1,2-Dichloropropane		SURROGATE RECOVERIES:	
Trans-1,3-Dichloropropene		601	
Trichloroethene		Bromochloromethane	
Dibromochloromethane		2-Bromo-1-Chloropropane	
1,1,2-Trichloroethane		1,4-Dichlorobutane	
cis-1,3-Dichloropropene		4-Bromofluorobenzene	
2-Chloroethylvinyl ether			
Bromoform		602	
1,1,2,2-Tetrachloroethane		a,a,a,-Trifluorotoluene	
Tetrachloroethylene			
Chlorobenzene			
1,3-Dichlorobenzene			
1,2-Dichlorobenzene			
1,4-Dichlorobenzene			

VOA RESULTS

LAB # LEACH BLANK WR
CLIENT NAME
SAMPLE ID

EPA METHOD 601	DATE: ANALYST: INSTRUMENT:	EPA METHOD 602	DATE: 5/17/88 ANALYST: G INSTRUMENT
COMPOUND	CONCENTRATION (ug/L)	COMPOUND	CONCENTRATION (ug/L)
Chloromethane		Benzene	
Bromomethane		Toluene	
Vinyl Chloride		Ethyl benzene	
Chloroethane		Chlorobenzene	
Methylene chloride		1,4-Dichlorobenzene	
Trichlorofluoromethane		1,3-Dichlorobenzene	
1,1-Dichloroethene		1,2-Dichlorobenzene	
1,1-Dichloroethane		P-Xylene	
Trans-1,2-Dichloroethene		M-Xylene	
Chloroform		O-Xylene	
1,2-Dichloroethane			
1,1,1-Trichloroethane			
Carbon tetrachloride			
Bromodichloromethane			
1,2-Dichloropropane		SURROGATE RECOVERIES:	
Trans-1,3-Dichloropropene		601	
Trichloroethene		Bromochloromethane	
Dibromochloromethane		2-Bromo-1-Chloropropane	
1,1,2-Trichloroethane		1,4-Dichlorobutane	
cis-1,3-Dichloropropene		4-Bromofluorobenzene	
2-Chloroethylvinyl ether			
Bromoform		602	
1,1,2,2-Tetrachloroethane		a,a,a,-Trifluorotoluene	
Tetrachloroethylene			
Chlorobenzene			
1,3-Dichlorobenzene			
1,2-Dichlorobenzene			
1,4-Dichlorobenzene			

RADIAN CORPORATION

REPORT FLAGS

R - Indicates that the matrix spike recovery for this analysis was not within acceptance limits indicating an interferent present.

+ - Indicates that the RPD between the MS and MSD is not wihin control limits.

@ - Indicates that the analytical spike recovery for this analysis was not within acceptance limits indicating an interferent present.

B - Sample result was greater than four times the spike added concentration, therefore the spike recovery should not be considered.

^ - Indicates duplicate analysis is not within control limits.

* - Indicates that the value obtained was less than 5 times the detection limit. Potential error for such low values range between 50 % and 100 %.

E - The reported value is estimated due to the presence of a interference. The analysis of a serial dilution did not agree within 10 % of the original determination.

s - Indicates value determined by Method of Standard Addition.

Q - Daily EPA QC recovery outside 95% confidence limit.

** - Surrogate recovery outside control limits indicating possible interferences.

QUALITY CONT● DATA SUMMARY

PNN 7

Submitted 6-29-88 Enviro.

Compiled

Workorder 88-05-147 Client Geoscience Units See below

PARAMETER	ANALYSIS DATE	CALIBRATION VERIFICATION STDS. mg/ml FOUND	TRUE	%R	DUPLICATE ANALYSIS SAMP#	SAMP	DUPL	RPD	SPIKE RECOVERY SAMP#	SSR	SR	SA	%R	BLANKS
As	6-13-88	0.100	0.100	100					[A] 305 of 46					<0.2
IDL	0.002 ug/ml	0.104	0.100	104					305 of 46 SPK	2.20	<0.200	2.00	100	<0.2
		0.106	0.100	106					[A] 02	0.628	0.006	0.025	88	<0.2
Cl	6-6-88	7.94	8.00	99										
		8.03	8.00	100										
		7.81	8.00	98										
F	6-6-88	4.04	4.00	101	02	3.10	3.08	1	02	3.82	3.10	1.0	72*	
		4.01	4.00	100	0									
SO4	6-6-88	40.0	40.0	100	01	894	889	1	01	108	89.4	20	93	
		40.1	40.0	100										
		39.2	40.0	98										
SO4	6-15-88	36.3	40.0	91	02	1323	1315	1	02	2123	1323	1000	80	
		37.3	40.00	93										

RPD = [(S-D)/((S+D)/2)] x 100
RPD = Relative Percent Difference
NC = Not calculable due to a value less than five times the IDL

SPIKE %R = [(SSR-SR)/SA] x 100
* = Value is less than five times the instrument detection limit
IDL = Instrument Detection Limit

A = Analytical
P = Predigestion
SSR = Spiked Sample Result
SR = Sample Result
SA = Spiked Added

QUALITY CONTI DATA SUMMARY

Submitted 6-29-88

Compiled

Workorder 88-05-147

Client Geoscience

Units ug/ml

PARAMETER	ANALYSIS DATE	CALIBRATION VERIFICATION STDS. FOUND	TRUE	%R	DUPLICATE ANALYSIS SAMP#	SAMP	DUPL	RPD	SPIKE RECOVERY SAMP#	SSR	SR	SA	%R	BLANKS
Hg	6-6-88	0.220	0.200	110										
IDL =	0.0006ug/ml	1.200	0.200	100										
		0.180	0.200	90										
NH3	6-8-88	1359	1413	96										3.03
DL =	0.01 ug/ml	1335	1413	94	01	2960	2950	<1						
		1364	1413	97										
NO3	6-9-88	1.00	1.00	100	01E	3.14	3.14	0	01E	7.43	3.14	5.00	86	
DL =	0.02 ug/ml	0.959	1.00	96										
		0.920	1.00	92										
		0.872	1.00	87										
		0.850	1.00	85										
		1.05	1.00	105										
		0.996	1.00	100										
NO3	6-10-88	1.27	1.25	102	01E	<0.02	<0.02	NC	01E	0.058	<0.02	0.1	58 P	
IL =	0.02 ug/ml	1.29	1.25	103										

RPD = [(1S-D1)/((S+D)/2)] x 100
RPD = Relative Percent Difference
NC = Not calculable due to a value less than five times the IDL

SPIKE %R = [(SSR-SR)/SA] x 100
# = Value is less than five times the instrument detection limit
IDL = Instrument Detection Limit

A = Analytical
P = Predigestion
SSR = Spiked Sample Result
SR = Sample Result
SA = Spiked Added

QUALITY CO● DATA SUMMARY

PNW 7

Submitted 6-29-88

Compiled

Workorder 8805147

Client Geoscience

Units ug/ml

PARAMETER	ANALYSIS DATE	CALIBRATION VERIFICATION STDS. FOUND	TRUE	%R	DUPLICATE ANALYSIS SAMP#	SAMP	DUPL	RPD	SPIKE RECOVERY SAMP#	SSR	SR	SA	%R	BLANKS
Pb	6-7-88	0.100	0.100	100										<0.002
IDL =	0.002ug/ml	0.104	0.100	104										<0.002
		0.104	0.100	104					40% Prep Blk 5731					<0.002
●									Blk Spk	0.022	<0.002	0.020	110	
PH	6-2-88	6.98	7.00	100	02D	7.16	7.18	<1						
		7.00	7.00	100										
PHEN	6-14-88	0.297	0.300	99	01E	0.010	0.013	26	01E	0.126	0.010	0.100	116	
IDL =	0.005ug/ml	0.310	0.300	103										
		0.275	0.300	92										
Se	6-9-88	0.051	0.050	102										<0.003
IDL	0.003ug/ml	0.052	0.050	104					30 of 616 Blk					<0.3
●		0.047	0.050	94					Blk Spk	2.30	<0.30	2.00	115	
		0.052	0.050	104					02I	0.027	<0.003	0.025	108	

RPD = [(1S-D1)/((S+D)/2)] x 100
RPD = Relative Percent Difference
NC = Not calculable due to a value less than five times the IDL

SPIKE %R = [(SSR-SR)/SA] x 100
* = Value is less than five times the instrument detection limit
IDL = Instrument Detection Limit

A = Analytical
P = Predigestion
SSR = Spiked Sample Result
SR = Sample Result
SA = Spiked Added

QUALITY CONT DATA SUMMARY

PNN 7

Submitted 6-29-88

Compiled

Workorder 8805147 Client Geoscience Units ug/ml

PARAMETER	ANALYSIS DATE	CALIBRATION VERIFICATION STDS. FOUND	TRUE	%R	DUPLICATE ANALYSIS SAMP#	SAMP	DUPL	RPD	SPIKE RECOVERY SAMP#	SSR	SR	SA	%R	BLANKS
TOC	6-14-88	25.3	24.0	105	MS+MSD 02	47.1	44.2	6	MS 02G	47.1	21.4	25	103	<1
IDL =	1.00 ug/ml	25.00	24.0	104					MSD 02G	44.2	21.4	25	91	
		25.1	24.0	105										
TOC	6-16-88	60.7	60.0	101	01E	66.6	63.9	4	MS 01E	121	66.6	60	91	<1
IDL =	1.00	60.7	60.0	101	MS+MSD 01	121	121	0	MSD 01E	121	66.6	60	91	
		62.0	60.0	103										
TOX	6-8-88	0.924	1.00	92	02H	0.137	0.143	4	02H	0.248	0.137	0.100	81	0.188
IDL	0.01 ug/ml	0.833	1.00	83										
TOX	6-7-88	1.05	1.00	105										
IDL =	0.01 ug/ml	0.861	1.00	86										
TOC	5-25-88													
UNITS	NTU													
IDL	1.00													

