General

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

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FROM: Charles Nylander, ESH-18

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DATE: March 19, 2002

MAIL STOP/TELEPHONE: K497/5-4681

SUBJECT: **QUARTERLY MEETING NOTES – JANUARY 30, 2002**

Attached are the minutes from the January 30, 2002 Hydrogeologic Characterization Program Quarterly Meeting held at the Plaza Resolana in Santa Fe, New Mexico. These minutes are being sent to you because you have received a copy of the Laboratory's Hydrogeologic Workplan and a binder for the Annual Reports and Meeting Minutes or you have requested to be on the distribution list. If you are not interested in continuing to receive meeting minutes, please contact me at the address or telephone number listed below.

The action item resulting from the meeting follows. The organization responsible for completion of each action item is given in parentheses.

- LANL validation protocols for perchlorate will be distributed to the NMED-GWQB. (LANL).

Please review these minutes for accuracy. If you identify substantive changes that should be made, please submit your comments to me in writing, or via e-mail at nylander@lanl.gov, or by telephone at 665-4681.

CN/am

Attachments: a/s

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MEETING PURPOSE, ATTENDEES, AND AGENDA

The Los Alamos National Laboratory Groundwater Integration Team (LANL GIT) met with the New Mexico Environment Department (NMED), the Department of Energy (DOE), and stakeholders on January 30, 2002 to host the 2nd Quarter Groundwater Meeting. The meeting was held at Plaza Resolana, Santa Fe, New Mexico. Charlie Nylander (GIT Chair) facilitated the meeting.

The following groups and stakeholders were represented (see List of Attendees for specific information):

NMED-Hazardous and Radioactive Materials Bureau
NMED-Groundwater Quality Bureau
NMED-DOE Oversight Bureau
DOE-Environment, Safety, and Health
DOE-Environmental Management
DOE-Defense Programs
Concerned Citizens for Nuclear Safety
Los Alamos County
University of California
LANL-Groundwater Integration Team

The purpose of the Quarterly Meeting was to provide NMED, DOE, and stakeholders with information on LANL's groundwater protection efforts and present planned activities for the upcoming fiscal year. The meeting agenda was as follows:

Introductions

Groundwater Integration Team (GIT) Subcommittee Reports
- Information Management
- Well Construction
- Hydrology
- Modeling
- Geochemistry

Status of Integrated Groundwater Protection Action Plan

FY02 Annual Plan and Planning Session with Stakeholders

Interactive Demonstration on How to Use the Water Quality Database

Perchlorate

Value Engineering Study Recommendations

FY01 Annual Report

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SUMMARY OF PRESENTATIONS AND DISCUSSIONS

Introduction

Charlie Nylander (LANL) welcomed participants to the Los Alamos National Laboratory Hydrogeologic Characterization Program quarterly meeting.

Information Management Subcommittee Report

Kendra Henning (LANL) described the Water Quality Database (WQDB) efforts for the past quarter. The WQDB now includes enhanced sample planning and tracking. The chain of custody and real-time tracking are now available. ESH-18 water level data, which was previously available at the ESH-18 web page, is now being placed into the WQDB. R-well data will also be available from the WQDB. There was a pilot download of the R-well data that is being worked on now. Web site enhancements have been made based on user comments. The 2001 Environmental Surveillance Report efforts have begun by taking stock of what is needed. Most effort in the quarter has been spent on ER-ESH data exchanges technical issues. Multiple approaches have been tried and tested, but the team is not pleased with results. The largest difficulty is limited resources; there is not enough time to dedicate to development.

There has been a break through in the ER-ESH data exchange. Conducted a new test of well construction data-push through to the WQDB and the data came through well. Will try another push of data and then will work on web reports so results can be accessed. Now have a start on how to accurately and efficiently push-pull data between databases. The well construction data had to be in place before chemistry data to know where to put the chemistry data.

Planned activities for the next quarter are largely focused on more ER-ESH data exchange. Expect to complete the water level data and development of a web-based validation data entry tool. The new data validation tool will replace the current tool, which is not efficient. The new tool will allow validators direct access to database. Also working on refining the web-based screening report that compares measured values to standards. This screening report is available internally, but want to make it available through the web in the next quarter. The ability to view the data spatially requires GIS capability. GIS is a specialized tool and expertise and funding are needed to place this function on the WQDB. If money becomes available, placing GIS on the WQDB will be pursued. It could be another year before the WQDB is loaded with complete data. More data sets in simple form (charts, graphs) will be available in three to four months. R-well construction and chemistry data will be available before the end of the fiscal year.

Questions and Answers:

Will historic pumping data from water supply wells be available through the WQDB? The WQDB is not currently designed for this data, but the design and data could be added.

What will the GIS function entail? Features of the GIS function on the WQDB were discussed. It will allow navigation of data based on a map location and spatial trend analyses. The user will be able to discern from which wells specific samples come.

Will GIS coordinates be the same as NMED coordinates? LANL coordinates are NAD State Plane Coordinates, which are the standard. NMED/HRB also uses NAD State Plane Coordinates.

Well Construction Subcommittee Report

John McCann (LANL) discussed well construction activity in the last quarter.

Well R-13 in Mortandad Canyon was finished as a single completion well. Restoration is done. Waiting for a pump and then will start sampling.

Well R-8 has been a challenge. There have been tough formation problems similar to what was encountered in Los Alamos Canyon. R-8 is located a couple miles up from State Road 4, below the confluence with DP Canyon. Operations for this well were started at the end of last fiscal year with a coring rig. The goal was to core 400 ft, but was only able to core to about 244 ft. At this point, started burning up drill bits. A bigger rig was brought in and open-hole drilling was started. The rig broke down and the top head drive and sensors were not operable. When the rig was fixed, drilling resumed to below 1000 ft. At this point, the borehole caved in around the drill string at about 760 ft. The drill was stuck in the borehole. It took a lot of time to retrieve the drill and tools were lost down the hole. Started fishing for the lost materials. Specialized spears were brought in to latch on to pieces of equipment. There is a balance between cost of fishing and abandoning the borehole. At one point a spear latched onto part of the stabilizer assembly, but could not get everything out. Decided to abandon and drill a new hole, R-8a, on the same pad and use the conservative drilling approach of casing advance. Got down to 760 ft and the drill became stuck again. Started operations to free casing using casing jacks and casing spear. A casing cutter was called in. The casing was cut and efforts were made to jack it out. Only 200 ft of casing was recovered out of the 500 ft of casing in the borehole. The remainder is stuck at 600 to 700 ft, above the water table. It was decided to construct the well in the borehole through the casing. Drilled open hole to 780 ft. Flowing sands would not allow the hole to stay open. Advanced smaller diameter casing. The well is being constructed now and backfilling is 50% complete. Two well screens were placed in the regional aquifer.

For future boreholes, will try to add more drilling options, particularly mud rotary. It was noted that there are some issues with mud rotary drilling. A circulation system is needed. More well development and waste management are needed. Plan to convene a meeting to discuss drilling method alternatives. Have left casing before in other wells. Because the casing is above the regional water table, the well design is unchanged. The prime contractor for drilling is Washington Group who subcontracts the drilling to Dynatech. It was stated that there has been trouble with Dynatech before and that this is a concern. When will we get a good driller? J. McCann (LANL) stated that Dynatech is doing a good job. LANL will be looking at other drilling companies for the next well. There are significant costs associated with changing drilling contractors. The formation that causes the problems such as in well R-8 is the Puye Formation where it is fine-grained clay. The same difficulties were seen at R-9. A preliminary look at cuttings show alternating layers of clay-rich beds. This is unknown territory – between unaltered and completely altered.

Planned FY02 activities include demobilization after R-8. R-14 and R-18 will be started. R-14 is in Ten Site Canyon and the earliest this well can be started is in mid May due to the T&E species. R-18 is on the rim of Pajarito Canyon and it is planned to start drilling in July.

Quarterly sampling efforts include:

- R-5: first round sampling
- R-7 and R-22: third round sampling
- Cdv-15-2: fourth round sampling
- R-9, R-9i, R-12, R-15, R-19: sampling is completed

Well completion reports for R-25, R-31, and R-22 are near completion. Well completion report for R-7 is in progress.

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Hydrology Subcommittee Report

Bill Stone (LANL) discussed the Hydrology Subcommittee activities for the last quarter.

- MCOBT-4.4: development continues; bailing is ineffective; a pump is being installed this week
- R-13: development and testing complete; 20 gpm pumping test barely stressed the well, however feel that adequate data provided
- R-22: test data analysis complete; results are in the well completion report
- WQDB: developed field form for well development; continue working on WQDB modules

Well completion report for R-7 is being written. An integrated hydrology report is in draft stage. This report will review all tests done to date.

Modeling Subcommittee Report

Bruce Robinson (LANL) reviewed modeling efforts of the last quarter:

- Completed another year of regional aquifer modeling, which is documented in a report.
- Completed Phase I of the infiltration study - deep infiltration from canyon bottoms to deeper zone.
- Compiled estimates based on borehole information (moisture, chloride profiles).
- Maps of key parameters are likely to influence infiltration (vegetation, elevation).
- Contributed to the Groundwater Annual Status Report for Fiscal Year 2001 and began work on the groundwater pathways assessment.

The regional aquifer modeling effort incorporated new data from wells and model calibration with new data. Moving from development to being able to use the data to predict groundwater flow. Regional aquifer velocity estimates are based on permeability and gradient measurements and estimates of porosity. The result is a wide distribution of velocity estimates (1m/yr to 200 m/yr). The larger the range in permeability measurements, the larger the distribution of calculated velocity. The calculated horizontal velocity (1-2 m/yr) has a narrower distribution and uses data in the 3D Geologic Model, taking into account local variations. The carbon-14 age estimates of water in the regional aquifer are consistent with the model results. All data are used in constraining the modeling.

Predictive analysis is a modeling technique to determine the range of possible behavior of a model, under the restriction that the model remains in calibration.

- Possible applications of regional aquifer model -
    - What is the minimum travel time to LANL boundary from release point
    - What is the most northerly path line between release point and downstream location
- The user-defined question is evaluated by making model predictions (e.g. travel maximum north coordinate of path, etc.) for a range of values of each uncertain parameter and finding the extreme value of the prediction for all calibrated models.
- It is one method to estimate uncertainty and to develop answers to questions.

An example of predictive analysis is uncertainty in flow path directions. Assume a point source of contamination at R-25. The analysis predicts the most northerly and most southerly path lines between R-25 and PM-2. This is an illustrative technique to achieve uncertainty in flow path. This method specifically addresses flow path, not travel time. However, several hundred years is a best guess for mobile contaminants. Instead of a single answer, a range will be derived and each point in the range will be consistent with the data.

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Geochemistry Subcommittee Report

Pat Longmire (LANL) reviewed Geochemistry Subcommittee progress for the quarter. The topics of interest include validated results of quarterly groundwater sampling and analysis of trace anions (perchlorates).

Update on R-wells:

- R-7 – Three screens, two with water (one in perched, one in regional). Located in Los Alamos Canyon, east of TA-2. Tritium is present in the perched zone (3.4 pCi/L) and in the regional aquifer (1.5 pCi/L). Tritium at these low concentrations indicates that the source is probably recharge from the Sierra de los Valles and that the major component of water in the perched zone and regional aquifer is natural. Natural old water has approximately 1 pCi/L; tritium is about 50-300 pCi/L in water less than 60 years old because worldwide fallout and the Laboratory influence it. Tritium greater than 750 pCi/L is Laboratory derived.
- R-8, R-9, R-9i – Tritium is present in these Los Alamos Canyon wells at 16 pCi/L (R-8), 246 pCi/L (R-9), and 167 pCi/L (R-9I) at concentrations that clearly indicate recent infiltration of water.
- R-12 in Sandia Canyon contains tritium at levels that also suggest recent recharge in past 60 years, perhaps the last decade. These results are consistent with previous sampling.
- R-13 in Mortandad Canyon had tritium at 0.64 pCi/L in the regional aquifer. This is indicative of very old water. Sr-90 and perchlorate were less than detection.
- R-15 in Mortandad contains Sr-90 less than detection. Nitrate was present at 2.4 mg/L and perchlorate was reported at 4.19 µg/L, which is very close to detection limit and may not be reliable.
- R-22 is located east of Area G, on the mesa top above Pajarito Canyon. Technicium-99 was less than detection, although it was previously detected. The uranium values are decreasing (reported at 8.44 µg/L in screen 3). The typical uranium value in water wells is about 1 ug/L. The uranium in R-22 has a natural uranium isotopic ratio, which leads to the hypothesis that the uranium is from the bentonite used in constructing the well. In the third sampling round (which has not been validated), the uranium has apparently dropped to 2 ug/L. These trends suggest that R-22 is still equilibrating. The isotopes suggest there has been mixing.
- R-25 – In the perched system the tritium concentration is similar to rainfall. HE hits are moderately consistent between sampling. In the regional aquifer the HE has decreased significantly in sampling rounds, so has tritium. The working hypothesis is that the regional system is affected by water from the perched zone and that most of the HE is in upper saturated (perched) zone.

Perchlorate – Different forms of perchloric acid were used at the Laboratory. Perchlorate (ClO_4^-) is formed by the dissolution of perchloric acid (and other perchloric substances) in water. It is a very stable compound that eventually reduces to chloride in the presence of microbes and other reactive reductants. Perchlorate is thermodynamically stable at E° values greater than 1.10 to 1.72; when the E° is less, it is more stable as chlorate (ClO_3^-). Chlorate concentrations have been observed in DP Spring and it is believed that it is a degradation product of perchlorate. DP Spring is the only place where it is known that perchlorate was discharged and where chlorate (potential degradation product) is observed in the spring. It does degrade under natural conditions with microbial action.

Samples of natural water have sulfate, which causes interference with perchlorate and can produce erroneous analytical data. This is because on the ion chromatograph, the "tail" of the sulfate peak overlaps the perchlorate peak. To prevent this, analytical labs need to remove interfering ions, particularly sulfate, which can be removed with barium treatment. Barium treatment is an optional part of Method 314, an EPA-certified method. Barium treatment consists of sulfate removal by barium-coated resin. In this process, water samples are passed through a cartridge containing barium, which removes sulfate from solution. Data from alluvial wells indicate that prior to barium treatment, perchlorate is 5.61 to

12.73 µg/L. After barium treatment, the perchlorate is less than detection (0 - 1.17 µg/L; J-flagged). The sulfate levels in these wells are generally less than 10 ppm. Analytical labs should be using the best methods to ensure accurate data is generated.

Integrated Groundwater Protection Action Plan

Diana Hollis (LANL) outlined the integrated groundwater protection plan. The goal is to always protect groundwater users from known and potential releases. This plan is an integrated, three step approach. EPA guidance will be followed to define 'protect'. The term 'always' assumes two time frames: in the first period there will be controlled access; in the second period the access is assumed to be unrestricted.

The first of the three steps is to objectively evaluate the existing groundwater monitoring program.

