Department of Energy
Oak Ridge Operations
Weldon Spring Site
Remedial Action Project Office
Route 2, Highway 94 South
St. Charles, Missouri 63303

February 27, 1989

Dr. Michael Garvey
208 Pitman Hill Road
St. Charles, Missouri 63303

Dear Dr. Garvey:

RESPONSE TO QUESTIONS RAISED CONCERNING THE RI/FS-EIS WORK PLAN

Enclosed are responses to your questions concerning the RI/FS-EIS Work Plan, which were raised at the December 6, 1988 public meeting. The responses are provided by the DOE (Enclosure 1), USGS (Enclosure 2), MDNR (Enclosure 3), and 1987 Quarry Monitoring (Enclosure 4).

Your concerns and comments are appreciated.

Sincerely,

Rod Nelson

Rod Nelson
Project Manager
Weldon Spring Site
Remedial Action Project

Enclosures:
As stated

cc w/enclosures:
D. Bedan, MDNR
D. Wall, USEPA
M. Halliday, SCCAHW

Enclosure 1

RESPONSE TO QUESTIONS RAISED DECEMBER 6, 1988 BY ST. CHARLES COUNTIANS AGAINST HAZARDOUS WASTE AT PUBLIC MEETING ON RI/FS-EIS WORK PLAN

Question: Will the environmental concerns, specifically of the contamination in the well field alluvium, be adequately addressed? Who will determine if the alluvium contamination will pose an unacceptable risk to public health and the environment?

Response: The environmental concerns of alluvial contamination are being addressed as part of the ongoing environmental monitoring program and will be addressed extensively following the removal of pond water and bulk wastes from the quarry. After this removal, DOE will conduct additional characterization of the quarry area and will evaluate the potential risks to public health and the environment associated with the conditions as they exist at that time and under projected future use scenarios. The risk evaluation will be reviewed by the U.S. Environmental Protection Agency (USEPA), Region VII and the Missouri Department of Natural Resources (MDNR), and it will be issued to the public.

Question: How will bulk quarry waste removal affect the dynamics of contaminant plume migration off site deposited in the alluvium and Femme Osage Slough;especially with the increasing need for pumping to supply quality water to a growing community?

Response: Excavation of bulk wastes from the quarry will remove the source of contaminants to the ground water. This action will greatly reduce the potential for future migration of contaminants from the quarry into the alluvium and Femme Osage Slough. The drinking water supplied by the county well field has not been affected to date by the presence of bulk wastes in the quarry. However, in order to ensure the protection of the well field and the continued supply of high-quality water to St. Charles County, it is important to remove these wastes to a controlled area pending a decision on their final disposition. Detailed plans are being developed on the procedures to be used to remove the bulk quarry wastes. Environmental

monitoring will be conducted during bulk waste removal to ensure that any environmental releases are at acceptably low levels. This monitoring program will include groundwater monitoring in the direction of the county well field.

Question: How will the results of environmental investigations at the quarry following bulk wastes removal affect these wastes present other than by source reduction? Will this investigation receive public comment?

Response: Following removal of the bulk wastes, environmental investigations at the quarry will support the performance of a risk assessment in order to evaluate the need for follow-on migration control measures such as groundwater remediation. Thus, the overall response action at the quarry will be comprehensive in that both source-control and migration-control measures will be addressed. Any subsequent response activities at the quarry will be described in environmental compliance documentation which will be made available to the public.

Question: In regard to the alluvium, how can the DOE consistently say that there are not elevated uranium activities observed in monitoring wells south of the slough? What about RMW-2, OBS-12 and #16?

Response: Monitoring has been performed in the alluvium since 1979 when LBL installed the first monitoring wells on both sides of the Femme Osage Slough. Elevated uranium levels have not been consistently elevated in monitoring wells south of the slough. The exceptions to this are RMW-2, OBS-12 and OBS-16. The uranium activities in RMW-2 are above background, but have remained below the U.S. EPA's proposed drinking water standards. The DOE is concerned about these elevated levels and recently installed additional monitoring wells to provide additional information on this contamination. The 1984 Environmental Monitoring Report reported an annual uranium average of 402 pCi/l for monitoring Well OBS-12. This annual average was calculated from two samples collected in 1984. These two

samples yielded results of 804 pCi/l and not detected. The former value is the only elevated uranium activity ever observed for this well. Several year samples were taken at the well during 1980, 1981, 1982, 1983, 1984, 1985, and 1986. All samples except the single elevated reading in 1984 yielded background results. An error in sampling, reporting, or labeling is the probable cause of this single elevated result. DOE is unaware of any elevated uranium levels from OBS-16B (MW-1011). Further clarification of this question is requested if you wish to pursue this issue.

Question: How often has the DOE evaluated uranium readings of the RMW and public drinking wells?

Response: RMW-1,-2, and -4 were analyzed for natural uranium on four occasions during 1987. RMW-3 was analyzed for natural uranium on three occasions during that same year. During 1988 all RMW wells were analyzed for natural uranium for three sampling episodes. The DOE has evaluated 100% of these data. It should be noted the RMW wells have been added to the 1989 Environmental Monitoring Program Plan (EMPP). They will be sampled and analyzed on a quarterly basis during 1989.

The DOE has not sampled individual public drinking water wells. However, as directed in the EMPP, the DOE samples raw water from the well field quarterly and analyzes for several chemical and radio-chemical parameters including natural uranium. This sample is taken at a point prior to treatment and the results are reported in the Annual Environmental Monitoring Report.

Question: Will a cluster well with different screened intervals near RMW-2 give better characterization?

Response: Additional wells near RMW-2 would give additional information regarding the vertical distribution of contaminants at RMW-2. What is more important is determining the migration pathway from the apparent source to the alluvium. The DOE recently installed

additional monitoring wells to help define this pathway and will continue to monitor RMW-2.

Question: As was mentioned in EPA's specific comments on the DEIS on May 5, 1987, Drinking Water Overview, "It is unclear to us whether planned groundwater monitoring at the Site (for radionuclides and other contaminants) will be directed to detection of movement toward the (public) well."

Response: Since the DEIS public hearing, groundwater monitoring at the WSQ has been greatly expanded to determine the extent of contamination in all directions, including toward the well field. Sixteen additional wells have been installed and several special studies and meetings have been held to achieve a consensus on WSQ monitoring activities. The majority of these activities have been directed toward detection of movement toward the production wells.

Question: Will DOE, in the future, pump the County monitoring wells and aid in ease of proper procedure for our County consultants?

Response: DOE is currently procuring dedicated sampling equipment to be installed in the County monitoring wells as soon as possible. This will standardize sampling between agencies.

Question: Will the new annual reports give quarterly data tables or will they continue to produce only annual averages from all monitoring activities at both sites?

Response: In the interest of brevity and clarity, the policy to report annual averages in the annual Environmental Monitoring Report (EMR) will remain unchanged. The DOE will continue to report the state of the environment in a format which best demonstrates the results of the monitoring program. When seasonal trends or

The DOE has established site policy that effectively states all data is available to the public. All monitoring information (including quarterly results) is available by request.

anomalous values occur, individual quarterly (or more frequent) results will be given in the EMR. When values at a given location show no change from earlier results, annual summaries will be presented.

Question: How can seasonal trends be evaluated with annual averages?

Response: Seasonal variations in groundwater quality, chemistry, and levels are indeed important aspects necessary to the complete understanding of the groundwater systems. Seasonal trends can not be evaluated with annual averages. The DOE evaluates impacts on the environment caused by seasonal fluctuations by interpreting all data. Seasonal trends can be seen and understood by comparing and analyzing all available accumulated information.

Question: Has the monitoring of the raw or finished water or individual public wells in the well field detected any contamination above the maximum concentration level (MCL)? If so, was error involved?

Response: The DOE has monitored raw water at the treatment plant quarterly since 1985 and has not detected any contamination above background. St. Charles County has primary responsibility for monitoring the public water supply and has considerable more data than the DOE.

Question: If contaminated groundwater has not migrated south of the Femme Osage Slough, how do we describe the readings of RMW-2, OBS-12, and OBS-16?

Response: Answered above.

Question: How can one side of the slough be hydraulically different from the other? What about the entire upper and lower slough interface?

Response: Any number of explanations are geologically possible to explain the difference between the north and south sides of the slough. The exact mechanisms are not completely understood at this time. However, both water level and water quality data indicate that the north and south sides are not well connected.

Question: Will the old quarterly data tables, since 1987, from the quarry be available?

Response: The quarterly sampling results for calendar year 1987 are enclosed as Enclosure 4 to this response. The first and second quarters data for calendar year 1988 were transmitted to Dr. Garvey in August 1988. As always, monitoring results are available on request.

Question: How often is the slough water released to the river?