RPD = [(|S-D|)/((S+D)/2)] x 100
RPD = Relative Percent Difference
NC = Not calculable due to a value less than five times the IDL

SPIKE %R = [(SSR-SR)/SA] x 100
# = Value is less than five times the instrument detection limit
IDL = Instrument Detection Limit

A = Analytical
P = Predigestion
SSR = Spiked Sample Result
SR = Sample Result
SA = Spiked Added

RADIAN ANALYTICAL SERVICES

QUALITY CONTROL DATA SUMMARY

Form II

Client ID Geoscience

Workorder 88-05-147

Compiled PNN

Submitted 6-29-88

INITIAL AND CONTINUING CALIBRATION VERIFICATION[1]

Units ug/ml

Parameter	Run Date	Initial Calib.			Continuing Calibration						
		True	Found	%R	True	Found	%R	Found	%R	Found	%R
Ag	6-15-88	5.00	4.96	99	5.00	4.86	97	4.97	99	4.71	94
Ba		5.00	5.11	102	5.00	5.11	102	5.17	103	5.12	102
Cd		5.00	5.18	104	5.00	5.21	104	5.27	105	5.23	105
Cr		5.00	4.99	100	5.00	4.90	98	5.07	101	4.93	97
Fe		20.0	20.0	100	20.0	19.7	99	20.2	101	19.9	100
Mn		5.00	5.00	100	5.00	4.97	99	5.02	100	4.95	99
Na	↓	20.0	21.2	106	20.0	20.1	101	21.2	106	20.9	105
	Continuing Calibration										
Ag	6-15-88				5.00	4.96	99				
Ba					5.00	5.18	104				
Cd					5.00	5.31	106				
Cr					5.00	5.05	101				
Fe					20.0	20.1	101				
Mn					5.00	5.07	101				
Na	↓				20.0	21.6	108				

1. Control Limits for %R: ICPES _____

AA F _____

RADIAN ANALYTICAL SERVICES

QUALITY CONTROL DATA SUMMARY

Form III

Client ID Geoscience

Workorder 88-05-147

Compiled PNN 7

Submitted 6-29-88

Matrix Aqueous

BLANKS

Units ug/ml

Parameter	IDL	Initial Calibration Blank Value	Continuing Calibration Blank Value			Preparation Blank Value	
			1	2	3	1	2
Ag	0.003	<0.003	<0.001	<0.001	0.004	<0.003	
Ba	0.003	<0.002	<0.001	<0.003	<0.003	0.004	
Cd	0.003	<0.003	<0.001	<0.003	<0.003	<0.003	
Cr	0.003	<0.030	0.031	0.006	0.014	0.006	
Fe	0.003	0.085	0.132	0.049	0.081	0.035	
Mn	0.001	0.002	0.003	<0.001	0.002	0.001	
Na	0.021	<0.013	<.508	<0.021	<0.021	0.044	
	Blanks are		over	the IDLs	due to	carryover	

1. IDL = Instrument Detection Limit
* Indicates value is less than 5X the IDL.

RADIAN ANALYTICAL SERVICES

QUALITY CONTROL DATA SUMMARY

Form VI

Client ID Geoscience

Workorder 88-05-147

Compiled PNN 7

Submitted 6-29-88

Matrix Aqueous

DUPLICATES

Type Pre Digested

Units ug/ml

Parameter	Sample No.	Control Limit	Sample (S)	Duplicate (D)	RPD[1]	RPD Flag[2]
Ag	02I	RPD ≤ 20	<0.003	0.001	NC	
Ba			0.044	0.089	68^	
Cd			<0.003	0.001	NC	
Cr			0.037	0.016	79^	
Fe			10.2	10.2	0	
Mn			0.494	0.131	116^	
Na	↓	↓	449	447	<1	

* Indicates value is less than 5X IDL. (IDL=Instrument detection limit)

1. RPD=Relative percent difference=[|S-D|/((S+D)/2)]X100.
2. NC_1=Not calculable due to a value less than 5X the IDL.
   NC_1=Not calculable due to a value less than the CRDL. (Contract Required Detection Limit)
   ^ =RPD out of control limit for matrix duplicate, which may indicate non-homogeneity of the sample.

VOA RESULTS

LAB # 8805147-015
CLIENT NAME GeoScience
SAMPLE ID Unit #2

EPA METHOD 601	DATE: ANALYST: INSTRUMENT:	EPA METHOD 602	DATE: 6/16/88 ANALYST: BMA INSTRUMENT: Dlan
COMPOUND	**CONCENTRATION (ug/L)**	**COMPOUND**	**CONCENTRATION (ug/L)**
Chloromethane		Benzene	246
Bromomethane		Toluene	44.6
Vinyl Chloride		Ethyl benzene	37.9
Chloroethane		Chlorobenzene	
Methylene chloride		1,4-Dichlorobenzene	
Trichlorofluoromethane		1,3-Dichlorobenzene	
1,1-Dichloroethene		1,2-Dichlorobenzene	
1,1-Dichloroethane		P-Xylene	17.4
Trans-1,2-Dichloroethene		M-Xylene	20.2
Chloroform		O-Xylene	23.7
1,2-Dichloroethane			
1,1,1-Trichloroethane			
Carbon tetrachloride			
Bromodichloromethane			
1,2-Dichloropropane			
Trans-1,3-Dichloropropene			
Trichloroethene			
Dibromochloromethane			
1,1,2-Trichloroethane			
cis-1,3-Dichloropropene			
2-Chloroethylvinyl ether			
Bromoform			
1,1,2,2-Tetrachloroethane			
Tetrachloroethylene			
Chlorobenzene			
1,3-Dichlorobenzene			
1,2-Dichlorobenzene			
1,4-Dichlorobenzene			

SURROGATE RECOVERIES:

601
- Bromochloromethane
- 2-Bromo-1-Chloropropane
- 1,4-Dichlorobutane
- 4-Bromofluorobenzene

602
- a,a,a,-Trifluorotoluene 118%

UNKNOWN COMPOUNDS PRESENT.

185

VOA RESULTS

LAB # X605147-005
CLIENT NAME Goldstar
SAMPLE ID EUNICE 4

EPA METHOD 601	DATE: ANALYST: INSTRUMENT:	EPA METHOD 602	DATE: 6/16/8 ANALYST: BM INSTRUMENT: 10
COMPOUND	**CONCENTRATION (ug/L)**	**COMPOUND**	**CONCENTRATION (ug/L)**
Chloromethane		Benzene	0.61* / 0.61* DUP
Bromomethane		Toluene	0.74 / 0.53*
Vinyl Chloride		Ethyl benzene	
Chloroethane		Chlorobenzene	
Methylene chloride		1,4-Dichlorobenzene	
Trichlorofluoromethane		1,3-Dichlorobenzene	
1,1-Dichloroethene		1,2-Dichlorobenzene	
1,1-Dichloroethane		P-Xylene	
Trans-1,2-Dichloroethene		M-Xylene	
Chloroform		O-Xylene	
1,2-Dichloroethane			
1,1,1-Trichloroethane			
Carbon tetrachloride			
Bromodichloromethane			
1,2-Dichloropropane		SURROGATE RECOVERIES:	
Trans-1,3-Dichloropropene		601	
Trichloroethene		Bromochloromethane	
Dibromochloromethane		2-Bromo-1-Chloropropane	
1,1,2-Trichloroethane		1,4-Dichlorobutane	
cis-1,3-Dichloropropene		4-Bromofluorobenzene	
2-Chloroethylvinyl ether			
Bromoform		602	
1,1,2,2-Tetrachloroethane		a,a,a,-Trifluorotoluene	104% / 103%
Tetrachloroethylene			
Chlorobenzene			
1,3-Dichlorobenzene			
1,2-Dichlorobenzene			
1,4-Dichlorobenzene			

VOA RESULTS

LAB # X805147-03A
CLIENT NAME GeoScience
SAMPLE ID Trip Blank

EPA METHOD 601	DATE: ANALYST: INSTRUMENT:	EPA METHOD 602	DATE: 6/16/88 ANALYST: BM INSTRUMENT: Delta
COMPOUND	**CONCENTRATION (ug/L)**	**COMPOUND**	**CONCENTRATION (ug/L)**
Chloromethane		Benzene	ND
Bromomethane		Toluene	
Vinyl Chloride		Ethyl benzene	
Chloroethane		Chlorobenzene	
Methylene chloride		1,4-Dichlorobenzene	
Trichlorofluoromethane		1,3-Dichlorobenzene	
1,1-Dichloroethene		1,2-Dichlorobenzene	
1,1-Dichloroethane		P-Xylene	
Trans-1,2-Dichloroethene		M-Xylene	
Chloroform		O-Xylene	
1,2-Dichloroethane			
1,1,1-Trichloroethane			
Carbon tetrachloride			
Bromodichloromethane			
1,2-Dichloropropane		SURROGATE RECOVERIES:	
Trans-1,3-Dichloropropene		601	
Trichloroethene		Bromochloromethane	
Dibromochloromethane		2-Bromo-1-Chloropropane	
1,1,2-Trichloroethane		1,4-Dichlorobutane	
cis-1,3-Dichloropropene		4-Bromofluorobenzene	
2-Chloroethylvinyl ether			
Bromoform		602	
1,1,2,2-Tetrachloroethane		a,a,a,-Trifluorotoluene	99 %
Tetrachloroethylene			
Chlorobenzene			
1,3-Dichlorobenzene			
1,2-Dichlorobenzene			
1,4-Dichlorobenzene			