- Quantify existing knowledge and uncertainty about sources and groundwater transport (all parameters)
- Simulate contaminant transport via groundwater from sources to groundwater access points
- Compare calculated concentration with "protective limits" at access points
- Determine if existing monitoring well will detect contamination before protective limits are exceeded at access points
- Define locations for additional wells if needed

The second step is to identify alternative actions to optimize the existing groundwater monitoring program.

- Identify alternative actions (e.g., additional monitoring, additional characterization of geology, hydrology, contaminant source, and/or more realistic models) that could reduce the uncertainty in direction and rate of potential contaminant plumes.
- Quantify reduction in uncertainties associated with alternative activities or combinations of activities
- Compare cost of alternative actions with expected savings in monitoring

The third step is to implement optimal actions and continuously iterate.

- Complete "high return" actions (including monitoring)
- Re-evaluate monitoring program to account for the results of completed actions
- Optimize further activities and/or additional monitoring if required
- Iterate every five years to incorporate changes in knowledge and changes in receptors and their locations

The intent is to complete the fist step in the process this year. Probabilistic modeling is being used and there is a team trying to elicit probability distribution functions from the GIT members. A flow chart showing the steps and who is responsible for completing the steps in the integrated groundwater protection plan is attached. It was noted that key members are missing from the flow chart. For example, the flow chart does not indicate any NMED involvement in calculating protective limits. It was stated that the County of Los Alamos should also be involved. Stakeholders and EAG must be included. There should be opportunity for public comment and input in the form of a public hearing. In response, it was stated that the regulatory path for this process is not known and the program will want to meet the most restrictive regulations, including stakeholder involvement. To the extent possible, existing EPA guidance documents will be used (e.g., Regional 6 Corrective Action and Risk Assessment Guidance 3).

The "protective limits" will be established by a LANL/DOE/NMED core team and will be re-evaluated at least every five years. In this way, the access points will include areas that may be developed in the future, particularly in the unrestricted access time frame. During the restricted access time frame, it is

assumed that development will not occur on administratively controlled land. The perched systems will be considered a contaminant source to regional aquifer, not a source of water.

This integrated action plan describes the transition from characterization to a long-term institutional groundwater protection program. Using what has been learned to date, it provides a plan to move into groundwater protection. All regulatory programs will be involved. It was suggested that there is a need to have dialogue about what "reasonably foreseeable" means. Steve Reynolds (former State Engineer) considered "reasonably foreseeable" as 200 years. Have discussed 100-year operation period and 1000-year protection period. These are all aspects that the core team will have to develop a consensus on.

FY02 Annual Plan and Planning Session with Stakeholders

Charlie Nylander (LANL) discussed the FY02 plan.

- Finish well R-8a, start R-14 and R-18.
- If DP funding becomes available, R-20 will start before the end of the fiscal year.
- Funding issues: requested $3 million over target. The request is pending. Local program office has identified $1.5 million additional funds, which is expected next month. Still waiting to see if $1.5 million will come from headquarters.
- Bigger catch-up in activities will occur in FY03 if additional requested above-target funds are received.
- Modeling and database development still moving forward.

There was a question about the timing of the permeable reactive barrier in Mortandad Canyon, since it was to begin last summer. It was learned that the barrier was delayed because of expense of moving dirt from the trench that has to be dug to contain the barrier. It is a concern that a low-tech solution is not moving forward, and there is an intention to bring this up in the press. The TA-50 outfall has been the source of contaminants, but it is not clear where the contaminants are located. The volume of liquid coming out was much greater in the past. Clean up water before it gets to regional aquifer and protect the people that use water out of the Rio Grande. In response, DOE and LANL are trying to identify funds that can be used to complete the construction of the permeable reactive barrier. A suggestion was made that the funds come out of pollution prevention.

Another issue raised is drill casing being left in wells and the affects on future monitoring. Will the wells be RCRA compliant? In response, it was stated that the wells would be RCRA compliant. At R-8, found a damp formation (water is insufficient to enter the well) about 100 ft above where the casing is left in the ground. The well will be cemented off. Below the stuck casing, there is significant distance between casing bottom and regional aquifer, which will be sealed up. Problems are not expected with piping. Casing was left in R-9 and R-12 and there have not been any problems with these wells. In the drilling program there have been times when the casing had to be left; this is not desirable because it is expensive.

Disappointment was expressed that MCOBT-8.5 was abandoned and information on that well was requested. It was considered to be a good location to monitor the permeable reactive barrier. In response, it was explained that the well was installed because it was part of the Mortandad Canyon RFI Workplan. The objective was to sample water in the Guaje Pumice, but it was dry. A complete description of MCOBT-8.5 will be included in the MCOBT-4.4 completion report. In wells where there is no water, it is difficult to know how to design a well because there is no way to know where to put the screens. Core was collected to 400 ft and chemical data from the core is being evaluated for nitrate,

tritium, and perchlorate. These analyses will be in the completion report. Nitrate went to core bottom and perchlorate to 300 ft. Still waiting for tritium results.

A concern was expressed that more characterization of the vadose zone is needed because if corrective action is needed, the characterization has to be sufficient such that it can be remediated before reaching the regional aquifer. The scope of characterization and requirements will be based on what was used for ER corrective action. It has not been specified ahead of time how much characterization is required. This effort will determine how much more characterization of the vadose zone is needed for monitoring network.

Hydrogeologic Characterization Program Annual Meeting

The next annual meeting will be the week of April 9 - 12, 2002. April 9 will be the managers meeting, April 10-11 will be technical sessions in Santa Fe, and the close out session will be April 12 at the Los Alamos Technical Associates conference room.

Interactive Demonstration of the Water Quality Database

K. Henning (LANL) gave a live demonstration on how to access and use the Water Quality Database (WQDB). There are several differences between internal and external access. The externally-accessed WQDB has a 10-day lag time in its data. Data collected on Pueblo property can not be accessed until after the Pueblo has approved the data. Due to security measures after September 11, maps and station coordinates are not available. External access address is: WQDBWorld.lanl.gov. Downloaded report formats include Excel (tab delimited), HTML, and PDF.

The database is updated every one to two weeks. Currently working to automate this process. Turnaround time is 60 days from field sample event to data in the WQDB. Some laboratory contracts do not provide for electronic deliverables, therefore that data is slower to be transferred into the WQDB. Working on obtaining contracts with electronic data deliverables.

Perchlorate

David Rogers (LANL) presented background information and analytical issues on perchlorate.

Perchlorate is highly soluble, mobile, and persistent. It appears as ammonium perchlorate (salts) and as perchloric acid. It is a strong oxidizer used in rocket fuel, fireworks, air bags, and analytical chemistry. The health effects are the result of interference with iodine uptake by the thyroid gland, affecting normal hormone production. EPA has detected perchlorate in the groundwater of 18 states, and most extensively in California. California developed the current analytical method with a 4 ppb detection limit in 1997.

There is no current state or federal drinking water standard, however some states have set levels. California has a drinking water action level of 18 ppb (1997) and Texas set an interim drinking water level of 4 ppb (2001). The EPA added perchlorate to the Safe Drinking Water Act Contaminant Candidate List in 1998 and has set provisional action levels of 4 to 18 ppb. A federal drinking water standard awaits completion of toxicology and risk assessment. EPA recently released a draft toxicology assessment, the conclusions of which would suggest an MCL of about 1 ppb.

LANL sources of perchlorate include past discharges to:

- Acid and Pueblo canyons from TA-45,
- DP and Los Alamos canyons from TA-21, and
- Mortandad Canyon from TA-50 Radioactive Liquid Waste Treatment Facility (RLWTF) at NPDES Outfall 051.

The average TA-50 perchlorate was about 250 ppb in 2000 and has been about 200 ppb in the past couple of years. The RLWTF has a Waste Acceptance Criteria for perchlorate of 500 ppb. A waste stream survey was conducted in 2000 and the primary sources of perchlorate were duct wash down water and process wastewater. At TA-50, pilot studies with ion exchange resins have been done and the effluent will be able to reach 4 ppb with treatment. All tubular ultrafilter permeate will be treated by the ion exchange process. The ion exchange vessels and resins will be incinerated off-site. Treatment should be in place at the end of March. In relation to perchlorate in PRSs, it was noted that little perchlorate is used in HE research.

Dennis McQuillan (NMED/GWQB) stated that perchlorate has been documented to occur naturally. It is present in evaporate deposits in Brazil that were mined extensively and made into fertilizers and munitions. Perchlorate was found by NMED at Ft. Wingate and older fertilizer sites. It is also present in groundwater at NASA.

Analytical issues are apparent in measuring perchlorate levels. EPA and other organizations are working on new measurement methods. Ion chromatography has pit falls. This method does not look at perchlorate directly, but looks at electrical signal. It relies on anion separation as the solution flows through a column. The detector response at a retention time characteristic of the anion is proportional to concentration. The elution time is the only parameter used to determine if the peak is perchlorate. If other anions are eluted at the same time, the ion chromatography method can not tell the difference. If other anions were present, a false positive would result with no method to further separate perchlorate from other interfering species.

A new method using Liquid Chromatography/Mass Spectrometry/Mass Spectrometry (LC/MS/MS) may be able to distinguish between perchlorate and other anions and it may yield a lower detection limit. Acculabs offers analysis by LC/MS/MS and claims their method detection limit (MDL) is 0.25 ppb and their reporting limit (RL) is 0.5 ppb. The results from Acculabs with spiked samples have varied widely due to method and instrument problems; the method precision and MDL need more evaluation.

General Engineering Laboratory (GEL) has done some of the perchlorate analysis on water samples using the ion chromatography method. Quotes from GEL reports illustrate the problems encountered if the interfering substances are not removed:

- GEL narrative for analysis of March 9, 2002 Spring 4B Sample – "The original analysis for this batch indicated elevated concentrations that the laboratory believed were false positives. After investigating the cause it was determined to be matrix related and that an additional cleanup step using Barium was needed to reduce the potential matrix interference....The samples in this SDG were reanalyzed beyond using the cleanup techniques per EPA 314.0."
- GEL: "Prior to April 25, 2001 GEL had not been doing all clean-up methods including the Barium clean-up to remove sulfates, the silver clean-up to remove chlorides, and the hydrogen clean-up to remove excess silver, carbonates and other cations. Without these clean-ups the results could be questioned if false positives are present."

GEL was concerned about interference and re-ran the samples using barium removal. The resulting data was almost all non-detects for perchlorate and only one sample had detection at 4 ppb. Consequently, as a result of GEL's method improvement:

- "Detections" during 2000 are false positives
- "Detections" in the Spring 4 area are false positives
- Many surface water "detections" of perchlorate during early 2001 are non-detections based on validation: perchlorate was found in the blank.
- Perchlorate at LANL now reliably detected only at Otowi-1, Mortandad Canyon surface water, and Mortandad Canyon alluvial groundwater.

LANL conducted two spiked sample studies in response to concern about reliability and reputability of perchlorate data. The studies were intended to evaluate the precision and reliability of laboratory analyses at ppb perchlorate levels in natural waters. The first was a test of the ion chromatography method. Water from water supply wells O-1, PM-3, PM-5, and G-5A were collected and submitted to two analytical laboratories (Babcock and GEL) for analysis by the ion chromatography method. Each lab received one unaltered sample and samples spiked with various concentrations of perchlorate: 1 ppb, 2 ppb, 4 ppb, and 6 ppb. Some samples were analyzed as many as six times. The results clearly showed that the analytical method near detection limit is not reliable. GEL analytical results show considerable variation; MDL of 1 ppb and RL of 4 ppb are in doubt. Letter from Mark Minteer states that at Pantex, the natural water has interference with detection limit more likely 4 ppb. In a letter issued by GEL: "based on conversations with Pantex personnel in early May, MDLs and PQLs [practical quantitation limits] were raised to 4 and 12 ppb respectively. In the fall of 2001 GEL submitted a proposal....as part of an audit finding to elevate the MDLs and PQLs of LANL projects as well." The Babcock results were more consistent; an MDL of 2 ppb appears reliable.

The second spike study was of the LC/MS/MS method. A set of spiked samples similar to the first study was submitted to Acculabs. The first run from Acculab had errors of over 500% and over 8 ppb. The Acculab case narrative for the first run said: "The .....results...are the first attempt to analyze groundwater samples...by the technique." "The precision is excellent over a wide range of concentrations with the worst precision being at the ....low concentration as expected. Acculabs re-ran the samples only after LANL requested it. Acculab (LC/MS/MS) results lack repeatablilty; MDL of 0.25 and RL of 0.5 ppb in doubt.

Overview of water supply results:

- Otowi-1 appears to have perchlorate, possibly at 2 ppb.
- No perchlorate detections in other water supply wells based on Babcock data.
- Possibly 33% estimated J-flagged "detections" in other water supply wells based on GEL data; however, this conclusion does not consider revised GEL MDL of 4 ppb.

J. Arends raised issue that this meetings presentation is different than the earlier presentation to the CAB. It was noted that having had additional time, a more complete presentation was prepared.

Spring 4 Results:

- No perchlorate detected in any other White Rock Canyon springs
- GEL result from 9/25/00 of 8.5 ppb - prior to GEL method revision
- GEL result from 3/9/01 of 6.6 ppb, but was non-detect upon reanalysis using GEL method revision
- GEL results from 9/24-25/01 and 11/1/01 were non-detect or J-flagged
- Acculabs results from 11/1/01 of 0.50 to 0.65 ppb: reliability of method and detection limit questionable at this level.

Summary for Perchlorate

- Need for precision taxes reproducibility of current analytical methods
- Due to GEL method modification, most prior LANL perchlorate results are non-detections

- GEL detection limit of 1 ppb is probably too low; GEL recommends 4 ppb
- LANL spike studies:
  - GEL detection limit and reproducibility in question
  - Babcock performance seems reliable with 2 ppb MDL
  - Acculabs accuracy and detection limit in question
  - Otowi-1 may have 2 ppb of perchlorate; Spring 4 has none
  - DOE-Albuquerque is leading an effort to formally adopt a 4 ppb MDL for perchlorate by ion chromatography under 40 CFR 136
  - Even at an MDL of 4 ppb, 10 to 20% false positives can be expected from ion chromatography
  - DOE is leading an effort to get the LC/MS/MS (Acculabs) method approved by EPA.

Steve Rae (LANL) suggested that between work at Ft. Wingate, NMED, and LANL, a workshop or seminar on perchlorate issues might by timely. It could be a good subject for collaboration between NMED and the Laboratory. However, comments from LANL stakeholders suggest that they are not concerned with the absolute perchlorate value, but that analytical results show impacts from the Laboratory. It was reiterated that it is a good idea for NMED and the Laboratory to continue to share data and to communicate routinely. John Young (NMED/HMB) agreed that the public recognizes 'hits', and then the hits disappear. It appears suspicious when samples are 'cleaned up' and they are no longer detections. It is in the interest of both parties, NMED and LANL, to keep communication open.