Response: The gate valve controlling water discharge is operated by the Missouri Department of Conservation. This gate valve is currently open and whenever water levels in the slough are high enough to flow through the outlet structure, water is released.

Question: Does DOE and EPA feel that the well field will continue to be a reasonable source of quality drinking water in the future?

Response: Based on current information, trend analysis, and on understanding of the major hydrologic features, we believe the well field will continue to be a source of quality drinking water for the foreseeable future. Again, the potential threat to the well field from contamination in the Quarry makes it prudent to begin treatment of the water in the Quarry and exhumation of the bulk contamination as soon as possible.

Question: Who is the responsible party should the well field need relocation?

Response: Should monitoring well results at the well field indicate a degradation in the quality of the drinking water due to contamination from the Quarry, DOE will take the lead to ensure a safe water supply.

Question: Will the DOE, in testing drinking water, determine compliance with 141.15(a) [the detection limit shall not exceed 1 pCi/l] and 141.15(b) [the detection limit shall not exceed 3 pCi/l]?

Response: The DOE is not the responsible agency for determining compliance with respect to drinking water standards. However, radiological analyses Radium-226 and -228 and gross alpha in the past (and in the future will continue to) conformed to the detection limits specified in 40 CFR part 141.25 for water samples collected by the WSSRAP.

Question: What are the results of the groundwater monitoring of the Gun Club in a similar alluvium upstream from the Weldon Spring Well Field?

Response: A December 1988 sampling of alluvial groundwater at the upstream gun club conducted jointly by MDNR and DOE reported 5 pCi/l of natural uranium from a filtered sample.

Question: Has the USGS determined what are appropriate background/baseline levels of the well field for contaminants found in the quarry? When will this data be available?

Response: USGS's response to this question can be found in Enclosure 2.

Question: Should DOE be using 4 pCi/l as background for alluvium of the well field or is it actually an elevated baseline reading?

Response: All information gathered to date indicates that 4 pCi/l is a good approximation to the upper limit of the background uranium concentration range. For example, a December 1988 sampling of alluvial water at the upstream Gun Club conducted jointly by MDNR and DOE reported 5 pCi/l of total natural uranium of a filtered sample. This location was selected because its upstream location precludes any contamination from the Weldon Spring Site. Determination of background levels of pollutants at the Weldon Spring Site is an ongoing effort consisting of planning, sampling and analyses, and data

interpretation. As part of this continuing review of data, 4pCi/l is an appropriate value for an upper limit to the background range.

Question: Is there a dilutional effect inherent in the design of the County monitoring wells with the long screened intervals?

Response: Before addressing the technical elements of the question, it is important to note that the St. Charles County monitoring wells (RMW-1 through 4) were installed according to specifications of St. CHarles County. It was the County's requirement that the 40 foot screens be used.

It is more correct to say that under certain conditions a dilution effect is possible rather that calling it "inherent in the design". If the 40 foot screen that is used at the County Well Field passed through several different flow zones, one of which was contributing flow of contamination, flow contributed by the other portions of the screened area would dilute the contribution of the contaminated zone. This is a situation well known to groundwater hydrologists and the screening interval is a factor considered in all groundwater studies. The Weldon Spring Site studies use both long and short screening intervals in various wells to meet a wide variety of needs ranging from site characterization of a specific zone to overall public health protection for a large area such as the County Well Field.

The rationale for the long screen interval at the County monitoring wells was an intentional effort to maximize the possibility of intercepting any flow of contaminated groundwater from the quarry. The County monitoring wells, therefore, would act as a last line of detection to intercept possible contamination from all zones of flow that might enter into the County Well Field.

To more precisely identify contaminated zones in the Quarry and County Well Field areas, DOE monitoring wells use a variety of screen lengths with ranges of 3, 5, 10 and 20 feet.

By selecting the appropriate screen length, water from a wide range of zones or aquifers can be sampled.

Question: Is the design compatible with the testing being required of the county monitoring wells?

Response: MDNR's response to this question can be found in Enclosure 3.

Question: We agree that water treatment and bulk waste removal will improve the source contamination, but we are not convinced that enough material is presented to evaluate the proposed interim storage at the second site.

Response: An extensive characterization of that portion of the raffinate pits and chemical plant area of the Weldon Spring site that has been proposed as the location for temporary storage of the quarry bulk wastes is currently under way. This area will be characterized and engineered, as appropriate, prior to its use. All activities related to this action will be conducted in a manner that ensures the health and safety of the public and the environment during the storage period. As with all environmental activities at the Weldon Spring Site, the public review and comment on the proposal prior to initiation of bulk waste removal activities.

Question: Has the DOE or the EPA realistically considered an alternate site for long-term storage of the bulk wastes of the quarry?

Response: The DOE has considered the off-site alternative for storage of excavated bulk wastes; no off-site facility currently exists that could accommodate these radioactively and chemically contaminated materials. Thus, if the bulk wastes are not to be stored on the Weldon Spring site pending a decision on their ultimate disposition, removal of wastes from the quarry could not be expedited, and the associated threat of exposure to migrated contaminants could continue until after the record of decision for the site is approved.

Question: Will bulk waste removal and later reorganization and interim storage at the second site improve the total situation or rather further complicate the environmental engineering assessment of the DOE's proposed alternative of long-term storage on site?

Response: The removal of bulk wastes from the quarry and consolidation at the raffinate pits and chemical plant area will greatly improve the current situation by permitting active control of the wastes to limit the potential for contaminant releases off-site. This action will also improve DOE's ability to assess alternatives for management of all contaminated materials from the Weldon Spring site because it will permit the characterization and segregation of much of the material and will support the overall characterization activities for a determination regarding long-term management. No decision on the means for waste disposal has yet been made. Such a decision will result from the analyses prepared to support the Remedial Investigation/Feasibility Study - Environmental Impact Statement (RI/FS-EIS) process.

Question: When will the engineering evaluation of the design and location of the interim storage facility be presented and will there be an opportunity for public comment?

Response: The engineering evaluation of the interim storage facility is scheduled to be issued for public comment in the fall of 1989.

Question: If methods for controlling surface water runoff from the site during construction is not a primary issue, how can the citizens of St. Charles be assured of adherence to discharge permit levels? Will surface runoff levels be monitored during excessive rainfalls?

Response: We currently have a NPDES permit for the surface water discharges from the site. Effluent water is measured, sampled and reported monthly to MDNR in compliance with

the permit requirements. This includes the measurement of both quantity and quality of the runoff during normal and excessive rainfall periods.

Question: What are you "constructing" here (A 4.2 P 171)?

Response: The term "constructing" is a generic term used to describe the remediation activities such as demolition of buildings, and construction of temporary support facilities such as haul roads, water treating plants, drainage control dikes, etc.

Question: Why is the effect of natural events such as intensive rains not considered a primary issue?

Response: Disruptive natural events such as earthquakes are considered primary issues (see Section A.4.1 of the Work Plan) because of the severity of their potential effects and the considerable engineering effort required to address such effects. Although an important issue, the potential effects of rainfall -- e.g., relative to engineering considerations -- are much less important than the potential effects of seismic activity. Thus, the effect of rainfall is considered a secondary issue, as identified in Section A.4.2 of the Work Plan.

Question: Will the treated water from the quarry and raffinate pits be piped to the Missouri River directly to avoid the fragile watersheds in St. Charles County which have been at risk for too long? Will both actions have public comment?

Response: The treated water from the quarry will be piped directly to the Missouri River, as described in the engineering evaluation/cost analysis (EE/CA) report for management of the contaminated quarry water. An EE/CA for management of contaminated water in the raffinate pits is in preparation, and a decision regarding the discharge location for this treated water will be included in the document. Both EE/CAs will be issued for public comment.

Question: Are new surface soils being used in construction of the southeast drainage dike? Will this create a new discharge area?

Response: The southeast drainage dike is planned to provide for sediment control and provide a way to more closely control off-site discharges. It will be constructed with on-site soil to avoid potentially contaminating additional soil. The discharge location will be the same.

Question: What safeguards will be made to traffic on Highway 94 in the quarry remediation and transportation?

Response: Public safety will be a top priority during the transportation of quarry wastes to the plant site. Studies are currently underway to provide transportation from the quarry to the chemical plant site by alternate routes to minimize use of public roads. Appropriate traffic control methods such as flagmen, traffic signals, etc. will be employed wherever specific traffic hazards are identified. Traffic control methods at haul road/Highway 94 intersections will be reviewed with transportation agencies to ensure they are appropriate. Waste transportation plans will also be reviewed during public meetings and public input will be solicited and incorporated into the plans.

Question: How will remediation at the chemical plant avoid water lines of Missouri Cities Water?

Response: We are working closely with local water authorities to identify and locate all water lines prior to any remediation in an area. Existing pipelines, located from as-build drawings and liaisons with local water authorities, are shown on project design drawings prior to any work in the field.