VOA RESULTS

LAB # System Blank
CLIENT NAME
SAMPLE ID

EPA METHOD 601	DATE: ANALYST: INSTRUMENT:	EPA METHOD 602	DATE: 4/6/88 ANALYST: AO INSTRUMENT PID
COMPOUND	CONCENTRATION (ug/L)	COMPOUND	CONCENTRATION (ug/L)
Chloromethane		Benzene	ND
Bromomethane		Toluene	
Vinyl Chloride		Ethyl benzene	
Chloroethane		Chlorobenzene	
Methylene chloride		1,4-Dichlorobenzene	
Trichlorofluoromethane		1,3-Dichlorobenzene	
1,1-Dichloroethene		1,2-Dichlorobenzene	
1,1-Dichloroethane		P-Xylene	
Trans-1,2-Dichloroethene		M-Xylene	
Chloroform		O-Xylene	
1,2-Dichloroethane			
1,1,1-Trichloroethane			
Carbon tetrachloride			
Bromodichloromethane			
1,2-Dichloropropane		SURROGATE RECOVERIES:	
Trans-1,3-Dichloropropene		601	
Trichloroethene		Bromochloromethane	
Dibromochloromethane		2-Bromo-1-Chloropropane	
1,1,2-Trichloroethane		1,4-Dichlorobutane	
cis-1,3-Dichloropropene		4-Bromofluorobenzene	
2-Chloroethylvinyl ether			
Bromoform		602	
1,1,2,2-Tetrachloroethane		a,a,a,-Trifluorotoluene	
Tetrachloroethylene			
Chlorobenzene			
1,3-Dichlorobenzene			
1,2-Dichlorobenzene			
1,4-Dichlorobenzene			

Geoscience
88-05-147

PNN
6-29-88

DAILY QUALITY CONTROL
RAS GC LAB

DATE:		SPIKED VALUE (ug/L)	Analyzed Value	% Recovery		Analyzed Value	% Recovery
	INSTRUMENT		D	D			
TEST METHOD	COMPOUND						
EPA 601	EPA WP 483 CONC. 2						
	Chloroform	12.0					
	1,2-Dichloroethane	2.0					
	1,1,1-Trichloroethane	1.4					
	Carbon Tetrachloride	2.6					
	Bromodichloromethane	2.0					
	Trichloroethene	2.9					
	Dibromochloromethane	2.6					
	Bromoform	2.9					
	Tetrachloroethene	1.6					
EPA 602	EPA - WP 879 CONC.1						
	Benzene	30.7	28.8	94			
	Toluene	4.1	4.4	107			
	Ethylbenzene	11.5	9.6	83			
	P-Xylene	19.1	19.0	99			
	M-Xylene	42.6	39.2	92			
	O-Xylene	10.6	10.5	99			
EPA 608		(ug/g)					
	Aroclor 1242	58.7					
	Aroclor 1260	56.8					

RADIAN ANALYTICAL SERVICES

QUALITY CONTROL DATA SUMMARY

Form II

Client ID Geoscience Consultants

Compiled Sgt 6-28-88

Workorder 88-05-050
88-05-057
88-05-058

Submitted

INITIAL AND CONTINUING CALIBRATION VERIFICATION[1]

Units ug/ml

Parameter	Run Date	Initial Calib.			Continuing Calibration						
		True	Found	%R	True	Found	%R	Found	%R	Found	%R
Ag	6-13-88	5.00	4.78	96	5.00	4.89	98	4.74	95		
Ba			4.92	98		5.03	101	5.02	100		
Cd			4.91	98		5.00	100	4.91	98		
Cr			4.76	95		4.78	96	4.71	94		
Fe		20.0	19.5	98	20.0	19.6	98	19.3	97		
Mn		5.00	4.78	96	5.00	4.82	96	4.69	94		
Na		20.0	20.4	102	20.0	17.9	90	20.9	105		

1. Control Limits for %R: ICPES _____
AA F _____

RADIAN ANALYTICAL SERVICES

QUALITY CONTROL DATA SUMMARY

Form III

Client ID Geoscience Consultants

Workorder 88-05-050
88-05-057
88-05-058

Compiled RJK 6-28-88

Submitted

Matrix aqueous

BLANKS

Units ug/ml

Parameter	IDL	Initial Calibration Blank Value	Continuing Calibration Blank Value 1	2	3	Preparation Blank Value 1	2
Ag	0.003	<0.003	<0.003	<0.003		<0.003	
Ba	0.003	<0.003	<0.003	<0.003		0.003 *	
Cd	0.003	<0.003	<0.003	<0.003		<0.003	
Cr	0.003	<0.003	<0.003	<0.003		<0.003	
Fe	0.003	0.156	<0.003	<0.003		0.031	
Mn	0.001	<0.001	<0.001	<0.001		0.002 *	
Na	0.021	0.036 *	<0.021	<0.021		3.17	

1. IDL = Instrument Detection Limit
* Indicates value is less than 5X the IDL.

RADIAN ANALYTICAL SERVICES

QUALITY CONTROL DATA SUMMARY

Form V

Client ID Geoscience Consultants

Workorder 88-05-050
88-05-057
88-05-058

Compiled SJK 6-28-88

Submitted

Matrix Blank / Aqueous

SPIKED SAMPLE RECOVERY

Spiking method predigestion

Units mg/ml

Parameter	Sample No.	Control Limit of %R	Spiked Sample Result (SSR)	Sample Result (SR)	Spike Added (SA)	D.F.	%R[1]	%R Flag[2]
Ag	Blank	75-125	0.856	(B)	1.00		86	
Ba			0.875				88	
Cd			0.888				89	
Cr			0.856				86	
Fe			8.77		10.0		88	
Mn			0.861		1.00		86	
Ni			8.92		10.0		89	

* Indicates value is less than 5X IDL. (IDL=Instrument detection limit)

1. %R = Percent Recovery = [(SSR - SR)/SA] X 100

2. R=For matrix spike: %R was not within control limit, which may indicate matrix interferences.

B=Sample result was greater than 4 times spike added concentration, therefore spike added concentration is considered insignificant.

(B) - Blank result is subtracted out from the sample result.

RADIAN ANALYTICAL SERVICES

QUALITY CONTROL DATA SUMMARY

Form VI

Client ID Geoscience Consultants

Workorder 88-05-050

Compiled 7/26 6-28

Submitted

Matrix aqueous

DUPLICATES

Type predigestion

Units ug/ml

Parameter	Sample No.	Control Limit	Sample (S)	Duplicate (D)	RPD[1]	RPD Flag[2]
Ag	05050-01	RPD ≤ 20	<0.003	<0.003	NC	
Ba	↓	↓	0.056	0.056	0	
Cd			0.016	0.016	0	
Cr			0.024	0.033	32	^
Fe			0.069	0.106	42	^
Mn			0.279	0.278	0	
Na			227	225	1	

* Indicates value is less than 5X IDL. (IDL=Instrument detection limit)

1. RPD=Relative percent difference=[|S-D|/((S+D)/2)]X100.
2. NC=Not calculable due to a value less than 5X the IDL.
   NC'=Not calculable due to a value less than the CRDL. (Contract Required Detection Limit.
   ^ =RPD out of control limit for matrix duplicate, which may indicate non-homogeneity of the sample.

Geoscience Consult
88-05-050
Sht 6-28-88

DAILY QUALITY CONTROL
RAS GC LAB

DATE:	5-12-88	SPIKED VALUE (ug/L)	Analyzed Value	% Recovery		Analyzed Value	% Recovery
	INSTRUMENT		D	D		G	G
TEST METHOD	COMPOUND						
EPA 601	EPA WP 483 CONC. 2						
	Chloroform	12.0					
	1,2-Dichloroethane	2.0					
	1,1,1-Trichloroethane	1.4					
	Carbon Tetrachloride	2.6					
	Bromodichloromethane	2.0					
	Trichloroethene	2.9					
	Dibromochloromethane	2.6					
	Bromoform	2.9					
	Tetrachloroethene	1.6					
EPA 602	EPA - WP 879 CONC.1						
	Benzene	30.7	26.5	86		22.7	74
	Toluene	4.1	4.4	107		4.5	110
	Ethylbenzene	11.3	9.7	84		9.3	81
	P-Xylene	19.1	19.7	103		19.0	99
	M-Xylene	42.6	38.8	91		35.5	83
	O-Xylene	10.6	10.4	98		10.7	101
EPA 608		(ug/g)					
	Aroclor 1242	58.7					
	Aroclor 1260	56.8					