Dennis McQuillan (NMED/GWQB) encouraged a seminar or workshop; however, perchlorate is not viewed as a priority environmental issue from a regulatory viewpoint. At Ft. Wingate, the perchlorate is in the 100s and at White Sands the results are in the 1000s. The successful pilot denitrification study in Albuquerque was discussed. Perchlorate is an electron receptor so in situ treatment may be possible. NMED is working with UNM and has met with the CDC. However, the real environmental problems are believed to be endocrine disruptors, manganese as neurotoxin, and nitrate (a new study suggests bladder cancer in women). Perchlorate is on the radar screen, but not a priority. NMED-GWQB would like to see LANL validation protocols. LANL will provide these.

Value Engineering Study

C. Nylander (LANL) discussed the DOE/HQ Value Engineering Study. Background:

- DOE/AL requested the Value Engineering (VE) Study; authorized in April, 2001
- VE Team of 10 DOE and contractor personnel were at LANL April 30-May 4, 2001
- Objective: to provide recommendations to improve the Hydrogeologic Characterization Program

Value Engineering:

- Was developed to capture informal processes used to meet industrial demands during WWII
- Follows Society of American Value Engineers (SAVE) guidelines
- Defines functions, determines costs of functions, and recommends lower-cost functional alternatives

The VE Report recommendations are:

Overall Recommendation 1: Prepare a comprehensive hydrogeologic report on the regional aquifer and initiate installation of a regional aquifer monitoring well network

Estimated Cost Savings: $10 million
Bases for Recommendation:

- Simultaneous characterization of all water zones has increased scope and costs
- A comprehensive integrated report on the regional aquifer can tell a compelling story
- 6-12 more single completion monitoring wells are adequate
- Alluvial and intermediate zones investigated by ER Project associated with PRSs

LANL Preliminary Response:

- Comprehensive characterization was the original scope, thus it can not "increase scope"
- A comprehensive integrated report is planned as a final deliverable for HWP
- Based on the DQO iteration, 15 more wells were identified
- Working on an approach to quantitatively determine number of wells

Overall Recommendation 2: Enhance project management to ensure deliverables are submitted on time and budget

Estimated Cost Savings: $152,000
Bases for Recommendation:

- Hydrogeologic Characterization Program is not organized as a separate project within the ER baseline
- Could increase effectiveness with project organization based on work breakdown structure
- Project managers control scope, schedule, and cost more easily

LANL Preliminary Response:

- Agrees with recommendation to organize all aspects of Hydrogeologic Geologic Characterization program together in the baseline
- DOE has not provided funding for project management of the HWP activities

VE Data Collection and Analyses Recommendation 1: Reduce total number of regional aquifer wells to be drilled

Estimated Cost Savings: $22.8 million
Bases for Recommendation:

- Only 6-12 additional wells needed because regional aquifer sufficiently well known

LANL Preliminary Response:

- Developing quantitative tool for determining data collection needs

VE Data Collection and Analyses Recommendation 2: Drill all future wells to a single-completion

Estimated Cost Savings: $19 million
Bases for Recommendation:

- New wells will be for monitoring top of regional aquifer

LANL Preliminary Response:

- Well completion based on DQOs for the well

VE Data Collection and Analyses Recommendation 3: Reduce the cost of groundwater chemistry analysis, through optimization of analytical parameters and sampling frequency, using lessons learned from wells already installed

Estimated Cost Savings: $360,000
Bases for Recommendation:
- Indicator parameters only for first 3 quarters; full suite for 4th quarter

LANL Preliminary Response:
- Analytical strategy negotiated with NMED

VE Data Collection and Analyses Recommendation 4: Minimize the time the drilling rig is on-site

Estimated Cost Savings: $1.6 million
Bases for Recommendation:
- Too much time when full-size rig is on-site on standby

LANL Preliminary Response:
- Agree. Adjustments are being made

VE Data Collection and Analyses Recommendation 5: Implement a competitively-bid, flexible, activity-based drilling contract

Estimated Cost Savings: $1 million
Bases for Recommendation:
- Other DOE sites have less expensive drilling contracts

LANL Preliminary Response:
- Agree. Have awarded contract to WGI

VE Recommendation 1 Regarding NMED & Stakeholder Relationship: Improve stakeholder and regulator understanding by tailoring information for maximum information transfer

Estimated Cost Savings: Not estimated
Bases for Recommendation:
- Develop a communication plan

LANL Preliminary Response:
- HWP has communication plan

VE Recommendation 2 Regarding NMED & Stakeholder Relationship: Increase use of integrated information management and display system for stakeholder interaction

Estimated Cost Savings: $500,000
Bases for Recommendation:
- Easy access to data with geographical reference

LANL Preliminary Response:
- Agree. WQDB is available and improving

VE Recommendation 3 Regarding NMED & Stakeholder Relationship: Use regional model to help communication of the site conceptual model

Estimated Cost Savings: not estimated
Bases for Recommendation:

- Include process for developing model, assumptions, input parameters

LANL Preliminary Response:

- Agree. This has been done in meetings and reports

VE Recommendation 4 Regarding NMED & Stakeholder Relationship: Develop better understanding of how NMED defines success

Estimated Cost Savings: not estimated
Bases for Recommendation:

- A "win" is final regional aquifer monitoring system in place

LANL Preliminary Response:

- Agree. Management meetings intended reach agreement on "end state"

VE Recommendation 5 Regarding NMED & Stakeholder Relationship: Identify deliverables and schedules collaboratively with NMED

Estimated Cost Savings: $1.16 million
Bases for Recommendation:

- Make NMED full partner in planning work

LANL Preliminary Response:

- Agreed. HWP activities have always had such a collaborative process

VE Recommendation 6 Regarding NMED & Stakeholder Relationship: Work with NMED to develop a set of indicator chemicals acceptable to both LANL and NMED

Estimated Cost Savings: $395,200
Bases for Recommendation:

- Use in place of full-suite analysis for first 3 quarters

LANL Preliminary Response:

- Agreed. Analytical strategy negotiated with NMED

VE Recommendation 7 Regarding NMED & Stakeholder Relationship: Establish a Joint Working Group with NMED to prioritize data needs for compliance and risk

Estimated Cost Savings: Not estimated
Bases for Recommendation:

- Work with NMED to specifically define data needs

LANL Preliminary Response:

- Agreed. Core team for quantitative approach proposed

VE Recommendation 8 Regarding NMED & Stakeholder Relationship: Improve and tailor reports on the results of characterization to be more "user friendly" both for NMED and stakeholder groups

Estimated Cost Savings: Not estimated
LANL Preliminary Response:

- Agreed. Continuing to improve communication

VE Recommendation 9 Regarding NMED & Stakeholder Relationship: Develop a formal dispute resolution mechanism between LANL and NMED specifically dealing with the regional aquifer

Estimated Cost Savings: Not estimated
LANL Preliminary Response:

- Agreed.

FY01 Annual Report

The draft Groundwater Annual Status Report will be mailed to the NMED this week. This report is more comprehensive than previous years. It summarizes current knowledge and articulates uncertainties. It proposes a revised scope of work, as discussed in the DQO Iteration presentation at the October 2001 Quarterly Meeting.

Los Alamos National Laboratory
Hydrogeologic Characterization Program
Quarterly Meeting
January 30, 2002
Minutes

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John Young	NMED		

Information Management Subcommittee Status Report

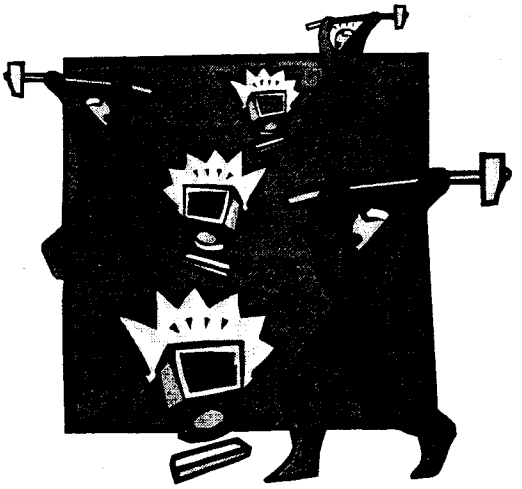
Hydrogeologic Characterization Program Quarterly Meeting
January 30, 2002

Quarter in Review

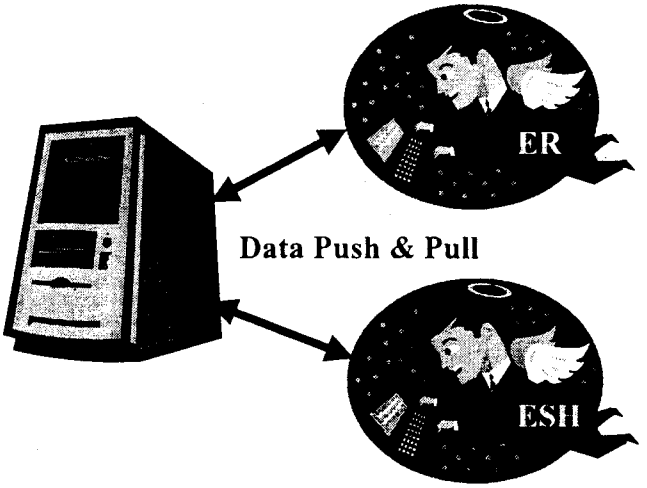
- Enhanced Sample Planning & Tracking System Features & Reports
- Water Level Module
- WQDB Website Enhancements
- Start of 2001 ESR Efforts
- ER/ESH Well Construction Data Exchange

ER/ESH Data Exchange

ER/ESH Data Exchange



ER/ESH Data Exchange



Looking Ahead

- More ERDB/WQDB Data Exchange (R-well Chemistry)
- Complete Water Level Module
- Develop Web-Based Validation Data Entry Tool
- Web-Based Data Screening Report
- GIS (dependent on funding)

Quarterly GIT Meeting

Well Construction Subcommittee Report

John McCann

January 30, 2002

Overview

- Drilling Accomplishments - Last Quarter
- Planned Drilling Activities
- Status of Quarterly Sampling Activities
- Status of Reporting Activities

Drilling Accomplishments Last Quarter

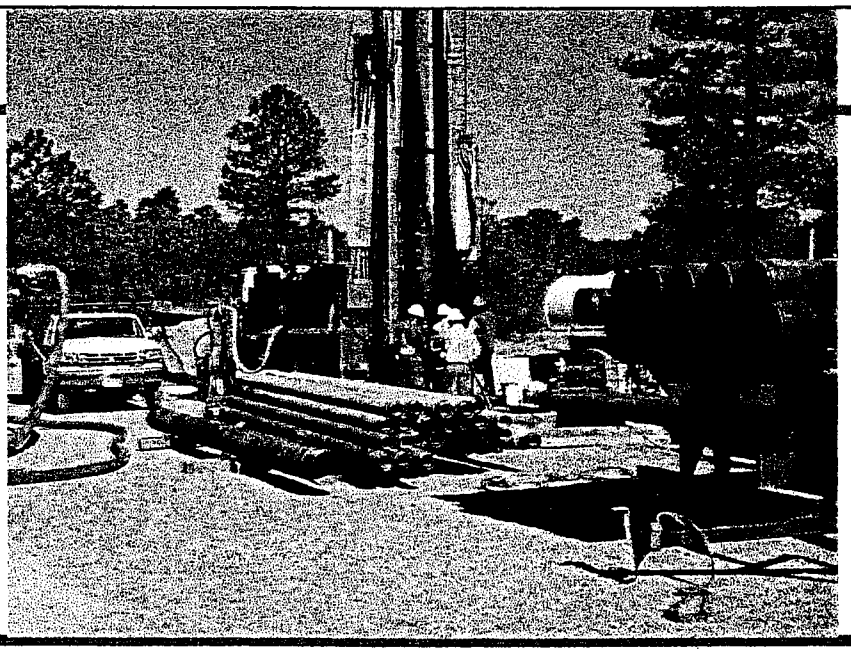
- Finished the installation of the R-13 well
- R-8 coring operations began Sept 27, 2002
- Cored to 244' bgs by Oct 1. However, went through 3 coring drill bits due to scoria
- Started up drilling well borehole with open hole approach - rig broke down on Oct 19
- Started drilling again around Oct 20, drill 200' in 24 hours. Upper borehole collapses, drill tools get stuck

Drilling Accomplishments Last Quarter

- Spent time trying to remove drill tools, end up twisting the drill tools off in the hole on Oct 31
- Start fishing operations Nov 1
- End up plugging and abandoning Dec 12
- Start new borehole (R-8A) Jan 7 with casing advance
- Advance to ≈ 770'. 113/4" casing gets stuck in formation.

Drilling Accomplishments Last Quarter

- Install casing jacks on rig and deploy special spear to recover casing. Drill open hole to total depth
- Employ specialty casing cutter. End up recovering only 200' of casing from borehole
- Borehole will not stay open due to flowing sands
- Had to advance smaller diameter casing to total depth
- Finally, the well is being installed as we speak!



Planned Drilling Activities

- R-14
  - DP-funded well in Ten Site Canyon (Mortandad Canyon system)
  - Drilled in May timeframe following T&E exclusion period
- R-18
  - ER-funded well on rim of Pajarito Canyon
  - Drilled in July timeframe following completion of R-14

Status of Quarterly Sampling

- Four wells were sampled last quarter:
  - 1st round at R-5
  - 3rd round at R-7
  - 3rd round at R-22
  - 4th round CdV-R-15-3
- Now have 6 wells with the quarterly sampling complete: R-9, R-9i, R-12, R-15, R-19, and CdV-R-15-3.