Question: There is a contradiction in placing the Francis Howell students and staff as a primary issue and not attempting to monitor their health. Will the same posture be continued should monitoring during clean up show exposure at measurable levels of airborne particulates and gasses?

Response: The health and safety of students and staff at Francis Howell High School (FHHS) are indeed of primary concern for the Weldon Spring Site Remedial Action Project. Operations during the remedial action work will be conducted in a manner that will ensure the health and safety of the students and staff of Francis Howell High School. The Missouri Department of Health (DOH) is in agreement with DOE that proper planning, adequate work procedures and practices, and a reliable monitoring program to verify compliance with exposure guidelines will ensure the health and safety of the students and faculty. The DOE and the Missouri DOH do not believe that baseline medical exams would be beneficial. An appropriate physical which would provide an adequate baseline for evaluating the health effects associated with the radiological levels associated with this project does not exist. That coupled with the long latency period for health effects from radiation exposure make medical exams impractical. Medical exams would not ensure the health or safety nor would they provide an early warning. Again, proper planning, adequate work procedures and practices, and reliable monitoring are more important in protecting the health and safety of the public. The DOE is committed to a safe environment for the public during the cleanup.

Question: Will the DOE follow the recent suggestion of the Missouri Department of Health and provide the Francis Howell School District with the funds required to hire impartial experts to conduct monitoring for radiation?

Response: The DOE is currently working with the Francis Howell School District to fund an independent consultant.

Question: Our group would like to work with the Missouri Department of Health and the school district in cross checking the present childhood leukemia patients in the state registry to the population of alumni from the Francis Howell school district to see if there is a statistical causal relationship to the Weldon Spring sites.

Response: This statement suggests a study involving the St. Charles Countians Against Hazardous Waste, the Missouri Department of Health and the school district. We recommend you contact those agencies directly.

Question: The leukemia study of the Missouri Department of Health was not set up to make a causal association between Francis Howell and the Weldon Spring sites.

Response: DOE concurs with this comment. The Missouri Department of Health conducted a study of leukemia incidence in children age 14 and under in St. Charles County for 1970-1983. This study was not conducted to determine if the Weldon Spring site was responsible for any of these cases. However, the study did conclude that there did not appear to be any evidence for linking the leukemia cases identified with any specific cause.

Question: Is storage on site still the preferred alternative by the DOE?

Response: A preferred alternative for management of the Weldon Spring site will result from the RI/FS-EIS process that is currently under way. Although on site storage is still considered a reasonable alternative based on current information, the preferred alternative will not be made until the RI/FS-EIS record of decision, which is scheduled for 1991.

Question: I would like the Federal Government to make a strong commitment to assume responsibility for ownership, maintenance and monitoring during the time the wastes are likely to be hazardous wherever the storage site is to be located.

Response: The DOE is very strongly committed to being responsible for the effective control of contaminated materials from the Weldon Spring site and will be responsible for monitoring and maintenance of the disposal facility, wherever it is located, for the foreseeable future.

Question: I do not understand the logic of a time frame of 200-1,000 years, that is too large a range of years.

Response: The 200- to 1,000-year time frame is identified for consistency with EPA's time frames for management of similarly contaminated radioactive material (see Section B.2.12 of the Work Plan).

Question: How can relocation to a "generic site" be realistically evaluated with a cost feasibility study?

Response: Consistent with EPA's RI/FS guidance; effectiveness, implementability, and cost are the three specific categories for screening preliminary alternatives, such as the relocation of Weldon Spring material to a generic site. Thus, the cost feasibility of waste relocation constitutes only a portion of the overall analysis of this alternative and will be addressed as required by the RI/FS process.

Question: Perhaps relocation to Callaway should be considered realistically?

Response: The DOE does not believe that disposal of the Weldon Spring wastes adjacent to the Callaway plant is an option that is realistically available. The land is privately owned and not currently available to DOE for waste disposal. The DOE will evaluate use of specific off-site locations in the future, if necessary.

Question: I would like the DOE to give some examples of situations which would render on-site disposal infeasible?

Response: On site disposal could be rendered infeasible by various factors, including (1) inadequate structural stability, (2) location on a large, active fault line, (3) location in a floodplain, and (4) the presence of significant historic sites or archeological and cultural resources.

Question: We would like the DOE and EPA to discuss comment Issue 14 with more detail. How can an impermeable cap limit osmosis and lateral recharge without an impermeable bottom to the cell?

Response: An impermeable cap can limit osmosis and lateral recharge within contaminated material by precluding the infiltration of surface water runoff or precipitation, i.e., the source of the gradient for contaminant movement; the nature of the bottom layer has no effect on the intrusion of water from above. No decision has been made on the design for a disposal cell. Various design features, such as use of an impermeable bottom, will be evaluated in engineering studies to support the RI/FS-EIS process.

Question: How will the decision be made regarding ground water remediation of the raffinate pit area? Please discuss Issue 18 with more detailed information? Try to make a better case for long-term storage in an area with groundwater contamination?

Response: A decision on groundwater remediation in the raffinate pits area will be made consistent with requirements of the RI/FS-EIS process, whereby technologies are screened for applicability and then assembled into alternatives that are screened and subsequently evaluated in detail prior to the selection of a preferred alternative. Current groundwater contamination in the raffinate pits area is a significant concern in evaluation of remedial action alternatives for the site. No decision on locating a disposal site has been made at this time. Such a decision will involve an evaluation of all relevant environmental factors, including the current contaminated groundwater at the Weldon Spring site.

Question: Please define "large void" in Issue #21.

Response: A "large void" is simply an open space within the geologic material, e.g., the can form as a result of limestone dissolution by groundwater, and that is larger than pore spaces typically found in such material.

Enclosure 2

United States Department of the Interior

GEOLOGICAL SURVEY

Water Resources Division
1400 Independence Road
Mailstop 200
Rolla, Missouri 65401

January 18, 1989

Rod Nelson
Department of Energy
Weldon Spring Site
Route 2, Highway 94 South
St. Charles, MO 63303

Dear Rod:

At the December 6, 1988, Weldon Spring Public Meeting on the Work Plan, Dr. Garvey asked "Has the USGS determined what are appropriate background/ baseline levels of the well field contaminants found in the quarry? When will this data be available?" The primary contaminant of interest in the quarry is uranium and USGS has not determined the background for uranium in the well field. However, in November, 1988, the Missouri Department of Natural Resources, Division of Environmental Quality and Jacobs Engineering sampled the Daniel Boone Gun Club well in the Missouri River alluvium about four miles upstream from the well field. USGS did not participate in that sampling because of scheduling problems. The results of sampling of the gun club well by DNR and Jacobs indicate that a background for uranium of four picocuries per liter for the well field is reasonable. The validity of four picocuries per liter for background will be checked by additional sampling of the gun club well tentatively scheduled for the week of January 23, 1989. USGS will participate in that sampling and our results should be available in about 60 days after sampling.

If you or Dr. Garvey have additional questions about USGS participation in work at Weldon Spring, please call me at 314-341-0827.

James H. Barks
Chief, Hydrologic Investigations

cc: Dr. Mike Garvey

Enclosure 3

JOHN ASHCROFT
Governor

TRACY MEHAN, III
Director

STATE OF MISSOURI
DEPARTMENT OF NATURAL RESOURCES

Division of Energy
Division of Environmental Quality
Division of Geology and Land Survey
Division of Management Services
Division of Parks, Recreation, and Historic Preservation

P.O. Box 176
Jefferson City, MO 65102

January 20, 1989

Mr. Rod Nelson, Project Manager
Weldon Spring Site Remedial Action Project
Route 2, Highway 94 South
St. Charles, Missouri 63303

Dear Mr. Nelson,

This letter is in response to your letter of January 18, 1989 requesting comments on one of Dr. Michael Garvey's questions at the December 6, 1988 public meeting on the Weldon Spring Project Work Plan.

Dr. Garvey asked whether the design of the St. Charles County monitoring wells is compatible with the testing being required of the county.

The MDNR believes that the well design is compatible with the testing being required of the County since the purpose of the monitoring wells is to serve as an early warning system. It is not necessary to have a more intensive monitoring system unless unusually high levels are detected. Currently, the water in all of the County monitoring wells meets public drinking water standards.

If more intensive monitoring were necessary there are selective sampling techniques or packer devices which could be used to help pinpoint any problems.

In any case the MDNR believes that there will be more than adequate time to take action if problems began to develop in the well field.

If you have any questions on this issue please do not hesitate to contact me.