DAILY QUALITY CONTROL
RAS GC LAB

DATE:	5-16-88	SPIKED VALUE (ug/L)	Analyzed Value	% Recovery		Analyzed Value	% Recovery
	INSTRUMENT		B	R		G	G
TEST METHOD	COMPOUND						
EPA 601	EPA WP 483 CONC. 2						
	Chloroform	12.0	11.7	98			
	1,2-Dichloroethane	2.0	1.9	95			
	1,1,1-Trichloroethane	1.4	2.1	150			
	Carbon Tetrachloride	2.6	2.8	108			
	Bromodichloromethane	2.0	2.3	115			
	Trichloroethene	2.9	3.0	103			
	Dibromochloromethane	2.6	4.5 [1]	173			
	Bromoform	2.9	2.2	76			
	Tetrachloroethene	1.6	1.7	106			
EPA 602	EPA - WP 879 CONC.1		D	D			
	Benzene	30.7	27.8	91		30.1	98
	Toluene	4.1	4.7	115		5.4	132
	Ethylbenzene	11.3	9.8	85		10.5	91
	P-Xylene	19.1	20.6	108		22.5	118 @
	M-Xylene	42.6	40.1	94		42.5	100
	O-Xylene	10.6	11.1	105		12.5	118
EPA 608		(ug/g)					
	Aroclor 1242	58.7					
	Aroclor 1260	56.8					

1 - interference

VOA RESULTS

LAB # SYSTEM BLANK
CLIENT NAME
SAMPLE ID

EPA METHOD 601	DATE: ANALYST: INSTRUMENT:	EPA METHOD 602	DATE: 5/12/15 ANALYST: AO INSTRUMENT:
COMPOUND	**CONCENTRATION (ug/L)**	**COMPOUND**	**CONCENTRATION (ug/L)**
Chloromethane		Benzene	ND
Bromomethane		Toluene	
Vinyl Chloride		Ethyl benzene	
Chloroethane		Chlorobenzene	
Methylene chloride		1,4-Dichlorobenzene	
Trichlorofluoromethane		1,3-Dichlorobenzene	
1,1-Dichloroethene		1,2-Dichlorobenzene	
1,1-Dichloroethane		P-Xylene	
Trans-1,2-Dichloroethene		M-Xylene	
Chloroform		O-Xylene	
1,2-Dichloroethane			
1,1,1-Trichloroethane			
Carbon tetrachloride			
Bromodichloromethane			
1,2-Dichloropropane		SURROGATE RECOVERIES:	
Trans-1,3-Dichloropropene		601	
Trichloroethene		Bromochloromethane	
Dibromochloromethane		2-Bromo-1-Chloropropane	
1,1,2-Trichloroethane		1,4-Dichlorobutane	
cis-1,3-Dichloropropene		4-Bromofluorobenzene	
2-Chloroethylvinyl ether			
Bromoform		602	
1,1,2,2-Tetrachloroethane		a,a,a,-Trifluorotoluene	
Tetrachloroethylene			
Chlorobenzene			
1,3-Dichlorobenzene			
1,2-Dichlorobenzene			
1,4-Dichlorobenzene			

VOA RESULTS

LAB # REAGENT BLANK-WATER
CLIENT NAME
SAMPLE ID

EPA METHOD 601	DATE: ANALYST: INSTRUMENT:	EPA METHOD 602	DATE: 5/12/88 ANALYST: INSTRUMENT:
COMPOUND	CONCENTRATION (ug/L)	COMPOUND	CONCENTRATION (ug/L)
Chloromethane		Benzene	ND
Bromomethane		Toluene	
Vinyl Chloride		Ethyl benzene	
Chloroethane		Chlorobenzene	
Methylene chloride		1,4-Dichlorobenzene	
Trichlorofluoromethane		1,3-Dichlorobenzene	
1,1-Dichloroethene		1,2-Dichlorobenzene	
1,1-Dichloroethane		P-Xylene	
Trans-1,2-Dichloroethene		M-Xylene	
Chloroform		O-Xylene	
1,2-Dichloroethane			
1,1,1-Trichloroethane			
Carbon tetrachloride			
Bromodichloromethane			
1,2-Dichloropropane		SURROGATE RECOVERIES:	
Trans-1,3-Dichloropropene		601	
Trichloroethene		Bromochloromethane	
Dibromochloromethane		2-Bromo-1-Chloropropane	
1,1,2-Trichloroethane		1,4-Dichlorobutane	
cis-1,3-Dichloropropene		4-Bromofluorobenzene	
2-Chloroethylvinyl ether			
Bromoform		602	
1,1,2,2-Tetrachloroethane		a,a,a,-Trifluorotoluene	
Tetrachloroethylene			
Chlorobenzene			
1,3-Dichlorobenzene			
1,2-Dichlorobenzene			
1,4-Dichlorobenzene			

VOA RESULTS

LAB # System Blank
CLIENT NAME
SAMPLE ID

EPA METHOD 601	DATE: ANALYST: INSTRUMENT:	EPA METHOD 602	DATE: 5/13/00 ANALYST: NP INSTRUMENT:
COMPOUND	**CONCENTRATION (ug/L)**	**COMPOUND**	**CONCENTRATION (ug/L)**
Chloromethane		Benzene	
Bromomethane		Toluene	
Vinyl Chloride		Ethyl benzene	
Chloroethane		Chlorobenzene	
Methylene chloride		1,4-Dichlorobenzene	
Trichlorofluoromethane		1,3-Dichlorobenzene	
1,1-Dichloroethene		1,2-Dichlorobenzene	
1,1-Dichloroethane		P-Xylene	
Trans-1,2-Dichloroethene		M-Xylene	
Chloroform		O-Xylene	
1,2-Dichloroethane			
1,1,1-Trichloroethane			
Carbon tetrachloride			
Bromodichloromethane			
1,2-Dichloropropane		SURROGATE RECOVERIES:	
Trans-1,3-Dichloropropene		601	
Trichloroethene		Bromochloromethane	
Dibromochloromethane		2-Bromo-1-Chloropropane	
1,1,2-Trichloroethane		1,4-Dichlorobutane	
cis-1,3-Dichloropropene		4-Bromofluorobenzene	
2-Chloroethylvinyl ether			
Bromoform		602	
1,1,2,2-Tetrachloroethane		a,a,a,-Trifluorotoluene	
Tetrachloroethylene			
Chlorobenzene			
1,3-Dichlorobenzene			
1,2-Dichlorobenzene			
1,4-Dichlorobenzene			

VOA RESULTS

LAB # Reagent Blank 05W
CLIENT NAME
SAMPLE ID

EPA METHOD 601	DATE: ANALYST: INSTRUMENT:	EPA METHOD 602	DATE: 5/13/86 ANALYST: CJ INSTRUMENT:
COMPOUND	CONCENTRATION (ug/L)	COMPOUND	CONCENTRATION (ug/L)
Chloromethane		Benzene	ND
Bromomethane		Toluene	
Vinyl Chloride		Ethyl benzene	
Chloroethane		Chlorobenzene	
Methylene chloride		1,4-Dichlorobenzene	
Trichlorofluoromethane		1,3-Dichlorobenzene	
1,1-Dichloroethene		1,2-Dichlorobenzene	
1,1-Dichloroethane		P-Xylene	
Trans-1,2-Dichloroethene		M-Xylene	
Chloroform		O-Xylene	
1,2-Dichloroethane			
1,1,1-Trichloroethane			
Carbon tetrachloride			
Bromodichloromethane			
1,2-Dichloropropane		SURROGATE RECOVERIES:	
Trans-1,3-Dichloropropene		601	
Trichloroethene		Bromochloromethane	
Dibromochloromethane		2-Bromo-1-Chloropropane	
1,1,2-Trichloroethane		1,4-Dichlorobutane	
cis-1,3-Dichloropropene		4-Bromofluorobenzene	
2-Chloroethylvinyl ether			
Bromoform		602	
1,1,2,2-Tetrachloroethane		a,a,a,-Trifluorotoluene	
Tetrachloroethylene			
Chlorobenzene			
1,3-Dichlorobenzene			
1,2-Dichlorobenzene			
1,4-Dichlorobenzene			

QUALITY I DL DATA SUMMARY

Submitted sgs 6-28-88

Compiled

Workorder 88-05-050 Client Geoscience Consultants Units ug/ml unless otherwise noted

PARAMETER	ANALYSIS DATE	CALIBRATION VERIFICATION STDS. FOUND	TRUE	%R	DUPLICATE ANALYSIS SAMP#	SAMP	DUPL	RPD	SPIKE RECOVERY SAMP#	SSR	SR	SA	%R	BLANKS
As	5-17-88	0.094	0.100						3020 5/16 Blank	0.019	—	0.020		P) <0.002
IDL=0.002 ug/ml		0.086	0.100											3020 5/16 <0.002
														P) <0.002
Coliform	5-30-88													
Reported in colonies/100mL														
Cl	5-31-88	7.79	8.00	97										
		7.83	8.00	98										
		7.86	8.00	98										
F	5-31-88	4.01	4.00	100										
		3.99	4.00	100										
		3.99	4.00	100										
SO_4	5-31-88	39.0	40.0	98										
		39.2	40.0	98										
		39.4	40.0	99										

RPD = [(S-D)/((S+D)/2)] x 100
RPD = Relative Percent Difference
NC = Not calculable due to a value less than five times the IDL

SPIKE %R = [(SSR-SR)/SA] x 100
# = Value is less than five times the instrument detection limit
IDL = Instrument Detection Limit

A = Analytical
P = Predigestion
SSR = Spiked Sample Result
SR = Sample Result
SA = Spiked Added