Status of Reporting Activities

Well Completion Rpts	Completion Date
R-25	Feb 02
R-31	Feb 02
R-22	Feb 02
R-7	Apr 02
Geochem Rpts	
R-15	Feb 02
R-9/R-9i	Mar 02
R-19	Apr 02
R-12	May 02
R-7	Aug 02
R-22	Sep 02

HYDROLOGY UPDATE

W. Stone

Quarterly Meeting, 30 Jan '02

Old Business

MCOBT-4.4

- Additional development by bailing ineffective
- Halted until dedicated pump installed
- Pump being installed this week

R-13

- Development was completed
- Pumping test was conducted
- Discharging 20 gpm barely stressed
- Results being analyzed

R-22

- Analysis of test data completed
- Results are presented in well report

Database

- Constructed field form for well development
- Reviewed/advised on hydrologic modules

New Business

R-7

- Well completion report is being prepared
- Reviewing first draft now

Modeling Subcommittee Report

Bruce Robinson

Hydrogeologic Characterization Quarterly Meeting

January 30, 2001

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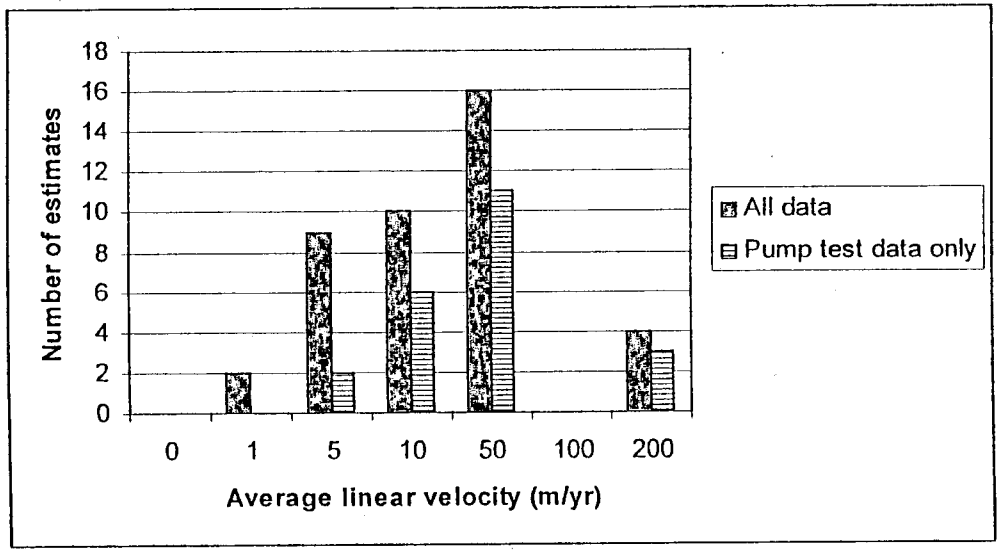
Modeling Activities: First Quarter of FY02

- Completed regional aquifer progress report for FY02
- Completed Phase 1 of infiltration study
  - Compiled estimates based on borehole information (moisture, chloride profiles)
  - Produced maps of key parameters likely to influence infiltration
- Contributed to sections of the annual status report
- Began preliminary work on Groundwater Pathways Assessment Project

Regional Aquifer Velocity Estimates

Permeability measurements and average gradient



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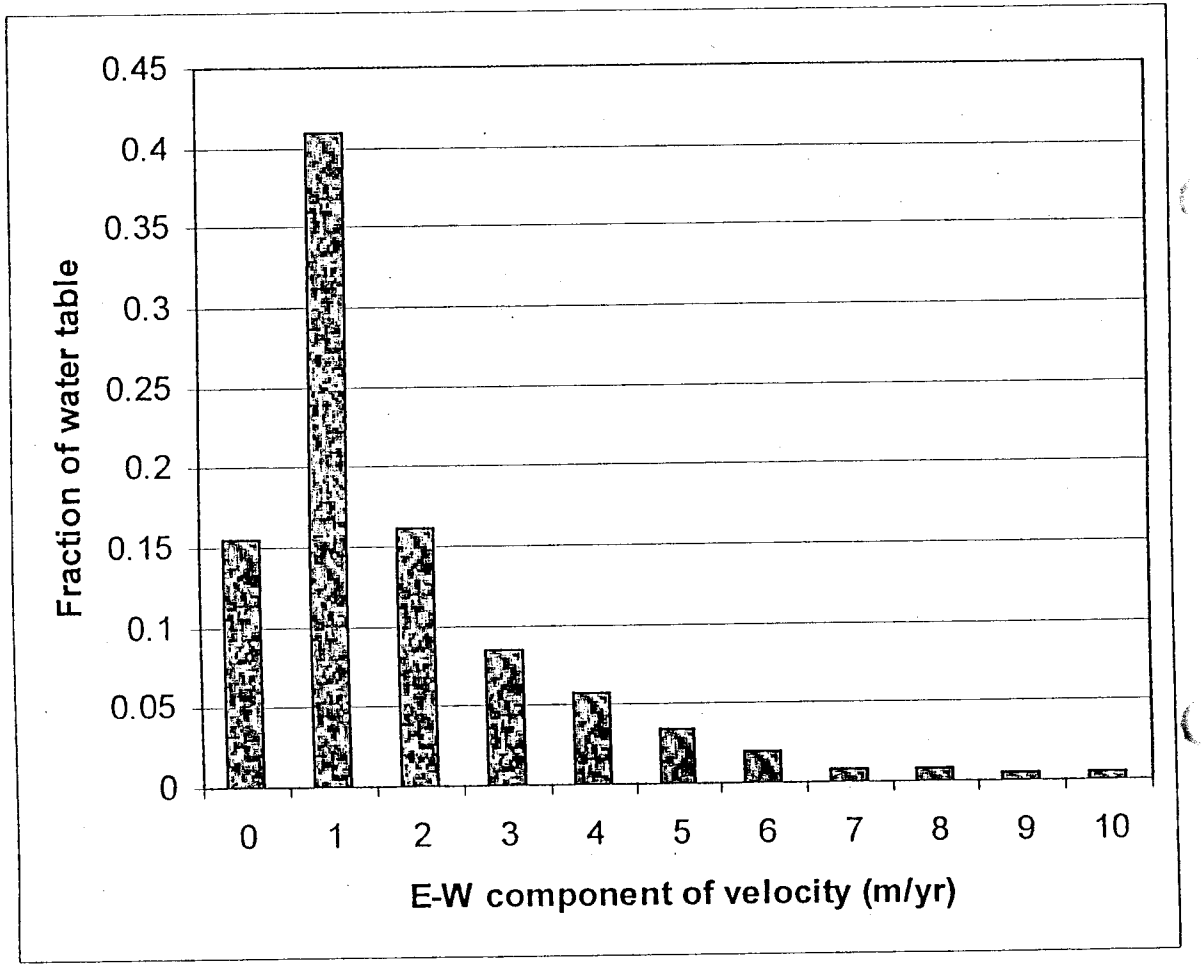
Regional Aquifer Velocity Estimates

Regional Aquifer Model Results

3D model properly accounts for local variations in permeability and hydraulic gradients, resulting in lower estimates of velocity

C-14 ages are consistent with the 3D model results



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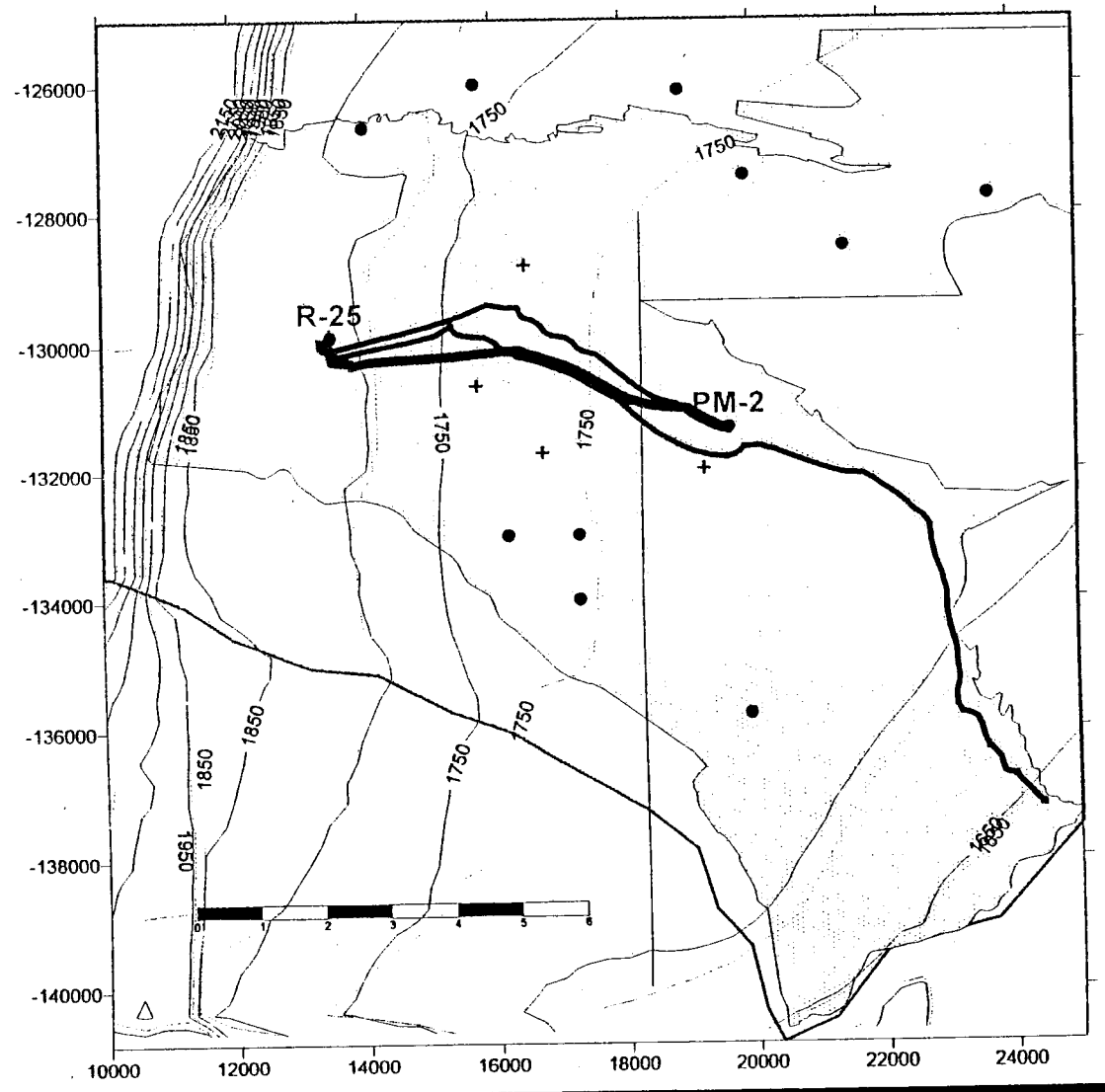
Use of Predictive Analysis in Groundwater Modeling Studies

- Predictive Analysis: A modeling technique to determine the range of possible behavior of a model *under the restriction that the model remain in calibration*
- Possible applications for the regional aquifer model:
  - What is the minimum travel time to the LANL boundary from a given release point?
  - What is the most northerly pathline between a release point and a downstream location?
- The user-defined question is evaluated by making a model predictions (e.g. travel time, maximum north coordinate of path, etc.) for a range of values of each uncertain parameter and finding the extreme value of the prediction for all calibrated models

Using Predictive Analysis to Estimate Uncertainty in Flow Path Direction

Point source at R-25

Analysis predicts the most northerly and most southerly pathlines between R-25 and PM-2



Los Alamos NATIONAL LABORATORY

STATUS REPORT FOR GEOCHEMISTRY SUBCOMMITTEE, GROUNDWATER INTEGRATION TEAM

BY

PATRICK LONGMIRE, DALE COUNCE,
BRENT NEWMAN, AND DAVID ROGERS

JANUARY 30, 2002

ENVIRONMENTAL RESTORATION PROJECT AND ESH-18

OBJECTIVES OF PRESENTATION

Present a summary of geochemical investigations conducted at Los Alamos National Laboratory and on the Pajarito Plateau since October 2001.

Topics of interest include:

- Quarterly Groundwater (Characterization) Sampling
- Analysis of Trace Anions-Perchlorate

SUMMARY OF CONSTITUENTS OF INTEREST IDENTIFIED AT R-WELLS (01/30/02)

Well	Zone	Sample	Chemical	Concentration
R-7	Perched	Well	Tritium	3.38 pCi/L
R-7	Regional	Well	Tritium	1.47 pCi/L
R-8	Regional	Borehole	Tritium	16.0 pCi/L
R-9I	Perched	Well	Tritium	246 and 167 pCi/L
R-9	Regional	Well	Tritium	14.7 pCi/L
R-12	Perched	Well	Tritium	187 and 98 pCi/L
R-12	Regional	Well	Tritium	57 pCi/L
R-13	Regional	Borehole	Tritium	0.64 pCi/L
R-15	Regional	Well	Tritium	3.29 pCi/L
		Well	Sr-90	-0.10 pCi/L
		Well	Nitrate (N)	2.40 mg/L
		Well	Perchlorate	4.19 μg/L

ND means not detected.

SUMMARY OF CONSTITUENTS OF INTEREST IDENTIFIED AT R-WELLS (01/30/02)

Well	Zone	Sample	Chemical	Concentration
R-22	Regional	Well	Tritium	2.87, -0.1 pCi/L, 0.89 -0.13 and 14.24 pCi/L
			Tc-99	[2] (3) and [0.8] (5) pCi/L
			U	8.44 (3) μg/L
R-25	Perched	Well	Tritium	52.0, 56.8, 39.6 pCi/L
R-25	Perched	Well	HMX, RDX, TNT	4.50, 30, 1.10 μg/L
R-25	Regional	Well	HMX, RDX, TNT	1.4, 7.8, and 0.92 μg/L
R-25	Regional	Well	Tritium	9.8, 5.8, 6.4 pCi/L

ND means not detected, (3) means screen number, and [0.8] means < detection.

PERCHLORATE AND CHLORO-OXYANION CHEMISTRY

Perchlorate (ClO_4^-) is a very stable compound that eventually reduces to chloride in presence of microbes and other reactive reductants.