Sincerely,

DIVISION OF ENVIRONMENTAL QUALITY

David E. Bedan,
Weldon Spring Work Group Coordinator

DEB/cjj

cc: Mr. Ron Kucera, Deputy Director, MDNR
Mr. William Ford, Director, DEQ
Dr. Jim Williams, Director, DGLS
Mr. Jerry Lane, Director, PDWP
Mr. Dan Wall, Superfund Branch, U.S. EPA, R-VII

GROUNDWATER

RADIOCHEMISTRY, WSQ

FIRST QUARTER 1987

Sample No.	Date Sampled	Activity +/- Error (pCi/Liter) Gross Alpha	Gross Beta	Natural Uranium	Radium -226	Radium -228	Thorium -230	Thorium -232
GW-1001	NOT SAMPLED INSUFFICIENT PRODUCTION							
GW-1002	3/12/87	ND	ND	3.8 +/- 1.1	ND	ND	ND	ND
GW-1003	NOT SAMPLED INSUFFICIENT PRODUCTION							
GW-1004	3/11/87	2600 +/- 300	2500 +/- 300	3900 +/- 400	ND	32 +/- 6	ND	ND
GW-1005	3/11/87	460 +/- 50	490 +/- 50	420 +/- 50	ND	ND	ND	ND
GW-1006	3/13/87	640 +/- 50	850 +/- 90	1300 +/- 200	1.0 +/- 0.1	ND	ND	ND
GW-1007	3/13/87	78 +/- 9	120 +/- 20	360 +/- 40	1.8 +/- 0.2	ND	ND	ND
GW-1008	3/13/87	500 +/- 50	280 +/- 30	770 +/- 80	3.7 +/- 0.1	ND	ND	ND
GW-1009	3/13/87	ND	ND	12 +/- 2.0	ND	ND	ND	ND
GW-1010	3/10/87	ND	ND	ND	ND	ND	ND	ND
GW-1011	3/10/87	ND	ND	ND	ND	ND	ND	ND
GW-1012	3/2/87	ND	28 +/- 2.9 +/- 1	ND	ND	ND	12+/- 1	ND

NOTE: Uncertainties represent 95% confidence limits (2 SIGMA).
ND - Not Detected

GROUNDWATER

RADIOCHEMISTRY, WSQ

SECOND QUARTER 1987

Sample No.	Date Sampled	Activity +/- Error (pCi/Liter) Natural Uranium	Radium 226	Thorium 230	Thorium 232
GW-1001	06/18/87	9.3 +/- 1.5	ND	ND	ND
GW-1002	06/18/87	2.1 +/- 0.8	ND	ND	ND
GW-1002D	06/18/87	2.0 +/- 0.8	ND	ND	ND
GW-1003	06/18/87	2.2 +/- 0.8	ND	ND	ND
GW-1004	06/16/87	3300 +/-400	ND	ND	ND
GW-1005	06/16/87	270 +/- 30	ND	ND	ND
GW-1006	06/02/87	970 +/- 150	ND	ND	ND
GW-1007	06/02/87	200 +/- 20	ND	ND	ND
GW-1008	06/19/87	540 +/- 60	ND	ND	ND
GW-1009	06/19/87	6.3 +/- 1.3	ND	ND	ND
GW-1010	05/26/87	0.9 +/- 0.6	ND	ND	ND
GW-1011	05/26/87	ND	ND	ND	ND
GW-1012	06/16/87	4.0 +/- 1.5	ND	ND	ND
GW-1018	07/31/87	ND	ND	ND	ND

NOTE: Uncertainties represent 95% confidence limits (2 SIGMA).
ND - Not Detected
D - Duplicate Sample

GROUNDWATER

RADIOCHEMISTRY, WSQ

THIRD QUARTER 1987

Sample No.	Date Sampled	Activity +/- Error (pCi/Liter) Gross Alpha	Gross Beta	Natural Uranium	Radium 226	Radium 228	Thorium 230	Thorium 232
GW-1001	10/02/87			12 +/- 2	ND		ND	ND
GW-1002	10/01/87			ND	ND		ND	ND
GW-1003		Not Sampled Insufficient Production						
GW-1004	10/02/87			2200 +/- 300	ND		ND	ND
GW-1005	10/01/87			970 +/- 100	ND		ND	ND
GW-1006	09/28/87			1900 +/- 200	ND		ND	ND
GW-1006-D	09/28/87			1400 +/- 200	ND		ND	ND
GW-1007	09/29/87			200 +/- 20	ND		ND	ND
GW-1008	09/29/87			320 +/- 40	ND		ND	ND
GW-1009	09/22/87			5.0 +/- 1.1	ND		ND	ND
GW-1010	09/22/87			1.3 +/- 0.6	ND		ND	ND
GW-1011	09/22/87			ND	ND		ND	ND
GW-1012	09/30/87			5.8 +/- 1.2	ND		ND	ND
GW-1013	09/28/87	300 +/- 30	290 +/- 30	1200 +/- 200	ND	ND	ND	ND
GW-1014	09/28/87	650 +/- 70	7490 +/- 50	1200 +/- 200	ND	ND	ND	ND
GW-1015	09/24/87	310 +/- 40	4180 +/- 20	470 +/- 50	ND	ND	ND	ND
GW-1015-D	09/24/87	320 +/- 40	4170 +/- 20	470 +/- 50	ND	3.5 +/- 1	ND	ND
GW-1016	09/24/87	26 +/- 6	ND	32 +/- 4	ND	ND	ND	ND
GW-1017	09/22/87	ND	ND	1.2+/-0.6	ND	ND	ND	ND
GW-1018	09/23/87	ND	ND	ND	ND	ND	ND	ND
GW-1019	09/23/87	ND	ND	ND	ND	ND	ND	ND

NOTE: Uncertainties represent 95% confidence limits (2 SIGMA)
ND - Not Sampled
D - Duplicate

GROUNDWATER

RADIOCHEMISTRY, WSQ

FOURTH QUARTER 1987

Sample No.	Date Sampled	Activity (pCi/L) Radium-226	Thorium-230	Thorium-232	Natural Uranium
GW-1001	12/14/87	ND	ND	ND	23 +/- 3
GW-1002	12/14/87	ND	ND	ND	2.7 +/- 0.9
GW-1003	NOT SAMPLED INSUFFICIENT PRODUCTION				
GW-1004	12/14/87	ND	ND	ND	2800 +/- 300
GW-1004D	12/14/87	ND	ND	ND	2000 +/- 3
GW-1005	12/18/87	ND	ND	ND	780 +/- 80
GW-1006	12/12/87	ND	ND	ND	770 +/- 80
GW-1007	12/12/87	ND	ND	ND	130
GW-1008	12/12/87	ND	ND	ND	460 +/- 50
GW-1009	12/12/87	ND	ND	ND	4.9 +/- 1.0
GW-1010	12/05/87	1.8 +/- 0.2	ND	ND	ND
GW-1011	12/05/87	ND	ND	ND	ND
GW-1012	12/18/87	ND	ND	ND	4.9 +/- 1.1
GW-1013	12/07/87	ND	ND	ND	1400 +/- 200
GW-1014	12/07/87	ND	ND	ND	1200 +/- 200
GW-1015	12/07/87	ND	ND	ND	700 +/- 70
GW-1015D	12/07/87	ND	ND	ND	450 +/- 50
GW-1016	12/07/87	ND	ND	ND	52 +/- 6
GW-1017	12/05/87	2.2 +/- 0.2	ND	ND	ND
GW-1018	12/05/87	1.9 +/- 0.2	ND	ND	ND
GW-1019	12/05/87	2.6 +/- 0.2	ND	ND	ND

* ND: Not Detected

NOTE: Uncertainties represent 95% confidence limits (2 SIGMA).

GROUNDWATER

INORGANIC ANIONS, WSQ

FIRST QUARTER, 1987

		Concentration mg/L								
U.S. E.P.A. Primary/Secondary Drinking Water Standard mg/L		Nitrate (as N) 10	Sulfate 250	Chloride 250	Fluoride 2	TDS 500	TOC S	Hardness S	Cyanide CWA Standard* 0.05	Phenol Standard* 0.001
Detection Limit									0.01	0.01
Sample No.	Date Sampled									
GW-1001	NOT SAMPLED INSUFFICIENT PRODUCTION									
GW-1002	3/12/87	0.4	62.7	9.06	ND	404	3	313	ND	ND
GW-1003	NOT SAMPLED INSUFFICENT PRODUCTION									
GW-1004	3/11/87	537	329	7.0	0.97	872	3.48	530	ND	ND
GW-1005	3/11/87	579	379	125	0.62	600	11.2	372	ND	ND
GW-1006	3/13/87	2.2	377	50.9	ND	1108	6.28	777	0.014	ND
GW-1007	3/13/87	3.2	132	71.0	ND	968	8.63	784	0.013	ND
GW-1008	3/13/87	ND	238	24.3	ND	816	6.06	784	ND	ND
GW-1009	3/13/87	ND	160	28.5	ND	870	5.01	740	ND	ND
GW-1010	3/10/87	ND	4.40	7.91	ND	278	4.17	215	ND	ND
GW-1011	3/10/87	ND	20	9.64	ND	318	4.00	267	ND	ND
GW-1012	3/2/87	0.8	479	11.4	0.76	1156	13	528	ND	ND