QUALITY CONTROL DATA SUMMARY

Submitted Sgs 6-28-88

Compiled

Workorder 88-05-050a Client Geoscience Consultants Units ug/ml unless otherwise noted

PARAMETER	ANALYSIS DATE	CALIBRATION VERIFICATION STDS. FOUND	TRUE	%R	DUPLICATE ANALYSIS SAMP#	SAMP	DUPL	RPD	SPIKE RECOVERY SAMP#	SSR	SR	SA	%R	BLANKS
Hg	5-13-88	0.0036	0.0040	90										P) <0.0001
IDL=0.0001 ug/ml		0.0034	0.0040	85										P) <0.0001
		0.0038	0.0040	95										P) <0.0001
NO_3	5-24-88	1.35	1.25	108										
IDL=0.02 ug/ml		1.35	1.25	108										
		1.35	1.25	108										
Pb	5-18-88	0.094	0.100	94										P) <0.002
IDL=0.002 ug/ml		0.096	0.100	96										3020 5/16 0.003*
														P) <0.002
pH	5-12-88	6.97	7.00	100	A) 01A	7.29	7.29	0						
Reported in pH units.		7.02	7.00	100	A) 010	7.23	7.26	0						
		6.98	7.00	100										
Phenolics	5-27-88	0.263	0.250	105										
IDL=0.005 ug/ml		0.276	0.250	110										

RPD = [(|S-D|)/((S+D)/2)] x 100
RPD = Relative Percent Difference
NC = Not calculable due to a value less than five times the IDL

SPIKE %R = [(SSR-SR)/SA] x 100
* = Value is less than five times the instrument detection limit
IDL = Instrument Detection Limit

A = Analytical
P = Predigestion
SSR = Spiked Sample Result
SR = Sample Result
SA = Spiked Added

QUALITY CONTROL DATA SUMMARY

Submitted SGE - 6-28-88

Compiled

Workorder 88-05-050 Client Geoscience Consultants Units ug/ml unless otherwise noted

PARAMETER	ANALYSIS DATE	CALIBRATION VERIFICATION STDS. FOUND	TRUE	%R	DUPLICATE ANALYSIS SAMP#	SAMP	DUPL	RPD	SPIKE RECOVERY SAMP#	SSR	SR	SA	%R	BLANKS
Se	5-18-88	0.049	0.050	98					3020 5/16 Blank	0.022	—	0.020	110	(P) <0.003
IDL=0.003 ug/ml		0.053	0.050	106										3020 5/16 <0.003
TOC	6-1-88	34.5	32.8	105	(A) 01F	8.24	7.98	3	MS 01F	39.6	8.11	30.0	105	(P) <1.0
IDL=1.0 ug/ml		32.2	32.8	98	MS+MSD 01F	39.6	62.6	23 +	MSD 01F	62.6	8.11	30.0	182	
					MS+MSD 01F	39.6	38.9	2	MSD 01F	38.9	8.11	30.0	103	
Tox	5-18-88	0.957	1.00	96										
IDL=0.01 ug/ml		0.827	1.00	83										
Tox	5-19-88	0.878	1.00	88	(A) 01G	0.103	0.097	6	(A) 01H	0.203	0.093	0.100	110	
IDL=0.01 ug/ml		0.983	1.00	98										
Turbidity	5-12-88				(A) 01	17.0	18.0	6						0.7
														0.7
MHO	5-12-88	1359	1413	96	(A) 01D	265	270	2						
		1359	1413	96										
		1374	1413	97										

RPD = [(|S-D|)/((S+D)/2)] x 100
RPD = Relative Percent Difference
NC = Not calculable due to a value less than five times the IDL

SPIKE %R = [(SSR-SR)/SA] x 100
* = Value is less than five times the instrument detection limit
IDL = Instrument Detection Limit

A = Analytical
P = Predigestion
SSR = Spiked Sample Result
SR = Sample Result
SA = Spiked Added

88-05-057

DAILY QUALITY CONTROL
RAS GC LAB

DATE:	5-13-88	SPIKED VALUE (ug/L)	Analyzed Value	% Recovery		Analyzed Value	% Recovery
	INSTRUMENT		B	B		G	G
TEST METHOD	COMPOUND						
EPA 601	EPA WP 483 CONC. 2						
	Chloroform	12.0	11.7	98			
	1,2-Dichloroethane	2.0	1.9	95			
	1,1,1-Trichloroethane	1.4	2.1	150			
	Carbon Tetrachloride	2.6	2.8	108			
	Bromodichloromethane	2.0	2.3	115			
	Trichloroethene	2.9	3.0	103			
	Dibromochloromethane	2.6	4.5 ①	175			
	Bromoform	2.9	2.2	76			
	Tetrachloroethene	1.6	1.7	106			
EPA 602	EPA - WP 879 CONC.1		D	D			
	Benzene	30.7	27.8	91		30.1	98
	Toluene	4.1	4.7	115		5.4	132
	Ethylbenzene	11.3	9.8	85		10.5	91
	P-Xylene	19.1	20.6	108		22.5	118 @
	M-Xylene	42.6	40.1	94		42.5	100
	O-Xylene	10.6	11.1	105		12.5	118
EPA 608		(ug/g)					
	Aroclor 1242	38.7					
	Aroclor 1260	56.8					

① - Interference

VOA SPIKE RESULTS

LAB # 88-05-057
SAMPLE ID 02J
METHOD EPA 602

UNITS /

COMPOUND	SPIKED SAMPLE RESULT (SSR)	SAMPLE RESULT (SR)	SPIKE ADDED (SA)	% R
Benzene	35.0	15.2	30.7	114
Toluene	5.2		4.1	127
Ethyl benzene	11.1	46.1	11.5	97
Chlorobenzene				
1,4-Dichlorobenzene				
1,3-Dichlorobenzene				
1,2-Dichlorobenzene				
P-Xylene		24.4	19.1	128 @
M-Xylene		47.3	42.6	111 @
O-Xylene		12.0	10.6	113

Spike of diluted sample. Area counts subtracted out.

% R = [(SSR-SR)/SA] x 100

VOA RESULTS

LAB # 5/13/88 Blank
CLIENT NAME
SAMPLE ID

EPA METHOD 601	DATE: ANALYST: INSTRUMENT:	EPA METHOD 602	DATE: 5/13/88 ANALYST: AO INSTRUMENT:
COMPOUND	CONCENTRATION (ug/L)	COMPOUND	CONCENTRATION (ug/L)
Chloromethane		Benzene	ND
Bromomethane		Toluene	
Vinyl Chloride		Ethyl benzene	
Chloroethane		Chlorobenzene	
Methylene chloride		1,4-Dichlorobenzene	
Trichlorofluoromethane		1,3-Dichlorobenzene	
1,1-Dichloroethene		1,2-Dichlorobenzene	
1,1-Dichloroethane		P-Xylene	
Trans-1,2-Dichloroethene		M-Xylene	
Chloroform		O-Xylene	
1,2-Dichloroethane			
1,1,1-Trichloroethane			
Carbon tetrachloride			
Bromodichloromethane			
1,2-Dichloropropane			
Trans-1,3-Dichloropropene			
Trichloroethene			
Dibromochloromethane			
1,1,2-Trichloroethane			
cis-1,3-Dichloropropene			
2-Chloroethylvinyl ether			
Bromoform			
1,1,2,2-Tetrachloroethane			
Tetrachloroethylene			
Chlorobenzene			
1,3-Dichlorobenzene			
1,2-Dichlorobenzene			
1,4-Dichlorobenzene			

SURROGATE RECOVERIES:

601
- Bromochloromethane
- 2-Bromo-1-Chloropropane
- 1,4-Dichlorobutane
- 4-Bromofluorobenzene

602
- a,a,a,-Trifluorotoluene

VOA RESULTS

LAB # Reagent Blank 0FW
CLIENT NAME
SAMPLE ID

EPA METHOD 601	DATE: ANALYST: INSTRUMENT:	EPA METHOD 602	DATE: 5/13/88 ANALYST: CJ INSTRUMENT: GC
COMPOUND	CONCENTRATION (ug/L)	COMPOUND	CONCENTRATION (ug/L)
Chloromethane		Benzene	
Bromomethane		Toluene	
Vinyl Chloride		Ethyl benzene	
Chloroethane		Chlorobenzene	
Methylene chloride		1,4-Dichlorobenzene	
Trichlorofluoromethane		1,3-Dichlorobenzene	
1,1-Dichloroethene		1,2-Dichlorobenzene	
1,1-Dichloroethane		P-Xylene	
Trans-1,2-Dichloroethene		M-Xylene	
Chloroform		O-Xylene	
1,2-Dichloroethane			
1,1,1-Trichloroethane			
Carbon tetrachloride			
Bromodichloromethane			
1,2-Dichloropropane		SURROGATE RECOVERIES:	
Trans-1,3-Dichloropropene		601	
Trichloroethene		Bromochloromethane	
Dibromochloromethane		2-Bromo-1-Chloropropane	
1,1,2-Trichloroethane		1,4-Dichlorobutane	
cis-1,3-Dichloropropene		4-Bromofluorobenzene	
2-Chloroethylvinyl ether			
Bromoform		602	
1,1,2,2-Tetrachloroethane		a,a,a,-Trifluorotoluene	
Tetrachloroethylene			
Chlorobenzene			
1,3-Dichlorobenzene			
1,2-Dichlorobenzene			
1,4-Dichlorobenzene			