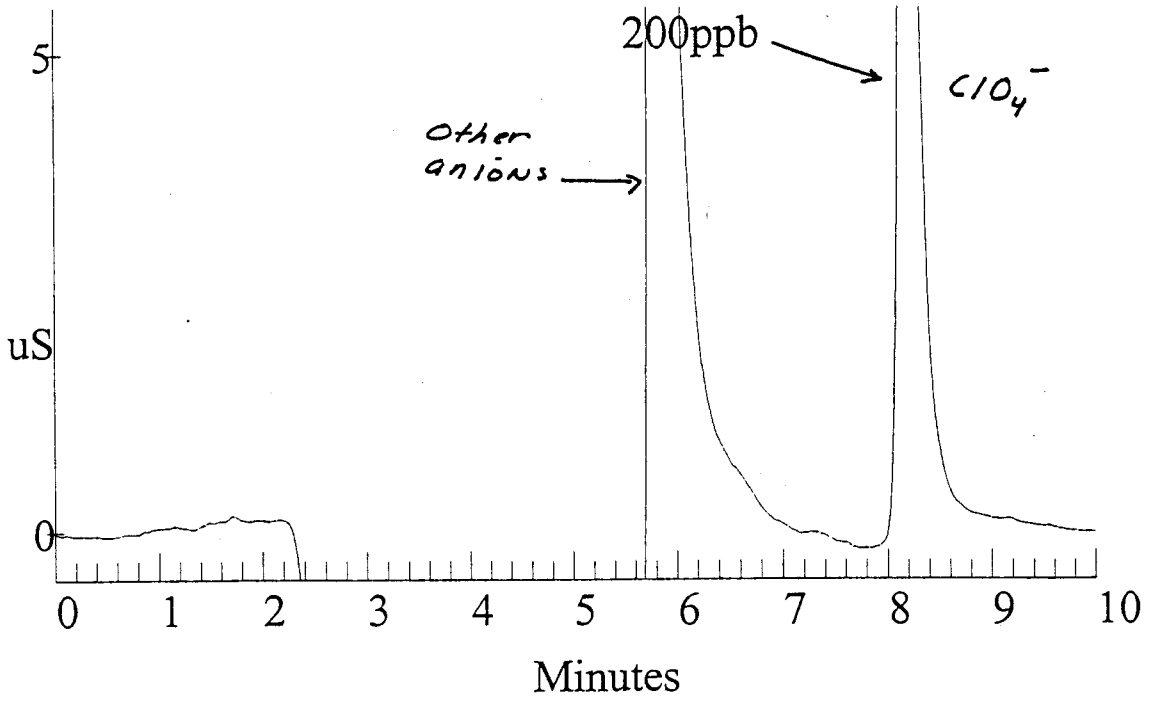
Reaction	E^0(V)	Eh at pH7
$ClO_4^- + 8H^+ + 8e^- = Cl^- + 4H_2O$	1.39	1.306
$ClO_4^- + 2H^+ + 2e^- = ClO_3^- + H_2O$	1.23	0.816
$ClO_3^- + 2H^+ + 2e^- = ClO_2^- + H_2O$	1.10	0.686
$ClO_2^0 + 2H^+ + 3e^- = ClO^- + H_2O$	1.36	1.083
$ClO_2^- + 2H^+ + 2e^- = ClO^- + H_2O$	1.51	1.096
$ClO^- + 2H^+ + 2e^- = Cl^- + H_2O$	1.72	1.096
$O_2(g) + 4H^+ + 4e^- = 2H_2O$	1.23	0.816

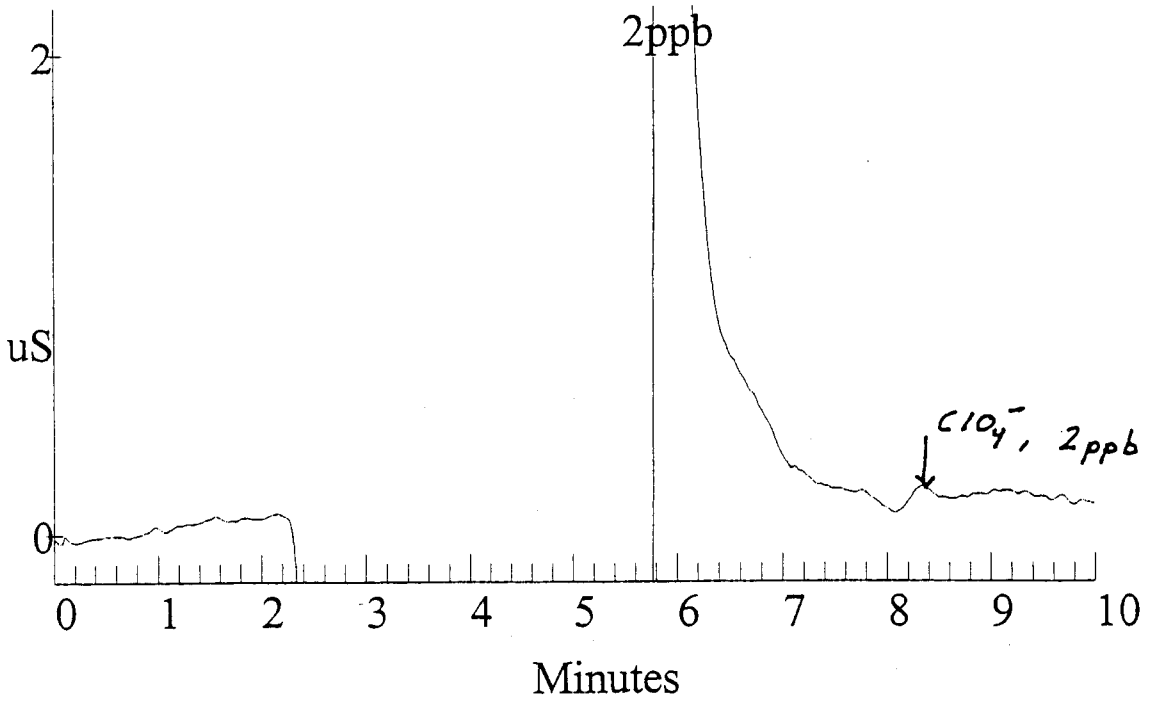
Four single bonds between chlorine and oxygen enhance the stability of perchlorate in aqueous solutions.

Chlorate (ClO_3^-) is a degradation product of perchlorate and is observed in Los Alamos Canyon.

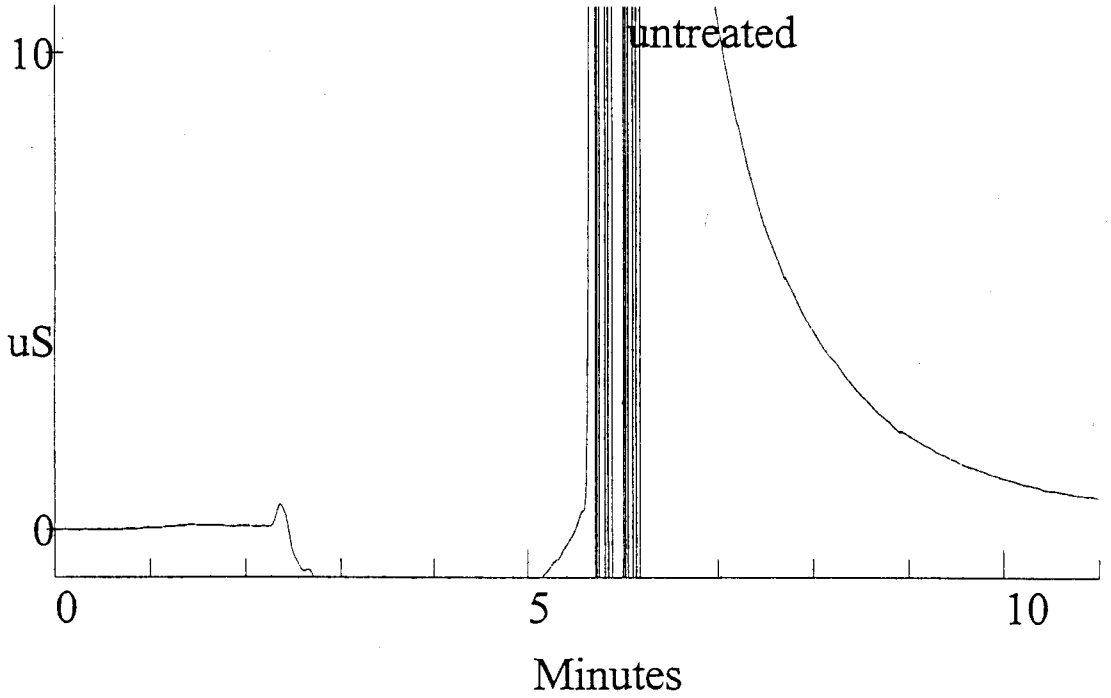
Perchlorate is thermodynamically stable at values greater than those show in the above table.

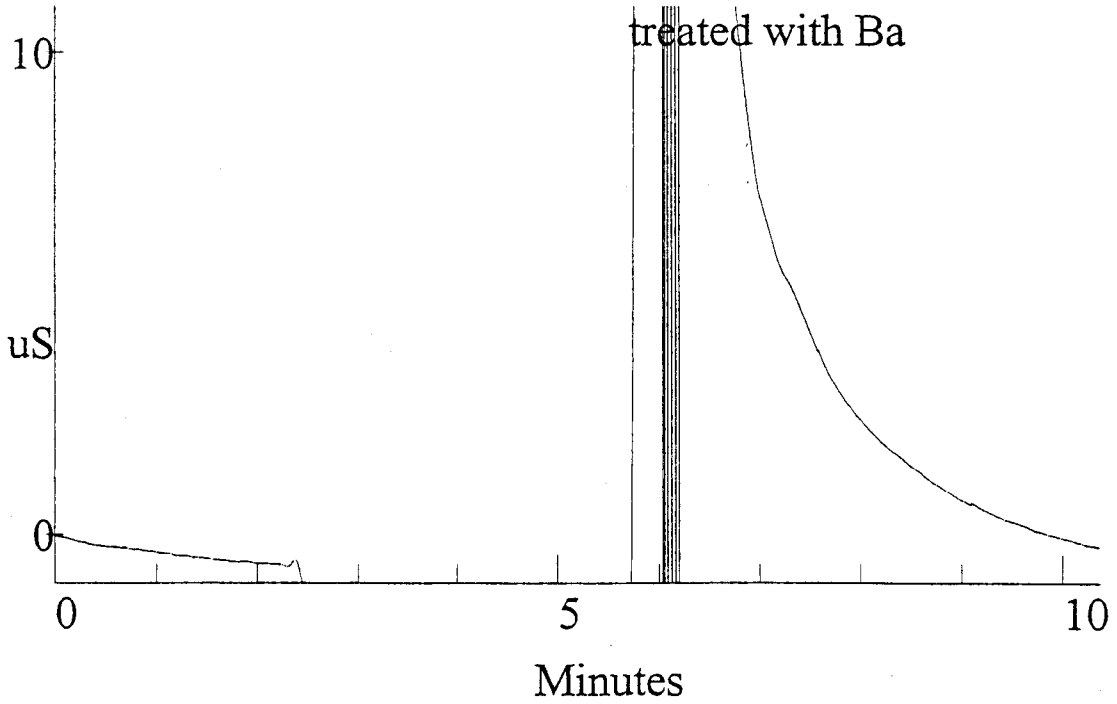
ClO4 in deionized water





Well R-8 water





SULFATE REMOVAL BY OF BARIUM-COATED RESIN

Water samples are passed through a cartridge containing barium, which removes sulfate from solution. Sulfate tail overlaps with the perchlorate peak using ion chromatography.

Perchlorate Analytical Results (μg/L) Reported by GEL

Sample	Prior to Ba Treatment	After Ba Treatment
LAO-0.7	6.02	0
LAO-2	5.61	0
LAO-3A	8.29	1.17
LAO-4.5C	5.97	0.66
LAO-6A	12.73	0.58

Water samples collected March 28 and 29, 2001. LAO denotes shallow wells in upper Los Alamos Canyon.

SUMMARY

Since October 2001, Geochemistry Subcommittee members have collected characterization groundwater samples from R-5, R-7, R-22, and CdV-15. Borehole water samples have been collected from R-8 and R-13.

Constituents of interest in R wells include nitrate (R-15), perchlorate (R-15), and HE compounds (R-25).

Groundwater with measurable tritium occurs at MCOBT-4.4, R-8, R-9, R-9I, R-12, R-15, and R-25. These wells contain groundwater less than 60 years of age.

Analytical results for perchlorate (<10 μg/L) should be critically evaluated using ion chromatography.

SUPPLEMENTAL MATERIAL FOR GEOCHEMISTRY SUBCOMMITTEE

R-WELL SCREENS, SAMPLING PORT DEPTHS, AND SAMPLING ROUNDS (01/30/02)

- R-5 — Four Screens; 169 ft, 375 ft, 678 ft, and 860 ft; 1 Round
- R-7 — Three Screens; 378 ft, 744 ft, and 915 ft; 3 Rounds
- R-8A — Two Screens; 731 ft, 825 ft; 0 Rounds
- R-9 — *Single Screen*; 700 ft; 4 Rounds
- R-9I — Two Screens; 199 ft and 279 ft; 4 Rounds
- R-12 — Three Screens; 468 ft, 507 ft, and 811 ft; 4 Rounds
- R-13 — *Single Screen*; 940 ft; 0 Round (04/02)
- R-15 — *Single Screen*; 1015 ft; 4 Rounds

R-WELL SCREENS, SAMPLING PORT DEPTHS, AND SAMPLING ROUNDS (01/30/02)

- R-19 — Seven Screens; 844 ft (dry), 909 ft, 1190 ft,1412 ft, 1586 ft, 1730 ft, and 1834 ft; 4 Rounds
- R-22 — Five Screens; 906 ft, 962 ft, 1273 ft, 1379 ft, and 1449 ft; 3 Rounds
- R-25 — Eight Screens; 755 ft, 892 ft, 1063 ft, 1192 ft, 1303 ft, 1406 ft, 1605, and 1796 ft; 3 Rounds
- R-31 — Five Screens; 439 ft, 515 ft, 666 ft, 827 ft, 1007 ft; 2 Rounds
- MCO-BT-4.4 — *Single Screen*; 493 ft; 0 Round (05/02)
- CDV-15 — Six Screens; 624 ft (dry), 806 ft (dry), 980 ft (dry), 1254 ft, 1350 ft, 1640 ft; 4 Rounds
- CDV-37 — Four Screens; 927 ft, 1201 ft, 1365 ft, 1553 ft; 0 Round (02/02)

SAMPLING PROTOCALS AT R-WELLS

- Purge single completed wells, removing at least 3 well bore volumes; measure field parameters; collect; filter; and preserve (if required).

- Collect groundwater samples at multicompleted wells; measure field parameters; filter; and preserve (if required). Groundwater samples are collected using the Westbay Instruments at a rate of four liters per hour (one trip per hour).