* - Clean Water Act
S - No Drinking Water Standard
ND - Not Detected

GROUNDWATER

INORGANIC ANIONS, WSQ

SECOND QUARTER 1987

Sample No.	Date Sampled	Concentration mg/L Nitrate	Sulfate	Chloride	Fluoride	TOC
GW-1001	06/18/87	0.8	349	24.3	0.8	11
GW-1002	06/18/87	320	70.9	7.9	0.4	28
GW-1002D	06/18/87	2.7	65.6	5.1	0.4	11
GW-1003	06/18/87	7.8	100	6.6	0.5	4
GW-1004	06/16/87	106	281	66	ND	3
GW-1005	06/16/87	45	160	42	ND	17
GW-1006	06/02/87	5.7	396	48.7	1.1	121
GW-1007	06/02/87	0.6	52.8	72.6	1.1	251
GW-1008	06/19/87	1.5	192	32.3	0.8	4
GW-1009	06/19/87	6.6	125	33.6	1.0	6
GW-1010	05/26/87	ND	3.3	9.8	ND	7
GW-1011	05/26/87	ND	14.1	9.5	ND	9
GW-1012	06/16/87	37	46	51	ND	26
GW-1018	07/31/87	3358	148	70	ND	5

ND - Not Detected
D - Duplicate

GROUNDWATER

INORGANIC ANIONS, WSQ

THIRD QUARTER 1987

Sample No.	Date Sampled	Concentration (mg/L) Nitrate	Sulfate	Chloride	Fluoride	Hardness	TDS	TOC	Cyanide	Phenol	TSS
GW-1001	10/02/87	1.7	463	17.4	1.2			145			
GW-1002	10/01/87	0.7	64.5	8.1	0.8			1			
GW-1003	NOT SAMPLED INSUFFICIENT PRODUCTION										
GW-1004	10/02/87	ND	25.9	30.4	1.4			2.16			
GW-1005	10/01/87	ND	194	16.9	1			2.44			
GW-1006	09/28/87	4.4	374	51	1.2			4.49			
GW-1006-D	09/28/87	4.7	365	51	1.2			4.57			
GW-1007	09/29/87	2.4	10.3	78.7	1.2			6.69			
GW-1008	09/29/87	2.1	227	25.6	1			3.63			
GW-1009	09/22/87	0.7	113	31.9	1.1			8			
GW-1010	09/22/87	1.4	1.2	11.6	0.7			8			
GW-1011	09/22/87	0.3	19.5	15.3	0.6			15			
GW-1012	09/30/87	3.5	37.0	7.9	1.3			1.21			
GW-1013	09/28/87	ND	112	24.5	0.9	444	1002	3.8	0.008	ND	ND
GW-1014	09/28/87	25.2	106	21.5	1.0	524	720	2.3	0.012	ND	ND
GW-1015	09/24/87	1.3	160	31.5	1.0	568	727	2.55	ND	ND	ND
GW-1015-D	09/24/87	1.5	156	30.6	1.0	556	599	6.58	ND	ND	ND
GW-1016	09/24/87	ND	154	14.6	0.9	544	670	2.63	ND	ND	ND
GW-1017	09/22/87	ND	1.3	24.4	1.0	630	715	15	ND	ND	47
GW-1018	09/23/87	ND	51.4	33.4	0.9	614	701	6	ND	ND	58
GW-1019	09/23/87	ND	1.05	8.5	0.8	440	483	12	ND	ND	12

D - Duplicate
ND - Not Detected

GROUNDWATER

INORGANICS ANIONS, WSQ

FOURTH QUARTER 1987

SAMPLE NO.	DATE SAMPLED	Concentration (MG/L) CHLORIDE	FLUORIDE	NITRATE	SULFATE
GW-1001	12/14/87	22.8	0.9	0.3	419
GW-1002	12/14/87	6.2	0.5	ND	56
GW-1004	12/14/87	31	1	ND	259
GW-1004D	12/14/87	395	1	ND	267
GW-1005	12/18/87	5.5	0.2	ND	175
GW-1006	12/12/87	66	0.9	0.43	30
GW-1007	12/12/87	65	0.8	4.1	29
GW-1008	12/12/87	7.2	0.8	ND	27
GW-1009	12/12/87	33	0.8	0.1	96
GW-1010	12/05/87	5.1	0.5	ND	0.58
GW-1011	12/05/87	8.8	0.5	ND	16.1
GW-1012	12/18/87	ND	0.3	ND	275
GW-1013	12/07/87	474	0.8	ND	1399
GW-1014	12/07/87	446	0.8	ND	1286
GW-1015	12/07/87	472	0.8	1.3	1686
GW-1015D	12/07/87	480	0.8	1.3	1651
GW-1016	12/07/87	372	0.7	ND	1699
GW-1017	12/05/87	8.8	0.8	ND	8.1
GW-1018	12/05/87	532	0.8	ND	935
GW-1019	12/05/87	4.33	0.65	ND	0.69

ND - Not Detected
D - Duplicate

GROUNDWATER

NITROAROMATICS, WSQ

FIRST QUARTER 1987

Sample No.	Date Sampled	2,4,6 TNT (ug/L)	2,4 DNT (ug/L)	2,6 DNT (ug/L)	Nitro-benzene (ug/L)	1,3,5-Trinitro-benzene (ug/L)	1,3-Dinitro-benzene (ug/L)
GW-1001	NOT SAMPLED INSUFFICIENT PRODUCTION						
GW-1002	3/12/87	4.3	0.5	0.9	ND	0.9	ND
GW-1003	NOT SAMPLED INSUFFICIENT PRODUCTION						
GW-1004	3/11/87	3.1	0.5	1.5	ND	0.3	ND
GW-1005	3/11/87	0.1	ND	ND	ND	0.1	ND
GW-1006	3/13/87	14.6	0.3	2.4	ND	6.8	ND
GW-1007	3/13/87	ND	ND	ND	ND	ND	ND
GW-1008	3/13/87	ND	ND	ND	ND	ND	ND
GW-1009	3/13/87	ND	0.2	ND	ND	ND	ND
GW-1010	3/10/87	ND	0.2	0.8	ND	ND	ND
GW-1011	3/10/87	ND	0.2	ND	ND	ND	ND
GW-1012	3/2/87	ND	0.2	ND	ND	ND	ND

ND - Not Detected

GROUNDWATER

NITROAROMATICS, WSQ

SECOND QUARTER 1987

Sample No.	Date Sampled	2,4,6-TNT (ug/L)	2,4 DNT (ug/L)	2,6 DNT (ug/L)	Nitro benzene (ug/L)	1,3,5-Trinitro benzene (ug/L)	1,3-Dinitro benzene (ug/L)
GW-1001	06/18/87	ND	ND	ND	ND	ND	ND
GW-1002	06/18/87	9.5	ND	ND	ND	3.2	ND
GW-1102	06/18/87	9.5	.84	ND	ND	3.1	ND
GW-1003	06/18/87	ND	ND	ND	ND	ND	ND
GW-1004	06/16/87	7.6	ND	ND	ND	0.46	ND
GW-1005	06/16/87	ND	ND	1.8	ND	ND	ND
GW-1006	06/02/87	22.2	0.60	5.4	ND	10.7	ND
GW-1007	06/02/87	ND	ND	ND	ND	ND	ND
GW-1008	06/19/87	ND	ND	ND	ND	ND	ND
GW-1009	06/19/87	ND	ND	ND	ND	ND	ND
GW-1010	05/26/87	ND	0.19	ND	ND	ND	ND
GW-1011	05/26/87	ND	ND	ND	ND	ND	ND
GW-1012	06/16/87	ND	ND	3.4	ND	ND	ND
GW-1018	07/31/87	ND	ND	ND	ND	ND	ND