VOA RESULTS

LAB # 5470A BLANK
CLIENT NAME
SAMPLE ID

EPA METHOD 601	DATE: ANALYST: INSTRUMENT:	EPA METHOD 602	DATE: 5/13/88 ANALYST: AP INSTRUMENT: Hewlett
COMPOUND	CONCENTRATION (ug/L)	COMPOUND	CONCENTRATION (ug/L)
Chloromethane		Benzene	ND
Bromomethane		Toluene	
Vinyl Chloride		Ethyl benzene	
Chloroethane		Chlorobenzene	
Methylene chloride		1,4-Dichlorobenzene	
Trichlorofluoromethane		1,3-Dichlorobenzene	
1,1-Dichloroethene		1,2-Dichlorobenzene	
1,1-Dichloroethane		P-Xylene	
Trans-1,2-Dichloroethene		M-Xylene	
Chloroform		O-Xylene	
1,2-Dichloroethane			
1,1,1-Trichloroethane			
Carbon tetrachloride			
Bromodichloromethane			
1,2-Dichloropropane		SURROGATE RECOVERIES:	
Trans-1,3-Dichloropropene		601	
Trichloroethene		Bromochloromethane	
Dibromochloromethane		2-Bromo-1-Chloropropane	
1,1,2-Trichloroethane		1,4-Dichlorobutane	
cis-1,3-Dichloropropene		4-Bromofluorobenzene	
2-Chloroethylvinyl ether			
Bromoform		602	
1,1,2,2-Tetrachloroethane		a,a,a,-Trifluorotoluene	
Tetrachloroethylene			
Chlorobenzene			
1,3-Dichlorobenzene			
1,2-Dichlorobenzene			
1,4-Dichlorobenzene			

VOA RESULTS

LAB # Reagent Blank - DRL
CLIENT NAME
SAMPLE ID

EPA METHOD 601	DATE: ANALYST: INSTRUMENT:	EPA METHOD 602	DATE: 5/13/88 ANALYST: CJ INSTRUMENT: Hermes
COMPOUND	CONCENTRATION (ug/L)	COMPOUND	CONCENTRATION (ug/L)
Chloromethane		Benzene	
Bromomethane		Toluene	
Vinyl Chloride		Ethyl benzene	
Chloroethane		Chlorobenzene	
Methylene chloride		1,4-Dichlorobenzene	
Trichlorofluoromethane		1,3-Dichlorobenzene	
1,1-Dichloroethene		1,2-Dichlorobenzene	
1,1-Dichloroethane		P-Xylene	
Trans-1,2-Dichloroethene		M-Xylene	
Chloroform		O-Xylene	
1,2-Dichloroethane			
1,1,1-Trichloroethane			
Carbon tetrachloride			
Bromodichloromethane			
1,2-Dichloropropane		SURROGATE RECOVERIES:	
Trans-1,3-Dichloropropene		601	
Trichloroethene		Bromochloromethane	
Dibromochloromethane		2-Bromo-1-Chloropropane	
1,1,2-Trichloroethane		1,4-Dichlorobutane	
cis-1,3-Dichloropropene		4-Bromofluorobenzene	
2-Chloroethylvinyl ether			
Bromoform		602	
1,1,2,2-Tetrachloroethane		a,a,a,-Trifluorotoluene	
Tetrachloroethylene			
Chlorobenzene			
1,3-Dichlorobenzene			
1,2-Dichlorobenzene			
1,4-Dichlorobenzene			

QUALITY C[illegible]OL DATA SUMMARY

Submitted SS 6-28-88

Compiled

Workorder 88-05-057 Client Geoscience Consultants Units ug/ml unless otherwise noted

PARAMETER	ANALYSIS DATE	CALIBRATION VERIFICATION STDS. FOUND	TRUE	%R	DUPLICATE ANALYSIS SAMP#	SAMP	DUPL	RPD	SPIKE RECOVERY SAMP#	SSR	SR	SA	%R	BLANKS
As	5-17-88	0.094	0.100	94	P) 01	0.014	0.014	0	3020 5/16 Blank	0.019	—	0.020	95	P) <0.002
IDL=0.002 ug/ml		0.086	0.100	86										3020 5/16 <0.002
		0.086	0.100	86										P) <0.002
														D) <0.002
Coliform	5-30-88													
Reported in	colonies/100 ml													
Cl	5-31-88	7.79	8.00	93										
		7.83	8.00	99										
		7.86	8.00	98										
F	5-31-88	4.01	4.00	100										
		3.99	4.00	100										
		3.99	4.00	100										
SO_4	5-31-88	40.0	40.0	100										
		39.2	40.0	98										
		39.4	40.0	99										

RPD = [(|S-D|)/((S+D)/2)] x 100
RPD = Relative Percent Difference
NC = Not calculable due to a value less than five times the IDL

SPIKE %R = [(SSR-SR)/SA] x 100
* = Value is less than five times the instrument detection limit
IDL = Instrument Detection Limit

A = Analytical
P = Predigestion
SSR = Spiked Sample Result
SR = Sample Result
SA = Spiked Added

QUALITY C[illegible]L DATA SUMMARY

Submitted SR 6-28-88

Compiled

Workorder 88-05-057 Client Geoscience Consultants Units ug/ml unless otherwise noted

PARAMETER	ANALYSIS DATE	CALIBRATION VERIFICATION STDS. FOUND	TRUE	%R	DUPLICATE ANALYSIS SAMP#	SAMP	DUPL	RPD	SPIKE RECOVERY SAMP#	SSR	SR	SA	%R	BLANKS
Hg	5-13-88	0.0036	0.0040	90										P) <0.0001
IDL=0.0001 mg/ml		0.0034	0.0040	85										P) <0.0001
		0.0038	0.0040	95										P) <0.0001
MHO	5-17-88	1320	1413	93	A) 02B	3430	3460	1						
Reported in	umhos units	1344	1413	95										
NO_3	5-23-88	1.26	1.25	101										
IDL=0.02 mg/ml		1.26	1.25	101										
Pb	5-18-88	0.094	0.100	94	P) 01	<0.002	<0.002	NC	3020 5/16 Blank	0.022	—	0.020	110	P) <0.002
IDL=0.002 mg/ml		0.096	0.100	96										3020 5/16 0.003*
		0.104	0.100	104										P) <0.002
														A) <0.002
pH	5-17-88	7.00	7.00	100	A) 02B	7.24	7.23	0						
Reported in	pH units.	7.00	7.00	100										
		7.00	7.00	100										

RPD = [(1S-D1)/((S+D)/2)] x 100
RPD = Relative Percent Difference
NC = Not calculable due to a value less than five times the IDL

SPIKE %R = [(SSR-SR)/SA] x 100
* = Value is less than five times the instrument detection limit
IDL = Instrument Detection Limit

A = Analytical
P = Predigestion
SSR = Spiked Sample Result
SR = Sample Result
SA = Spiked Added

QUALITY CONTROL DATA SUMMARY

Submitted S/S 6-28-88

Compiled

Workorder 88-05-057 Client Geoscience Consultants Units ug/ml unless otherwise noted

PARAMETER	ANALYSIS DATE	CALIBRATION VERIFICATION STDS. FOUND	TRUE	%R	DUPLICATE ANALYSIS SAMP#	SAMP	DUPL	RPD	SPIKE RECOVERY SAMP#	SSR	SR	SA	%R	BLANKS
Phenolics	5-27-88	0.263	0.250	105										
IDL=0.005 ug/ml		0.276	0.250	110										
Se	5-18-88	0.049	0.050	98	A) 01I	<0.00	<0.003	NC	3020 5/16 Blank	0.022	—	0.020	110	P) <0.003
IDL=0.003 ug/ml		0.053	0.050	106										3020 5/16 <0.003
		0.049	0.050	98										P) <0.003
TOC	6-1-88	34.5	32.8	105	P) DIL 1:2 02H	94.5	94.2	0	MS 02H	176	94.3	60.0	136 R	P) <1.0
IDL=1.0 ug/ml		32.2	32.8	98	MS+MSD 02H	176	175	1	MSD 02H	175	94.3	60.0	135 R	P) <1.0
		34.3	32.8	105										
TOX	5-23-88	1.08	1.00	108	A) 02E	0.114	0.106	7						
IDL=0.02 ug/ml		0.869	1.00	87										
TOX	5-24-88	0.930	1.00	93	A) 02G	0.142	0.131	8	A) 02H	0.181	0.094	0.100	87	1.6
IDL=0.02 ug/ml		0.841	1.00	84										1.6
Turbidity					A) 01	4.3	4.2	2						

RPD = [(S-D)/((S+D)/2)] x 100
RPD = Relative Percent Difference
NC = Not calculable due to a value less than five times the IDL

SPIKE %R = [(SSR-SR)/SA] x 100
# = Value is less than five times the instrument detection limit
IDL = Instrument Detection Limit

A = Analytical
P = Predigestion
SSR = Spiked Sample Result
SR = Sample Result
SA = Spiked Added