ANALYTICAL METHODS EPA SW846

- Metals- Inductively Coupled Plasma Optical Emission Spectroscopy and Inductively Coupled Plasma Mass Spectrometry
- Anions- Ion Chromatography
- Organic Compounds- Gas Chromatography and Gas Chromatography-Mass Spectrometry
- High Explosive Compounds- High Pressure Liquid Chromatography and Diode Array Detector
- Radionuclides- Alpha Spectrometry, Gas Proportional Counting, Gamma Spectroscopy, Direct Counting, Electrolytic Enrichment
- Stable Isotopes- Isotope Ratio Mass Spectrometry

Integrated Groundwater Protection Plan

Diana Hollis
January 30, 2002
GIT Quarterly Meeting

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Slide #1

Integrated Groundwater Protection Plan Update

- Goal: Protect groundwater users from known and potential contaminant releases *always*
- First step: Objectively evaluate existing groundwater monitoring program
- Second step: Identify alternative actions to optimize existing groundwater monitoring program
- Third step: Implement optimal actions and continuously iterate

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Slide #2

Integrated Groundwater Protection Plan

- Goal: *Protect* groundwater users from know and potential contaminant *always*
  - Follow EPA guidance to quantify "protect"
  - Assume two time-frames, first controlled access, then unrestricted access

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Slide #3

Integrated Groundwater Protection Plan

- First step: *Objectively* evaluate existing groundwater monitoring program
  - Quantify existing state of knowledge *and uncertainty* about sources and groundwater transport (all parameters)
  - Simulate contaminant transport via groundwater from sources to groundwater access points
  - Compare calculated concentrations with "protective limits" at access points
  - Determine if existing monitoring wells will detect contamination before protective limits are exceeded at access points
  - Define locations for additional wells if needed

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Slide #4

Integrated Groundwater Protection Plan

- Second step: Identify alternative actions to optimize existing groundwater monitoring program
  - Identify alternative activities (e.g., additional monitoring, additional characterization of geology, hydrology, contaminant source, and/or more realistic models) that could reduce the uncertainty in the direction and rate of potential contaminant plumes
  - Quantify reduction in uncertainties associated with alternative activities and combinations of activities
  - Compare cost of alternative actions with expected savings in monitoring

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Slide #5

Integrated Groundwater Protection Plan

- Third step: Implement optimal actions and continuously iterate
  - Complete "high return" actions (including monitoring)
  - Re-evaluate monitoring program to account for the results of completed actions
  - Optimize further activities and/or additional monitoring if required
  - Iterate every five years to incorporate changes in knowledge and changes in receptors and their locations

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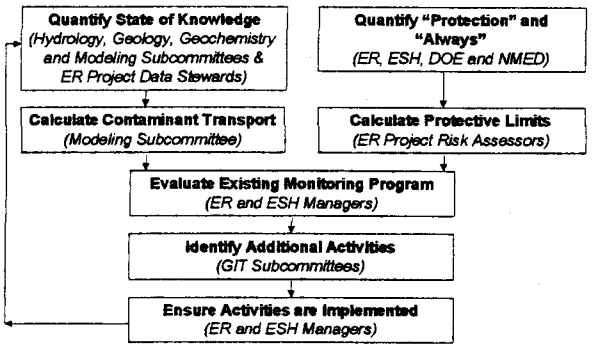
Slide #6

Integrated Groundwater Protection Plan



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Slide #7

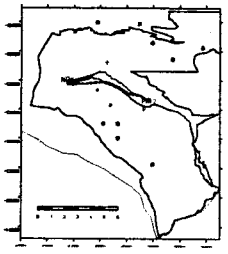
FY02 Planned Work

Charlie Nylander

FY02 Field Activities

- Complete R-8 and R-13
- Drill and complete R-14 and R-20
- Characterization sampling and analysis in completed wells

FY02 Non-Field Activities



- Information Management
- Regional aquifer modeling
- Geologic Model
- Quarterly and Annual Meetings
- Annual Report

Water Quality Database Website Demonstration

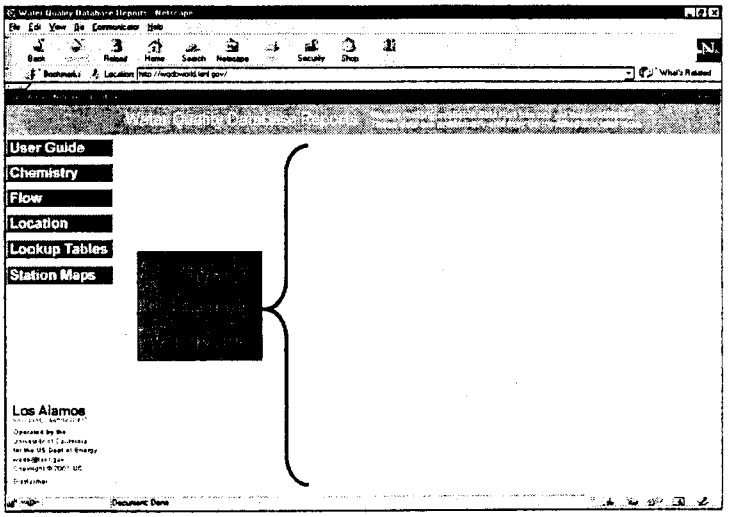
Hydrogeologic Characterization Program Quarterly Meeting
January 30, 2002

Overview

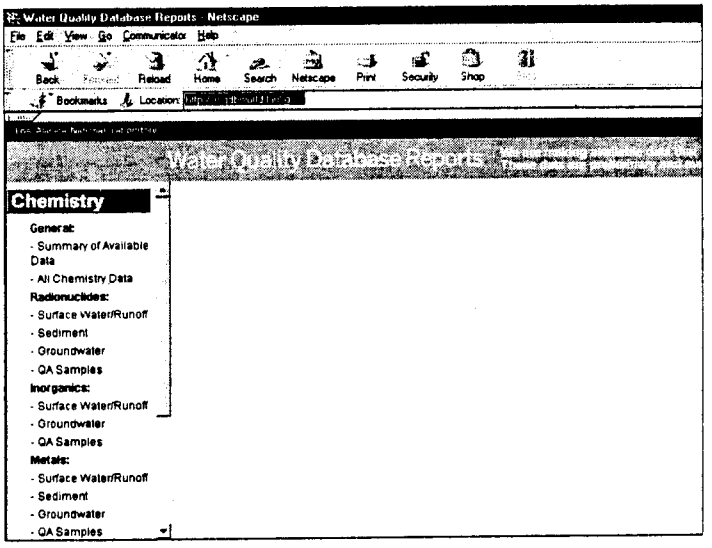
- How to get to the website
- How to Run a Report
- Report Output Options
- Tips & Tricks
- Q & A

Getting to the Website

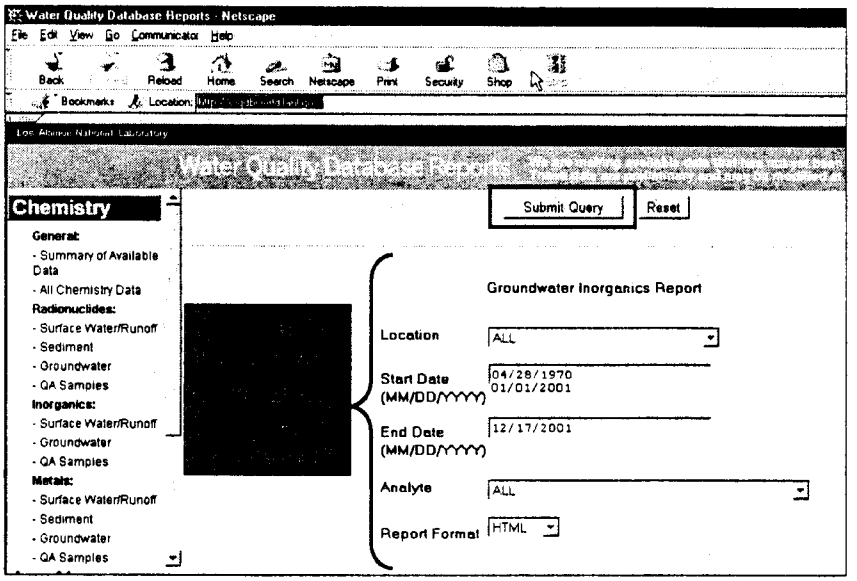
http://wqdbworld.lanl.gov



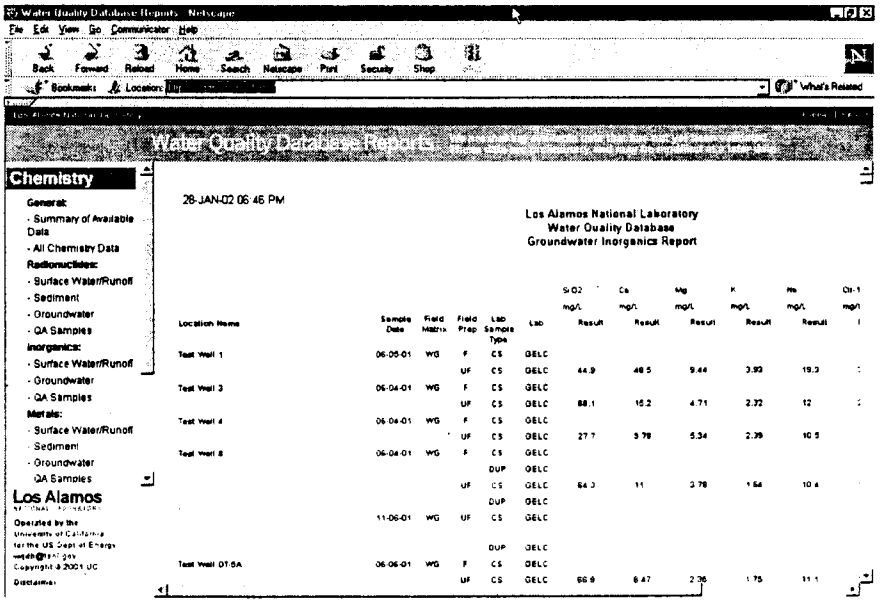
Step 1: Select a Report



Step 2: Complete Parameter Form & Submit Query

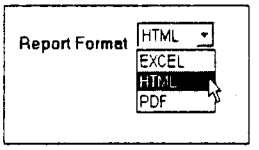


Step 3: Report Output (HTML Format)

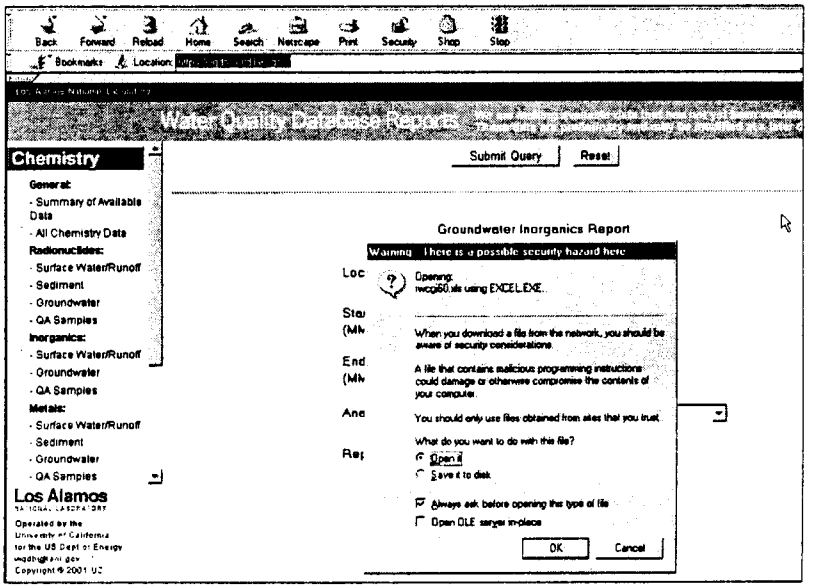


Report Format Options:

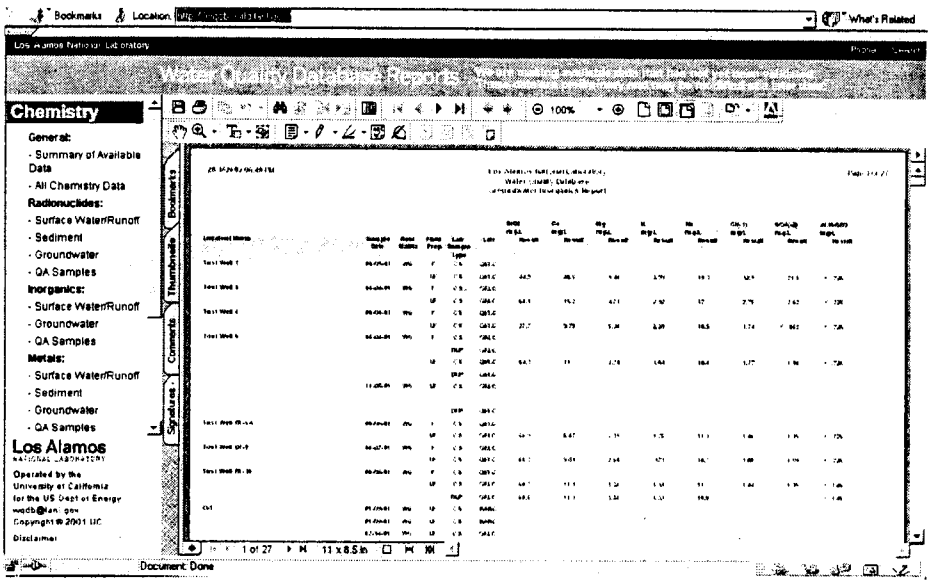
- **EXCEL** – Use when you wish to view or download an Excel file.
- **HTML** – Use to view the report on-screen (medium-quality formatting).
- **PDF** – Use to view the report on-screen (best formatting, but requires Adobe Acrobat Reader plug-in).



Excel Output Example



PDF Output Example



Tips & Tricks

- Restrict Your Queries
- Use the "Back" Button
- Data is Updated Approximately Every 2 Weeks
- Data Turnaround: approximately 60 days (Sample Collection → Website Availability)
- Data Are Preliminary
- Comments, Questions, Suggestions? khenning@lanl.gov

Question & Answer

Perchlorate Overview

for presentation to the

Los Alamos National Laboratory

Hydrogeologic Characterization Quarterly Meeting

Los Alamos National Laboratory
U.S. Department of Energy

David Rogers, ESH-18
Bob Beers, ESH-18

January 30, 2002

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Perchlorate --- Talk Outline

- Background information on perchlorate.
- Perchlorate analytical issues-
  - Most prior LANL perchlorate indications are non-detections due to matrix interference;
  - GEL detection limit probably too high.
- LANL spike study-
  - GEL detection limit in question;
  - Babcock performance seems reliable;
  - Acculabs accuracy in question.
- Summary of spring and Los Alamos water supply perchlorate results.

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The Perchlorate Ion (ClO_4^{-1}) --- An Overview

- Highly soluble, mobile, and persistent.
- Appears as ammonium perchlorate (salts) and as perchloric acid.
- A strong oxidizer used in rocket fuel, fireworks, air bags, and analytical chemistry.
- Interferes with iodine uptake by the thyroid gland, affecting normal hormone production.
- California developed the current analytical method with a 4 ppb detection limit in 1997.
- Detected by EPA in ground water in 18 states, most extensively in CA.

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Perchlorate --- Regulatory Standards

- No current state or federal drinking water standard.
- 1997 - California set a drinking water action level of 18 ppb.
- 1998 - EPA added to the SDWA Contaminant Candidate List.
- 2001- Texas set an interim drinking water level of 4 ppb.
- EPA has set provisional action levels of 4 ppb to 18 ppb.
- A federal standard awaits the completion of risk assessment studies.
- Current EPA MCL recommendation is 1 ppb.

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Perchlorate --- LANL Sources

- Possible past discharges to Acid & Pueblo Canyons from TA-45 and to DP & Los Alamos Canyons from TA-21
- Current discharges from the RLWTF at TA-50 to Mortandad Canyon at NPDES Outfall 051.
- Average RLWTF effluent concentration was about 250 ppb in 2000.
- RLWTF completed a perchlorate waste stream survey in 2000.
- Primary sources identified were duct wash-down water and process waste water.
- RLWTF has proposed a Waste Acceptance Criteria (WAC) of 500 ppb.

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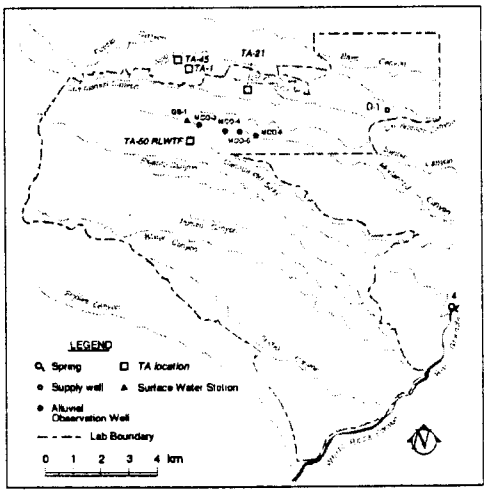
Perchlorate --- LANL Sources and Possible Detections



Locations of selected TAs, alluvial groundwater observation wells, springs, and surface water monitoring stations.