ND - Not Detected

GROUNDWATER

NITROAROMATICS, WSQ

THIRD QUARTER 1987

Sample No.	Date Sampled	2,4,6-TNT (ug/L)	2,4-DNT (ug/L)	2,6-DNT (ug/L)	Nitro-Benzene (ug/L)	1,3,5-Trinitro-benzene (ug/L)	1,3-Dinitro benzene (ug/L)
GW-1001	10/02/87	ND	ND	ND	ND	ND	ND
GW-1002	10/01/87	ND	ND	ND	2.2	0.48	ND
GW-1003	Not Sampled Insufficient Production						
GW-1004	10/02/87	ND	0.33	ND	ND	0.16	ND
GW-1005	10/01/87	ND	0.61	ND	1.7	0.52	ND
GW-1006	09/28/87	7.6	ND	1.0	8.5	1.5	ND
GW-1006-D	09/28/87	21.7	ND	5.2	18.6	15.0	ND
GW-1007	09/29/87	ND	ND	ND	ND	ND	ND
GW-1008	09/29/87	ND	ND	ND	ND	ND	ND
GW-1009	09/22/87	ND	ND	ND	ND	ND	ND
GW-1010	09/22/87	ND	ND	ND	ND	ND	ND
GW-1011	09/22/87	ND	ND	ND	ND	ND	ND
GW-1012	09/30/87	ND	ND	ND	ND	ND	ND
GW-1013	09/28/87	ND	.56	ND	.95	.23	ND
GW-1014	09/28/87	ND	.33	ND	1.6	.25	ND
GW-1015	09/24/87	28.9	ND	ND	44.0	8.3	ND
GW-1015-D	09/24/87	25.5	ND	ND	40.8	7.5	ND
GW-1016	09/24/87	ND	ND	ND	ND	ND	ND
GW-1017	09/22/87	ND	ND	ND	ND	ND	ND
GW-1018	09/23/87	ND	ND	ND	ND	ND	ND
GW-1019	09/23/87	ND	ND	ND	ND	ND	ND

ND - Not Detected
D - Duplicate

GROUNDWATER

NITROAROMATICS, WSQ

FOURTH QUARTER 1987

Sample No.	Date Sampled	1,3,5-Trinitro-benzene (ug/L)	1,3-Dinitro-benzene (ug/L)	2,4,6-TNT (ug/L)	2,4-DNT (ug/L)	2,6-DNT (ug/L)	Nitro-benzene (ug/L)
GW-1001	NOT SAMPLED INSUFFICIENT PRODUCTION						
GW-1002	12/14/87	0.6	ND	ND	ND	ND	ND
GW-1003	NOT SAMPLED INSUFFICIENT PRODUCTION						
GW-1004	12/14/87	0.6	ND	ND	ND	ND	ND
GW-1005	12/14/87	ND	ND	ND	0.4	ND	ND
GW-1006	12/12/87	ND	ND	ND	ND	ND	ND
GW-1007	12/12/87	ND	ND	ND	ND	ND	ND
GW-1008	12/12/87	1.1	ND	ND	6.3	ND	ND
GW-1009	12/12/87	ND	ND	ND	ND	ND	ND
GW-1010	12/05/87	ND	ND	ND	ND	ND	ND
GW-1011	12/05/87	ND	ND	ND	ND	ND	ND
GW-1012	12/18/87	ND	ND	ND	ND	ND	ND
GW-1013	12/07/87	0.4	ND	ND	0.3	ND	ND
GW-1014	12/07/87	0.1	ND	ND	ND	ND	ND
GW-1015	12/07/87	5.4	6.7	19.5	ND	ND	ND
GW-1016	12/07/87	ND	ND	ND	ND	ND	ND
GW-1017	12/05/87	NA	NA	NA	NA	NA	NA
GW-1018	12/05/87	ND	ND	ND	ND	ND	ND
GW-1019	12/05/87	ND	ND	ND	ND	ND	ND

ND - Not Detected

WELDON SPRING QUARRY AND FEMME OSAGE SLOUGH AREA, GROUNDWATER AND SURFACE WATER ANALYTICAL DATA GUIDE FOR THE YEAR 1987

1987	PARAMETERS ANALYZED																	
	RADIOCHEMISTRY							INORGANIC ANIONS, WATER QUALITY										NITRO
SAMPLE NUMBER	GA	GB	TNU	R-226	R-228	TH-230	TH-232	NO3	SO4	Cl	Fl	CYANID	PHENOL	TDS	TOC	TSS	Hd	

"X" DENOTES SAMPLES ANALYZED FOR INDICATED PARAMETER FOR THE INDICATED QUARTER

RADIOCHEMISTRY PARAMETERS CODE

GA=GROSS ALPHA
GB=GROSS BETA
TNU=TOTAL NATURAL URANIUM
R-226=RADIUM-226
R-228=RADIUM-228
TH-230=THORIUM-230
TH-232=THORIUM-232

DATE CODE

Q1=FIRST QUARTER
Q2=SECOND QUARTER
Q3=THIRD QUARTER
Q4=FOURTH QUARTER

INORGANIC ANIONS & WATER QUALITY PARAMETERS CODE

NO3=NITRATE
SO4=SULFATE
Cl=CHLORIDE
Fl=FLORIDE
CYANID=CYANIDE
PHENOL=PHENOL
TDS=TOTAL DISSOLVED SOLIDS
TOC=TOTAL ORGANIC CARBON
TSS=TOTAL SUSPENDED SOLIDS
Hd=HARDNESS

NITROAROMATICS=NITRO
ALL SAMPLES ANALYZED WERE ANALYZED FOR THE LISTED SIX PARAMETERS

2,4,6 TNT
2,4 DNT
2,6, DNT
NITROBENZENE
1,3,5 TRINITROBENZENE
1,3 DINITROBENZENE

WELDON SPRING QUARRY AND FEMME OSAGE SLOUGH AREA, GROUNDWATER AND SURFACE WATER ANALYTICAL DATA GUIDE FOR THE YEAR 1987

1987 SAMPLE NUMBER	PARAMETERS ANALYZED																			
	RADIOCHEMISTRY							INORGANIC ANIONS, WATER QUALITY												NITRO
	GA	GB	TNU	R226	R228	TH230	TH232	NO3	SO4	Cl	Fl	CYANID	PHENOL	TDS	TOC	TSS	Hd			
GROUNDWATER																				
GW-1001																				
Q1																				
Q2			X	X	X	X	X	X	X	X	X				X					X
Q3			X	X	X	X	X	X	X	X	X				X					X
Q4			X	X	X	X	X	X	X	X	X									
GW-1002																				
Q1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X			X
Q2			X	X	X	X	X	X	X	X	X				X					X
Q3			X	X	X	X	X	X	X	X	X				X					X
Q4			X	X	X	X	X	X	X	X	X									X
GW-1003																				
Q1																				
Q2			X	X	X	X	X	X	X	X	X				X					X
Q3																				
Q4																				
GW-1004																				
Q1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X			X
Q2			X	X	X	X	X	X	X	X	X				X					X
Q3			X	X	X	X	X	X	X	X	X				X					X
Q4			X	X	X	X	X	X	X	X	X									X
GW-1005																				
Q1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X			X
Q2			X	X	X	X	X	X	X	X	X				X					X
Q3			X	X	X	X	X	X	X	X	X				X					X
Q4			X	X	X	X	X	X	X	X	X									X
GW-1006																				
Q1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X			X
Q2			X	X	X	X	X	X	X	X	X				X					X
Q3			X	X	X	X	X	X	X	X	X				X					X
Q4			X	X	X	X	X	X	X	X	X									X
GW-1007																				
Q1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X			X
Q2			X	X	X	X	X	X	X	X	X				X					X
Q3			X	X	X	X	X	X	X	X	X				X					X
Q4			X	X	X	X	X	X	X	X	X									X
GW-1008																				
Q1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X			X
Q2			X	X	X	X	X	X	X	X	X				X					X
Q3			X	X	X	X	X	X	X	X	X				X					X
Q4			X	X	X	X	X	X	X	X	X									X

WELDON SPRING QUARRY AND FEMME OSAGE SLOUGH AREA, GROUNDWATER AND SURFACE WATER ANALYTICAL DATA GUIDE FOR THE YEAR 1987

1987 SAMPLE NUMBER	PARAMETERS ANALYZED																		
	RADIOCHEMISTRY							INORGANIC ANIONS, WATER QUALITY											NITRO
	GA	GB	TNU	R226	R228	TH230	TH232	NO3	SO4	Cl	Fl	CYANID	PHENOL	TDS	TOC	TSS	Hd		
GW-1009																			
Q1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X		X
Q2			X	X	X	X	X	X	X	X	X				X				X
Q3			X	X	X	X	X	X	X	X	X				X				X
Q4			X	X	X	X	X	X	X	X	X								X
GW-1010																			
Q1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X		X
Q2			X	X	X	X	X	X	X	X	X				X				X
Q3			X	X	X	X	X	X	X	X	X				X				X
Q4			X	X	X	X	X	X	X	X	X								X
GW-1011																			
Q1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X		X
Q2			X	X	X	X	X	X	X	X	X				X				X
Q3			X	X	X	X	X	X	X	X	X				X				X
Q4			X	X	X	X	X	X	X	X	X								X
GW-1012																			
Q1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X		X
Q2			X	X	X	X	X	X	X	X	X				X				X
Q3			X	X	X	X	X	X	X	X	X				X				X
Q4			X	X	X	X	X	X	X	X	X								X
GW-1013																			
Q1																			
Q2																			
Q3	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Q4			X	X	X	X	X	X	X	X	X								X
GW-1014																			
Q1																			
Q2																			
Q3	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Q4			X	X	X	X	X	X	X	X	X								X
GW-1015																			
Q1																			
Q2																			
Q3	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Q4			X	X	X	X	X	X	X	X	X								X
GW-1016																			
Q1																			
Q2																			
Q3	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Q4			X	X	X	X	X	X	X	X	X								X