Geoscience Consultants
88-05-058

DAILY QUALITY CONTROL
RAS GC LAB

DATE:	5-13-88	SPIKED VALUE (ug/L)	Analyzed Value	% Recovery		Analyzed Value	% Recovery
	INSTRUMENT		B	B		G	G
TEST METHOD	COMPOUND						
EPA 601	EPA WP 483 CONC. 2						
	Chloroform	12.0	11.7	98			
	1,2-Dichloroethane	2.0	1.9	95			
	1,1,1-Trichloroethane	1.4	2.1	150			
	Carbon Tetrachloride	2.6	2.8	108			
	Bromodichloromethane	2.0	2.3	115			
	Trichloroethene	2.9	3.0	103			
	Dibromochloromethane	2.6	4.5 [1]	173			
	Bromoform	2.9	2.2	76			
	Tetrachloroethene	1.6	1.7	106			
EPA 602	EPA - WP 879 CONC.1		D	D			
	Benzene	30.7	27.8	91		30.1	98
	Toluene	4.1	4.7	115		5.4	132
	Ethylbenzene	11.5	9.8	85		10.5	91
	P-Xylene	19.1	20.6	108		22.5	118 Q
	M-Xylene	42.6	40.1	94		42.5	100
	O-Xylene	10.6	11.1	105		12.5	118
EPA 608		(ug/g)					
	Aroclor 1242	58.7					
	Aroclor 1260	56.8					

1 - interference

DAILY QUALITY CONTROL
RAS GC LAB

DATE:	5-17-88	SPIKED VALUE (ug/L)	Analyzed Value	% Recovery		Analyzed Value	% Recovery
	INSTRUMENT		D	D		G	G
TEST METHOD	COMPOUND						
EPA 601	EPA WP 483 CONC. 2						
	Chloroform	12.0					
	1,2-Dichloroethane	2.0					
	1,1,1-Trichloroethane	1.4					
	Carbon Tetrachloride	2.6					
	Bromodichloromethane	2.0					
	Trichloroethene	2.9					
	Dibromochloromethane	2.6					
	Bromoform	2.9					
	Tetrachloroethene	1.6					
EPA 602	EPA - WP 879 CONC.1						
	Benzene	30.7	26.2	85		29.4	96
	Toluene	4.1	4.0	98		4.9	120
	Ethylbenzene	11.3	9.1	79		10.4	90
	P-Xylene	19.1	18.6	97		21.9	115 Q
	M-Xylene	42.6	38.5	90		42.3	99
	O-Xylene	10.6	10.5	99		12.6	119
EPA 608		(ug/g)					
	Aroclor 1242	58.7					
	Aroclor 1260	56.8					

VOA RESULTS

LAB # System Blank
CLIENT NAME
SAMPLE ID

EPA METHOD 601	DATE: ANALYST: INSTRUMENT:	EPA METHOD 602	DATE: 5/13/88 ANALYST: AO INSTRUMENT: Tekmar
COMPOUND	CONCENTRATION (ug/L)	COMPOUND	CONCENTRATION (ug/L)
Chloromethane		Benzene	
Bromomethane		Toluene	
Vinyl Chloride		Ethyl benzene	
Chloroethane		Chlorobenzene	
Methylene chloride		1,4-Dichlorobenzene	
Trichlorofluoromethane		1,3-Dichlorobenzene	
1,1-Dichloroethene		1,2-Dichlorobenzene	
1,1-Dichloroethane		P-Xylene	
Trans-1,2-Dichloroethene		M-Xylene	
Chloroform		O-Xylene	
1,2-Dichloroethane			
1,1,1-Trichloroethane			
Carbon tetrachloride			
Bromodichloromethane			
1,2-Dichloropropane		SURROGATE RECOVERIES:	
Trans-1,3-Dichloropropene		601	
Trichloroethene		Bromochloromethane	
Dibromochloromethane		2-Bromo-1-Chloropropane	
1,1,2-Trichloroethane		1,4-Dichlorobutane	
cis-1,3-Dichloropropene		4-Bromofluorobenzene	
2-Chloroethylvinyl ether			
Bromoform		602	
1,1,2,2-Tetrachloroethane		a,a,a,-Trifluorotoluene	
Tetrachloroethylene			
Chlorobenzene			
1,3-Dichlorobenzene			
1,2-Dichlorobenzene			
1,4-Dichlorobenzene			

VOA RESULTS

LAB # Reagent Blank 05
CLIENT NAME
SAMPLE ID

EPA METHOD 601	DATE: ANALYST: INSTRUMENT:	EPA METHOD 602	DATE: 5/13/92 ANALYST: C INSTRUMENT Hermes
COMPOUND	CONCENTRATION (ug/L)	COMPOUND	CONCENTRATION (ug/L)
Chloromethane		Benzene	ND
Bromomethane		Toluene	
Vinyl Chloride		Ethyl benzene	
Chloroethane		Chlorobenzene	
Methylene chloride		1,4-Dichlorobenzene	
Trichlorofluoromethane		1,3-Dichlorobenzene	
1,1-Dichloroethene		1,2-Dichlorobenzene	
1,1-Dichloroethane		P-Xylene	
Trans-1,2-Dichloroethene		M-Xylene	
Chloroform		O-Xylene	
1,2-Dichloroethane			
1,1,1-Trichloroethane			
Carbon tetrachloride			
Bromodichloromethane			
1,2-Dichloropropane		SURROGATE RECOVERIES:	
Trans-1,3-Dichloropropene		601	
Trichloroethene		Bromochloromethane	
Dibromochloromethane		2-Bromo-1-Chloropropane	
1,1,2-Trichloroethane		1,4-Dichlorobutane	
cis-1,3-Dichloropropene		4-Bromofluorobenzene	
2-Chloroethylvinyl ether			
Bromoform		602	
1,1,2,2-Tetrachloroethane		a,a,a,-Trifluorotoluene	
Tetrachloroethylene			
Chlorobenzene			
1,3-Dichlorobenzene			
1,2-Dichlorobenzene			
1,4-Dichlorobenzene			

VOA RESULTS

LAB # System Blank
CLIENT NAME
SAMPLE ID

EPA METHOD 601	DATE: ANALYST: INSTRUMENT:	EPA METHOD 602	DATE: 5/17/88 ANALYST: PO INSTRUMENT:
COMPOUND	**CONCENTRATION (ug/L)**	**COMPOUND**	**CONCENTRATION (ug/L)**
Chloromethane		Benzene	ND
Bromomethane		Toluene	
Vinyl Chloride		Ethyl benzene	
Chloroethane		Chlorobenzene	
Methylene chloride		1,4-Dichlorobenzene	
Trichlorofluoromethane		1,3-Dichlorobenzene	
1,1-Dichloroethene		1,2-Dichlorobenzene	
1,1-Dichloroethane		P-Xylene	
Trans-1,2-Dichloroethene		M-Xylene	
Chloroform		O-Xylene	
1,2-Dichloroethane			
1,1,1-Trichloroethane			
Carbon tetrachloride			
Bromodichloromethane			
1,2-Dichloropropane		SURROGATE RECOVERIES:	
Trans-1,3-Dichloropropene		601	
Trichloroethene		Bromochloromethane	
Dibromochloromethane		2-Bromo-1-Chloropropane	
1,1,2-Trichloroethane		1,4-Dichlorobutane	
cis-1,3-Dichloropropene		4-Bromofluorobenzene	
2-Chloroethylvinyl ether			
Bromoform		602	
1,1,2,2-Tetrachloroethane		a,a,a,-Trifluorotoluene	
Tetrachloroethylene			
Chlorobenzene			
1,3-Dichlorobenzene			
1,2-Dichlorobenzene			
1,4-Dichlorobenzene			

VOA RESULTS

LAB # Reagent Blank 5fw
CLIENT NAME
SAMPLE ID

EPA METHOD 601	DATE: ANALYST: INSTRUMENT:	EPA METHOD 602	DATE: 5/13/86 ANALYST: 4 INSTRUMENT: Alan
COMPOUND	CONCENTRATION (ug/L)	COMPOUND	CONCENTRATION (ug/L)
Chloromethane		Benzene	ND
Bromomethane		Toluene	
Vinyl Chloride		Ethyl benzene	
Chloroethane		Chlorobenzene	
Methylene chloride		1,4-Dichlorobenzene	
Trichlorofluoromethane		1,3-Dichlorobenzene	
1,1-Dichloroethene		1,2-Dichlorobenzene	
1,1-Dichloroethane		P-Xylene	
Trans-1,2-Dichloroethene		M-Xylene	
Chloroform		O-Xylene	
1,2-Dichloroethane			
1,1,1-Trichloroethane			
Carbon tetrachloride			
Bromodichloromethane			
1,2-Dichloropropane		SURROGATE RECOVERIES:	
Trans-1,3-Dichloropropene		601	
Trichloroethene		Bromochloromethane	
Dibromochloromethane		2-Bromo-1-Chloropropane	
1,1,2-Trichloroethane		1,4-Dichlorobutane	
cis-1,3-Dichloropropene		4-Bromofluorobenzene	
2-Chloroethylvinyl ether			
Bromoform		602	
1,1,2,2-Tetrachloroethane		a,a,a,-Trifluorotoluene	
Tetrachloroethylene			
Chlorobenzene			
1,3-Dichlorobenzene			
1,2-Dichlorobenzene			
1,4-Dichlorobenzene			