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Perchlorate --- Treatment at the RLWTF

- RLWTF conducted pilot scale tests using ion exchange resins selective for perchlorate.
- Pilot tests confirmed that treatment to below 4 ppb is achievable.
- All tubular ultrafilter (TUF) permeate will be treated by the ion exchange process.
- Ion exchange vessels and resin will be incinerated off site.
- Ion exchange treatment system is expected to be operational by March 31, 2002.

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Perchlorate --- Analytical Issues

- EPA: "The need for a reporting limit of 4 ppb taxes the sensitivity and reproducibility of the current ion chromatography method."
- EPA is working to study existing methods and develop new techniques.
- The IC method relies on anion separation as the solution flows through a column. The detector response at a retention time characteristic of the anion is proportional to concentration.
- The elution time is the only parameter used to determine if the peak is perchlorate. If other anions are eluted at the same time the IC method can not tell the difference.
- If other anions are present, a false positive would result with no method to further separate perchlorate from the interfering species.

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Perchlorate --- Analytical Issues

- A new method using liquid chromatography/mass spectrometry/mass spectrometry (LC/MS/MS) may distinguish between perchlorate and other anions.
- LC/MS/MS may yield lower detection limit.
- Analysis by LC/MS/MS offered by Acculabs.
- Acculabs' claimed MDL is 0.25 ppb; RL is 0.5 ppb.
- Results so far vary widely due to method and instrument problems; method precision and MDL need more evaluation.

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Perchlorate --- GEL Analysis Issues

- GEL narrative for analysis of March 9, 2002 Spring 4B sample: "The original analyses for this batch indicated elevated concentrations that the laboratory believed were false positives. After investigating the cause it was determined to be matrix related and that an additional cleanup step using Barium was needed to reduce the potential matrix interference... The samples in this SDG were reanalyzed beyond using the cleanup techniques per EPA 314.0."
- GEL: "Prior to April 25, 2001 GEL had not been doing all clean-up methods including the Barium clean-up to remove sulfates, the silver clean-up to remove chlorides, and the hydrogen clean-up to remove excess silver, carbonates and other cations. Without these clean-ups the results could be questioned if false positives are present."

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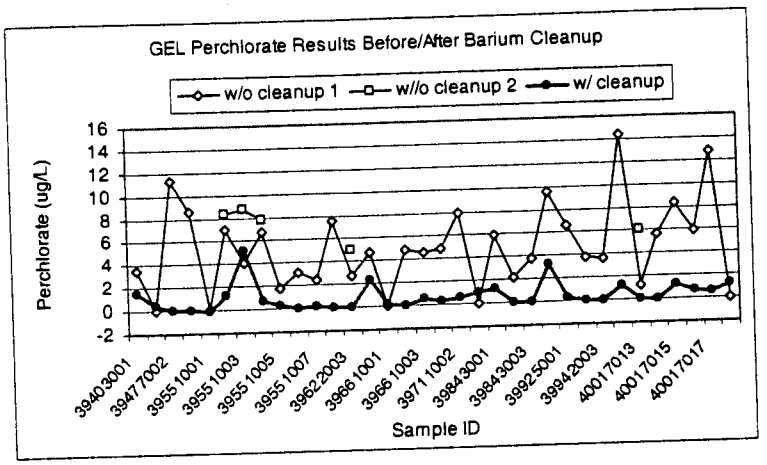
Perchlorate --- GEL Analysis Issues



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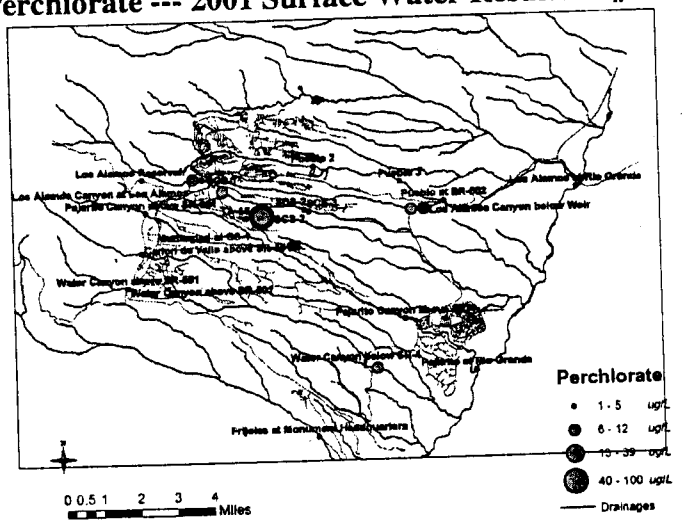
Perchlorate --- 2001 Surface Water Results Rejected



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Perchlorate --- Most GEL Detections Rejected

- As a result of GEL's method improvement-
  - "Detections" during 2000 are false positives;
  - "Detections" in Spring 4 area are false positives
  - Many surface water "detections" of perchlorate during early 2001 are false positives, lacking sufficient processing before analysis;

- The remaining surface water "detections" of perchlorate during early 2001 are non-detections based on validation- perchlorate was found in the blank.

- Perchlorate at LANL now reliably detected only at:
  - Otowi-1 water supply well;
  - Mortandad Canyon surface water;
  - Mortandad Canyon alluvial groundwater.

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Perchlorate --- LANL Spike Study 9/5/01 --- Purpose

- Study goal: evaluate precision and reliability of laboratory analyses at ppb perchlorate levels.

- Submit spiked samples from water supply wells to each analytical laboratory as test case.

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Perchlorate --- LANL Spike Study --- GEL IC Analysis

Analytical Quality Associates, Inc.
616 Maxine NE
Albuquerque, NM 87123
Phone: 505-299-5201
Fax: 505-299-6744
Email: minteer@aol.com

To: Bob Beers, William Turney, and Ken Mullen (LANL ESH)
From: Mark Minteer (AQA/DOE-AL Analytical Management Program)
Date: 11/2/01
Re: ClO_4 detection limit study results

Background and Summary:

The method detection limit for perchlorate (ClO_4) by ion chromatography (IC), as calculated by GEL according to the specifications of 40 CFR 136, is 1 ppb. We have shown empirically that for ClO_4 by IC, as with previous results for some GC and HPLC techniques, the high precision attainable for low-level standards in clean (DI) water leads to calculated detection limits that are demonstrably lower than the limit of sensitivity of the instrument.

Pantex, LANL ESH, and LANL ER have all seen unexpected, random low-level hits for ClO_4 by IC. Matrix-specific MDL verification studies run for Pantex in late 2000 and early 2001 showed that ClO_4 can not be detected at the calculated 1 ppb MDL for IC when run in a real Ogallala aquifer groundwater matrix. Pantex adopted a 4 ppb MDL for ClO_4 after reviewing those data (see Attachment One). Additional data were recently acquired using groundwater from Los Alamos, with similar results. The data for groundwater matrices from both DOE-AL facilities show significant random variations in background (noise) that lead to frequent false positives. Based upon the data acquired in the new MDL verification studies, the GEL IC chemist (Bob Sosa) and DOE-AL Analytical Management Program staff recommend that LANL ESH also adopt an MDL level for ClO_4 run by IC that is no lower than 4 ppb.

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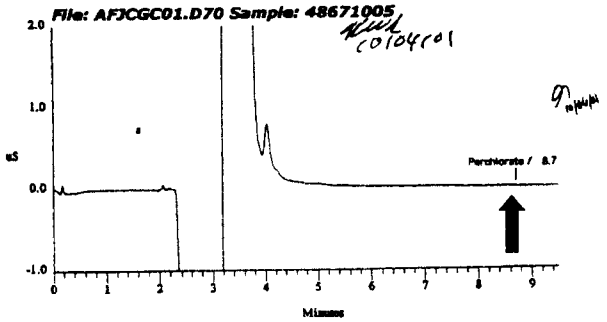
Perchlorate --- LANL Spike Study --- GEL IC Analysis

Pk. Num	Ret Time	Component Name	Concentration ug/l	Height	Area	Bl. Code	%Delta
1	8.71	Perchlorate	1.493	6310	45944	1	0.00
		Totals	1.493	6310	45944		

File: AFJCGC01.D70 Sample: 48671005



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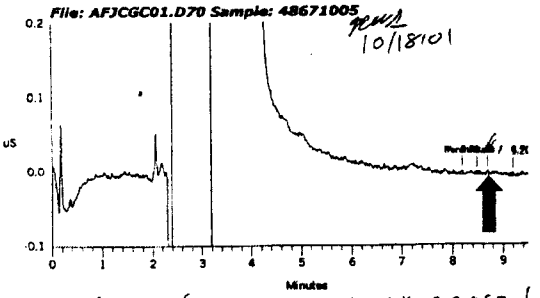
Perchlorate --- LANL Spike Study --- GEL IC Analysis

Pk. Num	Ret Time	Component Name	Concentration ug/l	Height	Area	Bl. Code	%Delta
3	8.70	Perchlorate	1.304	5304	19752	1	0.00
		Totals	1.304	5304	19752		



This chromatogram was reprocessed so the perchlorate could be more easily seen.

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Perchlorate --- LANL Spike Study 9/5/01 --- IC Analysis

Summary of Perchlorate Study Analytical Results. Sample Date: 9/5/2001. All units are ug/L (ppb).

	O-1		PM-3		PM-5		G-5A	
Sample Type	Babcock	GEL	Babcock	GEL	Babcock	GEL	Babcock	GEL
Initial Sample	<2	3.86	<2	<0.958	<2	2.05	<2	<0.958
Initial Sample Rerun #1	<2	3.24	<2	<0.958	<2	<0.958	<2	<0.958
Initial Sample Rerun #2	<2	2.55	<2	1.47	<2	1.493	<2	1.474
Initial Sample Rerun #3	NA	3.07	NA	<0.958	NA	1.663	NA	1.287
Initial Sample Rerun #4	NA	2.92	NA	1.62	NA	<0.958	NA	<0.958
Dupe Sample	<2	3.53	<2	2.56	<2	<0.958	<2	2.61
Unspiked Sample Mean	**<2**	**3.19**	**<2**	**1.42**	**<2**	**1.35**	**<2**	**1.37**
1 ppb Spike	NA	3.87	NA	3.49	NA	1.3	NA	<0.958
1 ppb Spike Rerun #1	NA	3.53	NA	1.86	NA	3.267	NA	1.88
1 ppb Spike Rerun #2	NA	3.88	NA	<0.958	NA	2.58	NA	3.026
1 ppb Spike Rerun #3	NA	3.77	NA	2.67	NA	1.505	NA	<0.958
1 ppb Spike Rerun #4	NA	3.87	NA	3.49	NA	1.295	NA	3.058
1 ppb Spike Mean		**3.78**		**2.49**		**1.99**		**1.98**
2 ppb Spike	2.7	4.22	<2	3.90	<2	2.3	3.1	3.24
2 ppb Spike Rerun #1	<2	4.52	<2	3.21	<2	3.525	<2	3.56
2 ppb Spike Rerun #2	<2	4.91	<2	3.57	<2	3.2	<2	3.269
2 ppb Spike Rerun #3	NA	4.56	NA	3.60	NA	3.37	NA	3.455
2 ppb Spike Rerun #4	NA	4.69	NA	3.00	NA	3.594	NA	3.015
2 ppb Spike Mean	**2.23**	**4.58**	**<2**	**3.45**	**<2**	**3.20**	**2.37**	**3.31**
4 ppb spike	6	6.59	4	4.16	4	3.72	5	6.19
6 ppb spike	7	7.56	6	5.72	7	6.88	7	5.42

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Perchlorate --- LANL Spike Study --- LC/MS/MS Analysis

Summary of Perchlorate Spike Study
Analytical Results from Acculabs.
Sample Date: 10/24/2001. All units are ug/L (ppb)

	PM-3	
Sample Type	first run	rerun
Initial Sample	1.4	0.51
Initial Sample Rerun #1	1.6	0.57
Initial Sample Rerun #2	1.6	0.57
Initial Sample Rerun #3	1.7	0.58
Initial Sample Rerun #4	1.4	0.53
Average of Detections	*1.5*	*0.5*
1 ppb Spike	5	1.5
1 ppb Spike Rerun #1	5.4	1.5
1 ppb Spike Rerun #2	5.7	1.6
1 ppb Spike Rerun #3	5.6	1.6
1 ppb Spike Rerun #4	5.6	1.6
Average	*5.5*	*1.6*
2 ppb Spike	8.5	2.6
2 ppb Spike Rerun #1	8.4	2.7
2 ppb Spike Rerun #2	8.3	2.7
2 ppb Spike Rerun #3	8.1	2.6
2 ppb Spike Rerun #4	8.1	2.7
Average	*8.3*	*2.7*
3 ppb Spike	9	3.7
3 ppb Spike Rerun #1	9.5	3.7
3 ppb Spike Rerun #2	9.7	3.7
3 ppb Spike Rerun #3	10	3.8
3 ppb Spike Rerun #4	10	3.7
Average	*9.6*	*3.7*
4 ppb Spike	10	5.1
4 ppb Spike Rerun #1	10	5.2
4 ppb Spike Rerun #2	12	6.2
4 ppb Spike Rerun #3	11	5.3
4 ppb Spike Rerun #4	11	5.2
Average	*10.8*	*5.4*
5 ppb Spike	11	8.5
5 ppb Spike Rerun #1	12	8.4
5 ppb Spike Rerun #2	11	7.8
5 ppb Spike Rerun #3	12	7.6
5 ppb Spike Rerun #4	13	5.1
Average	*11.8*	*7.5*

- Acculabs' first LC/MS/MS runs had errors of over 500% and over 8 ppb.
- Acculabs reran the samples only after LANL requested it.
- Acculabs case narrative for first run:

"The… results… are the first attempt to analyze… groundwater samples… by the technique."

"…the precision is excellent over a wide range of concentrations with the worst precision being at the… low concentration as expected."

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Perchlorate --- LANL Spike Study 9/5/01 --- Conclusions

- GEL analytical results show considerable variation; MDL of 1 ppb and RL of 4 ppb in doubt.
- GEL: "Based on conversations with Pantex personnel in early May, MDLs and PQLs were raised to 4 and 12 ppb respectively. In fall of 2001 GEL submitted a proposal… as part of an audit finding to elevate the MDLs and PQLs of LANL projects as well."
- Babcock results more consistent; MDL of 2 ppb appears reliable.
- Acculab (LC/MS/MS) results lack repeatability; MDL of 0.25 ppb and RL of 0.5 ppb in doubt.

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Perchlorate --- Overview of Water Supply Results

- Otowi 1 appears to have perchlorate, possibly at 2 ppb.
- No perchlorate detections in other water supply wells based on Babcock data.
- Possibly 33% estimated J-flagged "detections" in other water supply wells based on GEL data;
  - -this conclusion does not consider revised GEL MDL of 4 ppb.