WELDON SPRING QUARRY AND FEMME OSAGE SLOUGH AREA, GROUNDWATER AND SURFACE WATER ANALYTICAL DATA GUIDE FOR THE YEAR 1987

1987 SAMPLE NUMBER	PARAMETERS ANALYZED																			
	RADIOCHEMISTRY							INORGANIC ANIONS, WATER QUALITY												NITRO
	GA	GB	TNU	R226	R228	TH230	TH232	NO3	SO4	Cl	F1	CYANID	PHENOL	TDS	TOC	TSS	Hd			
GW-1017																				
Q1																				
Q2																				
Q3	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X
Q4			X	X	X	X	X	X	X	X	X									X
GW-1018																				
Q1																				
Q2			X	X	X	X	X	X	X	X	X					X				X
Q3	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X
Q4			X	X	X	X	X	X	X	X	X									X
GW-1019																				
Q1																				
Q2																				
Q3	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X
Q4			X	X	X	X	X	X	X	X	X									X
ST.CHARLES COUNTY MONITORING WELLS (NOTE DATE FORMAT CHANGE)																				
RMW-1 Q1	X	X	X	X	X	X	X	X	X	X	X			X	X		X			
RMW-2 Q1	X	X	X	X	X	X	X	X	X	X	X			X	X		X			
RMW-3 Q1	X	X	X	X	X	X	X	X	X	X	X			X	X		X			
RMW-4 Q1	X	X	X	X	X	X	X	X	X	X	X			X	X		X			
RMW-1 Q2			X																	X
RMW-2 Q2			X																	X
RMW-3 Q2																				
RMW-4 Q2			X																	X
RMW-1 Q3	X	X	X	X	X	X	X													
RMW-2 Q3	X	X	X	X	X	X	X													
RMW-3 Q3	X	X	X	X	X	X	X													
RMW-4 Q3	X	X	X	X	X	X	X													

WELDON SPRING QUARRY AND FEMME OSAGE SLOUGH AREA, GROUNDWATER AND SURFACE WATER ANALYTICAL DATA GUIDE FOR THE YEAR 1987

1987 SAMPLE NUMBER	PARAMETERS ANALYZED																			
	RADIOCHEMISTRY							INORGANIC ANIONS, WATER QUALITY												NITRO
	GA	GB	TNU	R226	R228	TH230	TH232	NO3	SO4	Cl	Fl	CYANID	PHENOL	TDS	TOC	TSS	Hd			
SURFACE WATER																				
SW-1001																				
Q1	X	X	X	X	X	X	X	X	X	X	X			X	X		X			
Q2	X	X	X	X	X	X	X	X	X	X	X									
Q3	X	X	X	X	X	X	X	X	X	X	X									
Q4	X	X	X	X	X	X	X	X	X	X	X									
SW-1002																				
Q1	X	X	X	X	X	X	X	X	X	X	X			X	X		X			
Q2	X	X	X	X	X	X	X	X	X	X	X									
Q3	X	X	X	X	X	X	X	X	X	X	X									
Q4	X	X	X	X	X	X	X	X	X	X	X									
SW-1003																				
Q1	X	X	X	X	X	X	X	X	X	X	X			X	X		X			
Q2	X	X	X	X	X	X	X	X	X	X	X									
Q3	X	X	X	X	X	X	X	X	X	X	X									
Q4	X	X	X	X	X	X	X	X	X	X	X									
SW-1004																				
Q1	X	X	X	X	X	X	X	X	X	X	X			X	X		X			
Q2	X	X	X	X	X	X	X	X	X	X	X									
Q3	X	X	X	X	X	X	X	X	X	X	X									
Q4	X	X	X	X	X	X	X	X	X	X	X									
SW-1005																				
Q1	X	X	X	X	X	X	X	X	X	X	X			X	X		X			
Q2	X	X	X	X	X	X	X	X	X	X	X									
Q3	X	X	X	X	X	X	X	X	X	X	X									
Q4	X	X	X	X	X	X	X	X	X	X	X									
SW-1006																				
Q1	X	X	X	X	X	X	X	X	X	X	X			X	X		X			
Q2	X	X	X	X	X	X	X	X	X	X	X									
Q3	X	X	X	X	X	X	X	X	X	X	X									
Q4	X	X	X	X	X	X	X	X	X	X	X									
SW-1007																				
Q1	X	X	X	X	X	X	X	X	X	X	X			X	X		X			
Q2	(PHASE I WATER																			
Q3	QUALITY ASSESSEMENT																			
Q4	ONLY)																			
SW-1008																				
Q1	X	X	X	X	X	X	X	X	X	X	X			X	X		X			
Q2	ADDED TO EMPP Q3																			
Q3	X	X	X	X	X	X	X	X	X	X	X				X				X	
Q4			X	X	X	X	X	X	X	X	X								X	

SURFACE WATER

RADIOCHEMISTRY, WSQ

FIRST QUARTER 1987

Sample No.	Date Sampled	Activity +/- Error (pCi/Liter) Gross Alpha	Gross Beta	Total Natural Uranium	Radium -226	Radium -228	Thorium -230	Thorium -232
SW-1001	3/12/87	ND	ND	3.7 +/- 1	ND	I	ND	ND
SW-1002	3/12/87	ND	ND	ND	ND	ND	ND	ND
SW-1003	3/23/87	26 +/- 5	26 +/- 4	45 +/- 7	ND	ND	ND	ND
SW-1004	3/13/87	26 +/- 5	56 +/- 7	47 +/- 7	ND	ND	ND	ND
SW-1005	3/10/87	19 +/- 5	19 +/- 5	39 +/- 4	ND	ND	ND	ND
SW-1006	3/09/87	ND	ND	ND	ND	ND	ND	ND
SW-1007	3/11/87	ND	ND	25 +/- 3	ND	ND	ND	ND
SW-1008	3/11/87	1100 +/-200	1200 +/-200	2100 +/-200	3.9 +/-0.4	ND	ND	ND

Note: Uncertainties represent 95% confidence limits (2 SIGMA)
ND - Not Detected
I - Interference

SURFACE WATER

RADIOCHEMISTRY, WSQ

SECOND QUARTER 1987

Sample No.	Date Sampled	Activity +/- Error (pCi/Liter) Gross Alpha	Gross Beta	Total Natural Uranium	Radium 226	Thorium 230	Thorium 232
SW-1001	05/21/87	ND	ND	ND	ND	ND	ND
SW-1002	05/21/87	ND	ND	1.0+/-0.6	ND	ND	ND
SW-1003	05/21/87	42+/-8	27+/-6	40+/-4	ND	ND	ND
SW-1004	05/21/87	39+/-7	28+/-6	44+/-5	ND	ND	ND
SW-1005	05/21/87	16+/-5	13+/-5	43+/-4	ND	ND	ND
SW-1006	05/21/87	ND	ND	ND	ND	ND	ND

NOTE: Uncertainties represent 95% confidence limits (2 SIGMA)
ND - Not Detected

SURFACE WATER

RADIOCHEMISTRY, WSQ

THIRD QUARTER 1987

Sample No.	Date Sampled	Activity +/- Error (pCi/Liter) Gross Alpha	Gross Beta	Total Natural Uranium	Radium 226	Thorium 230	Thorium 232
SW-1001	08/24/87	20 +/- 10	21 +/- 10	3.0 +/- 0.9	5.4 +/- 0.2	ND	ND
SW-1002	08/24/87	ND	ND	ND	1.3 +/- 0.8	ND	ND
SW-1003	09/01/87	16 +/- 6	22 +/- 6	25 +/- 3	ND	ND	ND
SW-1004	09/01/87	21 +/- 6	25 +/- 6	18 +/- 2	ND	ND	ND
SW-1005	08/24/87	17 +/- 5	14 +/- 5	8.1 +/-1.4	ND	ND	ND
SW-1006	08/24/87	ND	8.3 +/- 4	ND	0.6 +/- 0	ND	ND
SW-1008	09/02/87	1000 +/-100	740 +/-80	830 +/-90	ND	ND	ND