VOA RESULTS

LAB # System Blank
CLIENT NAME
SAMPLE ID

EPA METHOD 601	DATE: ANALYST: INSTRUMENT:	EPA METHOD 602	DATE: 5/17/88 ANALYST: INSTRUMENT:
COMPOUND	**CONCENTRATION (ug/L)**	**COMPOUND**	**CONCENTRATION (ug/L)**
Chloromethane		Benzene	
Bromomethane		Toluene	
Vinyl Chloride		Ethyl benzene	
Chloroethane		Chlorobenzene	
Methylene chloride		1,4-Dichlorobenzene	
Trichlorofluoromethane		1,3-Dichlorobenzene	
1,1-Dichloroethene		1,2-Dichlorobenzene	
1,1-Dichloroethane		P-Xylene	
Trans-1,2-Dichloroethene		M-Xylene	
Chloroform		O-Xylene	
1,2-Dichloroethane			
1,1,1-Trichloroethane			
Carbon tetrachloride			
Bromodichloromethane			
1,2-Dichloropropane		SURROGATE RECOVERIES:	
Trans-1,3-Dichloropropene		601	
Trichloroethene		Bromochloromethane	
Dibromochloromethane		2-Bromo-1-Chloropropane	
1,1,2-Trichloroethane		1,4-Dichlorobutane	
cis-1,3-Dichloropropene		4-Bromofluorobenzene	
2-Chloroethylvinyl ether			
Bromoform		602	
1,1,2,2-Tetrachloroethane		a,a,a,-Trifluorotoluene	
Tetrachloroethylene			
Chlorobenzene			
1,3-Dichlorobenzene			
1,2-Dichlorobenzene			
1,4-Dichlorobenzene			

VOA RESULTS

LAB # LEACH BLANK JH
CLIENT NAME
SAMPLE ID

EPA METHOD 601	DATE: ANALYST: INSTRUMENT:	EPA METHOD 602	DATE: 5/17/88 ANALYST: INSTRUMENT:
COMPOUND	CONCENTRATION (ug/L)	COMPOUND	CONCENTRATION (ug/L)
Chloromethane		Benzene	
Bromomethane		Toluene	
Vinyl Chloride		Ethyl benzene	
Chloroethane		Chlorobenzene	
Methylene chloride		1,4-Dichlorobenzene	
Trichlorofluoromethane		1,3-Dichlorobenzene	
1,1-Dichloroethene		1,2-Dichlorobenzene	
1,1-Dichloroethane		P-Xylene	
Trans-1,2-Dichloroethene		M-Xylene	
Chloroform		O-Xylene	
1,2-Dichloroethane			
1,1,1-Trichloroethane			
Carbon tetrachloride			
Bromodichloromethane			
1,2-Dichloropropane		SURROGATE RECOVERIES:	
Trans-1,3-Dichloropropene		601	
Trichloroethene		Bromochloromethane	
Dibromochloromethane		2-Bromo-1-Chloropropane	
1,1,2-Trichloroethane		1,4-Dichlorobutane	
cis-1,3-Dichloropropene		4-Bromofluorobenzene	
2-Chloroethylvinyl ether			
Bromoform		602	
1,1,2,2-Tetrachloroethane		a,a,a,-Trifluorotoluene	
Tetrachloroethylene			
Chlorobenzene			
1,3-Dichlorobenzene			
1,2-Dichlorobenzene			
1,4-Dichlorobenzene			

QUALITY CONTROL DATA SUMMARY

Submitted SAS 6-28-88

Compiled

Workorder 88-05-058 Client Geoscience Consultant Units ug/ml unless otherwise noted

PARAMETER	ANALYSIS DATE	CALIBRATION VERIFICATION STDS. FOUND	TRUE	%R	DUPLICATE ANALYSIS SAMP#	SAMP	DUPL	RPD	SPIKE RECOVERY SAMP#	SSR	SR	SA	%R	BLANK
As	5-17-88	0.094	0.100	94	P) D1	0.014	0.014	0	3020 5/16 Blank	0.019	—	0.020	95	P) <0.00
IDL=0.002 ug/ml		0.086	0.100	86										3020 s <0.00
		0.086	0.100	86										P) <0.00
														P) <0.00
Coliform	5-30-88													
Units are colonies/100 ml														
Cl	6-1-88	7.86	8.00	98										
		7.48	8.00	98										
		7.58	8.00	95										
F	6-1-88	4.04	4.00	101										
		3.84	4.00	96										
		3.88	4.00	97										
SO4	6-1-88	39.2	40.0	98										
		39.3	40.0	98										
		39.1	40.0	98										

RPD = [(|S-D|)/((S+D)/2)] x 100
RPD = Relative Percent Difference
NC = Not calculable due to a value less than five times the IDL

SPIKE %R = [(SSR-SR)/SA] x 100
# = Value is less than five times the instrument detection limit
IDL = Instrument Detection Limit

A = Analytical
P = Predigestion
SSR = Spiked Sample Result
SR = Sample Result
SA = Spiked Added

QUALITY CONTROL DATA SUMMARY

Submitted SRS 6-28-88

Compiled

Workorder 88-05-058 Client Geoscience Consultants Units ug/ml unless otherwise noted

PARAMETER	ANALYSIS DATE	CALIBRATION VERIFICATION STDS. FOUND	TRUE	%R	DUPLICATE ANALYSIS SAMP#	SAMP	DUPL	RPD	SPIKE RECOVERY SAMP#	SSR	SR	SA	%R	BLANKS
Hg	5-13-88	0.0036	0.0040	90					MS 01	0.0016	<0.0001	0.0020	80	P) <0.0001
IDL=0.0001ug/ml		0.0034	0.0040	85										P) <0.000
		0.0038	0.0040	95										P) <0.000
MHO	5-17-88	1344	1413	95										
		1349	1413	95										
NO3	5-23-88	1.26	1.25	101										
IDL=0.02		1.26	1.25	101										
Pb	5-18-88	0.094	0.100	94	A) 01	<0.002	<0.002	NC	3020 S/W Blank	0.022	—	0.020	110	P) <0.002
IDL=0.002 ug/ml		0.104	0.100	104					A) 02	0.024	<0.002	0.025	96	3020 S/W 0.003*
		0.104	0.100	104										P) <0.002
pH	5-20-88	7.01	7.00	100										
Recorded in pH units		1354	1413	96										

RPD = [(|S-D|)/((S+D)/2)] x 100
RPD = Relative Percent Difference
NC = Not calculable due to a value less than five times the IDL

SPIKE %R = [(SSR-SR)/SA] x 100
* = Value is less than five times the instrument detection limit
IDL = Instrument Detection Limit

A = Analytical
P = Predigestion
SSR = Spiked Sample Result
SR = Sample Result
SA = Spiked Added

QUALITY CONTROL DATA SUMMARY

Submitted Sfk 6-28-88

Compiled

Workorder 88-05-058 Client Geoscience Consultants Units ug/ml unless otherwise noted

PARAMETER	ANALYSIS DATE	CALIBRATION VERIFICATION STDS. FOUND	TRUE	%R	DUPLICATE ANALYSIS SAMP#	SAMP	DUPL	RPD	SPIKE RECOVERY SAMP#	SSR	SR	SA	%R	BLANKS
pH	5-17-88	7.00	7.00	100										
Recorded in	pH units	7.00	7.00	100										
		7.00	7.00	100										
		7.00	7.00	100										
Phenolics	6-7-88	0.263	0.250	105										
IDL=0.005	ug/ml	0.276	0.250	110										
		0.275	0.250	110										
Se	5-18-88	0.049	0.050	98					3020 5/16 Blank	0.022	—	0.020	110	(P) <0.003
IDL=0.003		0.053	0.050	106										3020 5/16 <0.003
		0.049	0.050	98										(P) <0.003
														(P) <0.003
TOC	6-1-88	34.5	32.8	105	(P) DIL 1:2 02H	81.6	82.0	0	MS DIL 1:2 02H	128	81.8	60.0	77	<1.0
IDL=1.0 ug/ml		34.3	32.8	105	MS+MSD 02H	128	128	0	MSD DIL 1:2 02H	128	81.8	60.0	77	<1.0
		33.5	32.8	102										

RPD = [(S-D)/((S+D)/2)] x 100
RPD = Relative Percent Difference
NC = Not calculable due to a value less than five times the IDL

SPIKE %R = [(SSR-SR)/SA] x 100
* = Value is less than five times the instrument detection limit
IDL = Instrument Detection Limit

A = Analytical
P = Predigestion
SSR = Spiked Sample Result
SR = Sample Result
SA = Spiked Added

QUALITY CONTROL DATA SUMMARY

Submitted SSR 6-28-88

Compiled

Workorder 88-05-058

Client Geoscience Consultants

Units ug/ml unless otherwise noted

PARAMETER	ANALYSIS DATE	CALIBRATION VERIFICATION STDS. FOUND	TRUE	%R	DUPLICATE ANALYSIS SAMP#	SAMP	DUPL	RPD	SPIKE RECOVERY SAMP#	SSR	SR	SA	%R	BLANKS
TDK	5-20-88	0.926	0.100	93	A) 02F	0.054	0.050	8	A) 02G	0.211	0.121	0.100	90	
IDL=0.01 mg/ml		0.999	0.100	100										
		0.992	0.100	99										
Turbidity	5-14-88													1.6
														1.6

RPD = [(|S-D|)/((S+D)/2)] x 100
RPD = Relative Percent Difference
NC = Not calculable due to a value less than five times the IDL

SPIKE %R = [(SSR-SR)/SA] x 100
# = Value is less than five times the instrument detection limit
IDL = Instrument Detection Limit

A = Analytical
P = Predigestion
SSR = Spiked Sample Result
SA = Spiked Added