NOTE: Uncertainties represent 95% confidence limits (2 SIGMA).
ND - Not Detected

SURFACE WATER

RADIOCHEMISTRY, WSQ

FOURTH QUARTER 1987

Sample No.	Date Sampled	Activity +/- Error (pCi/Liter) Gross Alpha	Gross Beta	Total Natural Uranium	Radium 226	Thorium 230	Thorium 232	Total Uranium
SW-1001	11/30/87	ND	12	ND	ND	ND	ND	
SW-1002	11/30/87	3.1 +/- +-2.3	7.4 +/- +-4.1	ND	ND	ND	ND	
SW-1003	11/30/87	16 +/- +-4	21 +/- +-5	3.7 +/- +0.9	ND	ND	ND	
SW-1004	11/30/87	20 +/- +-5	20 +/- +-5	27 +/- +-3	ND	ND	ND	
SW-1005	11/30/87	14 +/- +-4	18 +/- +-5	27 +/- +-3	ND	ND	ND	
SW-1006	11/30/87	ND	20 +/- +-5	ND	ND	ND	ND	
SW-1008	12/18/87			ND	ND	ND	ND	2200 +/- +-300

NOTE: Uncertainties represent 95% confidence limits.
ND - Not Detected

SURFACE WATER

INORGANIC ANIONS, WSQ

FIRST QUARTER 1987

		Concentration mg/L						
U.S. E.P.A. Primary/Secondary Drinking Water Standard	mg/L	Nitrate (as N) 10	Sulfate 250	Choride 250	Fluoride 2	Hardness S	TDS 500	TOC S
Sample No.	Date Sampled							
SW-1001	3/12/87	0.3	62.1	10.7	ND	988	258	4.0
SW-1002	3/12/87	0.2	38.4	6.88	ND	362	238	2.14
SW-1003	3/23/87	ND	32.6	7.96	ND	233	300	7.14
SW-1004	3/13/87	ND	33.4	7.97	ND	212	264	7.72
SW-1005	3/10/87	ND	32.2	7.32	ND	213	252	6.57
SW-1006	3/09/87	ND	37.6	8.19	ND	375	424	3.02
SW-1007	3/11/87	ND	34.1	6.52	ND	182	224	7.62
SW-1008	3/11/87	546	202	8.28	0.43	303	212	4.66

ND - Not Detected

SURFACE WATER

INORGANIC ANIONS, WSQ

SECOND QUARTER 1987

Sample No.	Date Sampled	Concentration mg/l Nitrate	Sulfate	Chloride	Fluoride
SW-1001	05/21/87	1.68	59.8	11.2	ND
SW-1002	05/21/87	0.82	57.6	8.0	ND
SW-1003	05/21/87	ND	43.9	9.0	ND
SW-1004	05/21/87	ND	43.9	9.2	ND
SW-1005	05/21/87	ND	45.9	9.6	ND
SW-1006	05/21/87	ND	69.0	10.8	ND

ND - Not Detected

SURFACE WATER

INORGANIC ANIONS, WSQ

THIRD QUARTER 1987

Sample No.	Date Sampled	Concentration mg/l Nitrate	Sulfate	Chloride	Fluoride	TOC
SW-1001	08/24/87	1.3	60.0	11.2	ND	
SW-1002	08/24/87	1.0	57.0	13.4	ND	
SW-1003	09/01/87	ND	51.6	12.5	0.3	
SW-1004	09/01/87	ND	52.3	12.6	0.3	
SW-1005	08/24/87	ND	57.6	10.3	ND	
SW-1006	08/24/87	ND	18.7	11.4	ND	
SW-1008	09/02/87	ND	47.8	5.0	0.7	4

ND - Not Detected

SURFACE WATER

INORGANIC ANIONS, WSQ

FOURTH QUARTER 1987

Sample No.	Date Sampled	Concentration mg/L Chloride	Fluoride	Nitrate	Sulfate
SW-1001	11/30/87	5.2	0.33	1.3	41.5
SW-1002	11/30/87	5.6	0.33	1.3	40.4
SW-1003	11/30/87	11.6	0.41	ND	61.1
SW-1004	11/30/87	11.6	0.42	ND	61.5
SW-1005	11/30/87	11.8	0.42	ND	66.8
SW-1006	11/30/87	12.2	0.57	ND	68.6
SW-1008	12/18/87	5.5	0.3	0.4	106

ND - Not Detected

SURFACE WATER

NITROAROMATICS, WSQ

THIRD QUARTER, 1987

Sample No.	Date Sampled	Concentration (ug/L) 2,4,6-TNT	2,4 DNT	2,6 DNT	Nitro benzene	1,3,5-Trinitro benzene	1,3-Dinitro benzene
SW-1008	09/02/87	18.3	18.3	17.9	ND	3.0	ND

ND - Not Detected

SURFACE WATER

NITROAROMATICS, WSQ

FOURTH QUARTER 1987

Sample No.	Date Sampled	Concentration (ug/L) 2,4,6-TNT	2,4 DNT	2,6 DNT	Nitro benzene	1,3,5-Trinitro benzene	1,3-Dinitro benzene
SW-1008	12/18/87	23.9	5.5	ND	ND	0.6	ND

ND - Not Detected

INORGANIC ANION AND WATER QUALITY RESULTS FOR ST. CHARLES COUNTY MONITORING WELLS

FIRST QUARTER 1987

Sample No.	Date Sampled	Concentration mg/L Nitrate	Sulfate	Chloride	Fluoride	Hardness	TDS	TOC
U.S. E.P.A. Primary/Secondary Drinking Water Standard		10	250	250	2	S	500	S
RMW-1	3/9/87	ND	20.1	8.39	ND	526	526	19.2
RMW-2	3/9/87	0.81	54.5	2.12	ND	408	426	31.2
RMW-3	3/9/87	ND	57.1	8.42	ND	529	574	21.6
RMW-4	3/9/87	0.25	57.5	6.61	ND	450	480	11.4

S - No Drinking Water Standard
ND - Not Detected

GROUNDWATER

RADIOCHEMISTRY RESULTS FROM ST. CHARLES COUNTY MONITORING WELLS

FIRST QUARTER 1987

Sample No.	Date Sampled	Activity pCi/L Gross Alpha	Gross Beta	Natural Uranium	Radium 226	Radium 228	Thorium 230	Thorium 232
RMW-1	3/9/87	ND	13 +/- 6	ND	ND	ND	ND	ND
RMW-2	3/9/87	ND	ND	7.6 +/- 1	ND	ND	ND	ND
RMW-3	3/9/87	ND	ND	ND	ND	ND	ND	ND
RMW-4	3/9/87	ND	ND	ND	ND	ND	ND	ND

NOTE: Uncertanties represent 95% confidence limits (2 SIGMA)
ND - Not Detected

GROUNDWATER
NITROAROMATICS, RESULTS FROM ST. CHARLES CO.
MONITORING WELLS
SECOND QUARTER 1987

SAMPLE NUMBER	DATE SAMPLED	PARAMETER 2,4,6-TNT	2,4 DNT	'2,6 DNT	(CONCENTRATION ug\L) NITRO-BENZENE	1,3,5 TRINITRO BENZENE	1,3-DINITRO BENZENE
RMW-1	4-16-88	ND	ND	ND	ND	ND	ND
RMW-2	4-16-88	ND	ND	ND	ND	ND	ND
RMW-3	4-16-88	NOT SAMPLED, LOCATION FLOODED					
RMW-4	4-16-88	ND	ND	ND	ND	ND	ND

ND= NOT DETECTED

GROUNDWATER
RADIOCHEMISTRY RESULTS FROM ST. CHARLES CO.
MONITORING WELLS
SECOND QUARTER 1987

SAMPLE NUMBER	DATE SAMPLED	PARAMETER TOTAL URANIUM, NATURAL	ACTIVITY pCi/L
RMW-1	4-16-87		Ø.8+/-Ø.5
RMW-2	4-16-87		2.1+/-Ø.6
RMW-3	4-16-87	NOT SAMPLE, LOCATION FLOODED	
RMW-4	4-16-87		1.3+/-Ø.5

NOTE: UNCERTAINTIES REPRESENT 95% CONFIDENCE LIMITS (2 SIGMA)

GROUNDWATER
RADIOCHEMISTRY RESULTS FROM ST. CHARLES CO.
MONITORING WELLS
THIRD QUARTER 1987

DATE SAMPLED 07-31-87	PARAMETER		ACTIVITY pCi\L				
SAMPLE NUMBER	GROSS ALPHA	GROSS BETA	TOTAL URANIUM	RADIUM 226	RADIUM 228	THORIUM 23Ø	THORIUM 232
RMW-1	ND	5.5+/-3.Ø	3.2+/-1.3	ND	ND	ND	ND
RMW-2	6.1+/-2.7	5.8+/-3.Ø	5.4+/-1.4	ND	ND	ND	ND
RMW-3	ND	ND	ND	ND	ND	ND	ND
RMW-4	ND	7.3+/-3.1	ND	ND	ND	ND	ND

ND= NOT DETECTED
NOTE: UNCERTAINTIES REPRESENT 95% CONFIDENCE LIMITS (2 SIGMA)