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Perchlorate --- Otowi 1 Results

- Two GEL detections of 5 ppb and 5.9 ppb.
- Thirty J-flagged (estimated) detections:
  - 10 of 13 samples from GEL
  - 20 of 27 samples from Babcock.
- Two Acculabs results of 2.0 and 5.9 (rerun was 2.1) ppb.

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Perchlorate --- Spring 4 Results

- No perchlorate detected in any other White Rock Canyon springs.
- GEL result from 9/25/00 of 8.5 ppb- prior to GEL method revision.
- GEL result from 3/9/01 of 6.6 ppb (reanalysis using GEL method revision was non-detect).
- GEL results from 9/24-25/01 and 11/1/01 were non-detect or J-flagged.
- Acculabs results from 11/1/01 of 0.50 to 0.65 ppb- reliability of method and detection limit questionable at this level.

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Perchlorate --- Results from Spring 4 Area

Location	Date	Sample Co	Analyte	Symbol	Std Result	Std Mdl	Std Uom	Qual Code	Lab Code
Spring 4	09/25/00	CS	ClO4		8.49	1.04	ug/L		GELC
Spring 4	09/24/01	CS	ClO4	<	0.96	0.96	ug/L	U	GELC
Spring 4	09/24/01	DUP	ClO4	<	0.96	0.96	ug/L	U	GELC
Spring 4	11/01/01	CS	ClO4		2.35	0.96	ug/L	J	GELC
Spring 4A	09/25/00	CS	ClO4	<	1.04	1.04	ug/L	U	GELC
Spring 4A	09/25/01	CS	ClO4	<	0.96	0.96	ug/L	U	GELC
Spring 4A	09/25/01	DUP	ClO4	<	0.96	0.96	ug/L	U	GELC
Spring 4A	11/01/01	CS	ClO4		1.71	0.96	ug/L	J	GELC
Spring 4AA	11/01/01	CS	ClO4		1.57	0.96	ug/L	J	GELC
Spring 4B	03/09/01	CS	ClO4		6.62	0.96	ug/L		GELC
Spring 4B	03/09/01	RE	ClO4	<	0.80	0.80	ug/L	U	GELC
Spring 4B	11/01/01	CS	ClO4		1.40	0.96	ug/L	J	GELC
Spring 4C	11/01/01	CS	ClO4		2.63	0.96	ug/L	J	GELC
Spring 4C	11/01/01	DUP	ClO4		2.50	0.96	ug/L	J	GELC
Spring 4	11/01/01	CS	ClO4		0.65	0.25	ug/L		ACCU
Spring 4A	11/01/01	CS	ClO4		0.50	0.25	ug/L		ACCU
Spring 4AA	11/01/01	CS	ClO4		0.55	0.25	ug/L		ACCU
Spring 4B	11/01/01	CS	ClO4		0.58	0.25	ug/L		ACCU
Spring 4B	11/01/01	DUP	ClO4	<	0.50	0.25	ug/L	B	ACCU
Spring 4C	11/01/01	CS	ClO4		0.67	0.25	ug/L		ACCU

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Perchlorate --- Summary

- Need for precision taxes reproducibility of current analytical methods .
- Due to GEL method modification, most prior LANL perchlorate results are now non-detections.
- GEL detection limit of 1 ppb is probably too low- GEL recommends 4 ppb.
- LANL spike study-
  - GEL detection limit and reproducibility in question.
  - Babcock performance seems reliable with 2 ppm MDL.
  - Acculabs accuracy and detection limit in question.
- Otowi 1 may have 2 ppb of perchlorate; Spring 4 has none.

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Perchlorate --- Summary (continued)

- DOE Albuquerque is leading an effort to formally adopt a 4 ppb MDL for perchlorate by ion chromatography under 40 CFR 136.
- Even at an MDL of 4 ppb, we can expect 10 to 20% false positives from ion chromatography.
- DOE is leading an effort to get the LC/MS/MS (Acculabs) method approved by EPA.

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Perchlorate --- LANL Path Forward

- Look for improved perchlorate analytical techniques and detection limits.
- Stay current on work done by other organizations on improved perchlorate analytical techniques.
- Evaluate possibility of matrix interference in perchlorate results.
- Continue to collect perchlorate monitoring data at LANL.
- Continue monitoring of Los Alamos water supply wells in cooperation with Los Alamos County.

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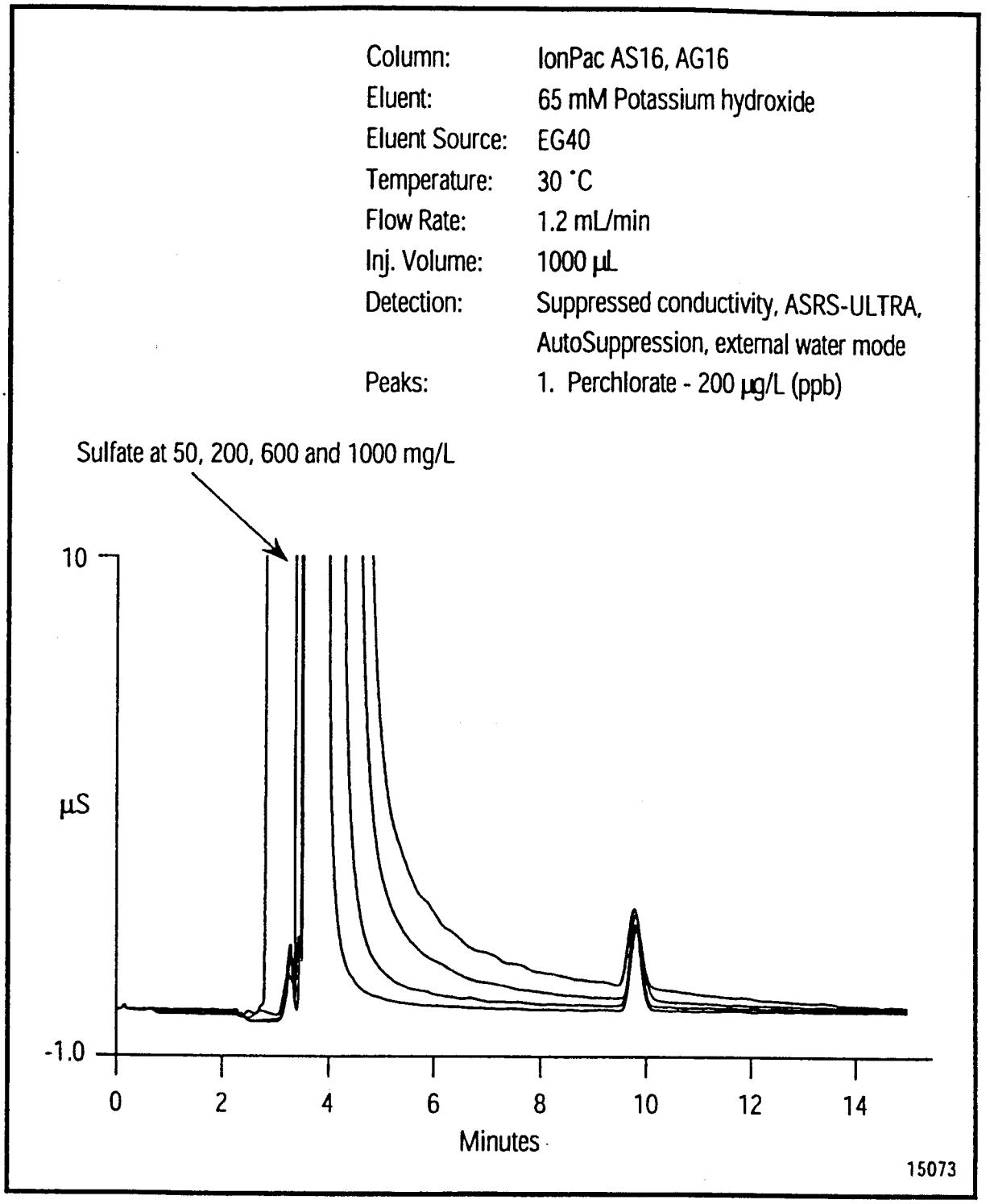

Figure 4. *Effect of sulfate on perchlorate recovery on the IonPac AS16 column.*

Value Engineering Study of the Hydrogeologic Characterization Program

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Background

- DOE/AL requested the Value Engineering Study; authorized in April, 2001
- VE Team of 10 people from DOE and contractors at LANL April 30-May 4, 2001
- Objective: to provide recommendations to improve the Hydrogeologic Characterization Program.

Value Engineering

- Developed to capture informal process used to meet industrial demands during WWII
- Guidelines by Society of American Value Engineers (SAVE)
- Defines functions, determine costs of functions, recommends lower-cost functional alternatives

VE Project Strategy Recommendation 1

Prepare a comprehensive hydrogeologic report on the regional aquifer and initiate installation of a regional aquifer monitoring well network

Estimated Cost Savings: $10 million

VE Strategy Recommendation 1 Bases

- Simultaneous characterization of all water zones has increased scope and costs
- A comprehensive integrated report on the regional aquifer can tell a compelling story
- 6-12 more single completion monitoring wells are adequate
- Alluvial and intermediate zones investigated by ER Project associated with PRSs

LANL Preliminary Response to Strategy Recommendation 1

- Comprehensive characterization was the original scope, thus it can not "increase scope"
- A comprehensive integrated report is planned as a final deliverable for HWP
- Based on the DQO iteration, 15 more wells identified
- Working on an approach to quantitatively determine number of wells

VE Project Strategy Recommendation 2

Enhance project management to ensure deliverables are submitted on time and budget

Estimated Cost Savings: $152,000

VE Project Strategy Recommendation 2 Bases

- Hydrogeologic Characterization Program is not organized as a separate project within the ER baseline
- Could increased effectiveness with project organization based on work breakdown structure
- Project managers control scope, schedule, cost more easily

LANL Preliminary Response to Strategy Recommendation 2

- Agrees with recommendation to organize all aspects of hydrogeologic characterization program together in the baseline
- DOE has not provided funding for project management of the HWP activities

VE Data Collection and Analyses Recommendation 1

Reduce total number of regional aquifer wells to be drilled

Only 6-12 additional wells needed because regional aquifer sufficiently well known.

Estimated Cost Savings: $22.8 million

LANL Response: Developing quantitative tool for determining data collection needs

VE Data Collection and Analyses Recommendation 2

Drill all future wells to a single-completion

New wells will be for monitoring top of regional aquifer

Estimated cost savings: $19 million

LANL Response: Well completion based on DQOs for the well

VE Data Collection and Analyses Recommendation 3

Reduce the cost of groundwater chemistry analysis, through optimization of analytical parameters and sampling frequency, using lessons learned from wells already installed

Indicator parameters only for first 3 quarters; full suite for 4th quarter

Estimated cost savings: $360,000

LANL Response: Analytical strategy negotiated with NMED

VE Data Collection and Analyses Recommendation 4

Minimize the time the drilling rig is on-site

Too much time when full-size rig is on-site on standby

Estimated cost savings: $1.6 million

LANL Response: Agree. Adjustments are being made

VE Data Collection and Analyses Recommendation 5

Implement a competitively-bid, flexible, activity-based drilling contract

Other DOE sites have less expensive drilling contracts

Estimated cost savings: $1 million

LANL Response: Agree. Have awarded contract to WGI

VE Recommendation 1 Regarding NMED & Stakeholder Relationship

Improve stakeholder and regulator understanding by tailoring information for maximum information transfer

Develop a communication plan

Estimated Cost Savings: not estimated

LANL Response: HWP has communication plan

VE Recommendation 2 Regarding NMED & Stakeholder Relationship

Increase use of integrated information management and display system for stakeholder interaction

Easy access to data with geographical reference

Estimated Cost Savings: $500,000

LANL Response: Agree. WQDB is available and improving

VE Recommendation 3 Regarding NMED & Stakeholder Relationship

Use regional model to help communication of the site conceptual model

Include process for developing model, assumptions, input parameters

Estimated Cost Savings: not estimated

LANL Response: Agree. This has been done in meetings and reports

VE Recommendation 4 Regarding NMED & Stakeholder Relationship

Develop better understanding of how NMED defines success

A "win" is final regional aquifer monitoring system in place

Estimated Cost Savings: Not estimated

LANL Response: Agree. Management meetings intended reach agreement on "end state"

VE Recommendation 5 Regarding NMED & Stakeholder Relationship

Identify deliverables and schedules collaboratively with NMED

Make NMED full partner in planning work

Estimated Cost Savings: $1.16 million

LANL Response: Agreed. HWP activities have always had such a collaborative process

VE Recommendation 6 Regarding NMED & Stakeholder Relationship

Work with NMED to develop a set of indicator chemicals acceptable to both LANL and NMED

Use in place of full-suite analysis for first 3 quarters

Estimated Cost Savings: $395,200

LANL Response: Agreed. Analytical strategy negotiated with NMED

VE Recommendation 7 Regarding NMED & Stakeholder Relationship

Establish a Joint Working Group with NMED to prioritize data needs for compliance and risk

Work with NMED to specifically define data needs

Estimated Cost Savings: Not estimated

LANL Response: Agreed. Core team for quantitative approach proposed

VE Recommendation 8 Regarding NMED & Stakeholder Relationship

Improve and tailor reports on the results of characterization to be more "user friendly" both for NMED and stakeholder groups

Estimated Cost Savings: Not estimated

LANL Response: Agreed. Continuing to improve communication

VE Recommendation 9 Regarding NMED & Stakeholder Relationship

Develop a formal dispute resolution mechanism between LANL and NMED specifically dealing with the regional aquifer

Estimated Cost Savings: Not estimated

LANL Response: Agreed.

Next Steps

- LANL will submit formal comments on VE report by end of February
- Final report and LANL comments will be distributed to HWP distribution
- Any comments?

FY01 Groundwater Annual Status Report

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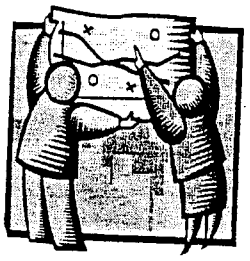
Improvements



- Summarizes what we know so far
- What are the uncertainties
- How to reduce the uncertainties
- Proposes revised scope

Section 1

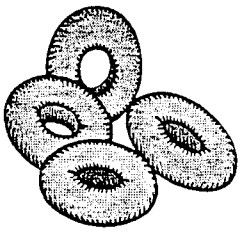
FY01 accomplishments all described in the same place
- Descriptions of wells completed
- Modeling activities
- Information management
- Reports

Section 4

Summarizes what is known and remaining uncertainties

- Overview of geology, vadose zone, regional aquifer, and geochemistry
- Relationship to the hydrogeologic conceptual model (Section 3)
- Uncertainties

Section 5



Updated bagel charts based on Section 4

- Status with respect to Hydrogeologic Workplan decisions
- Wells needed to reduce uncertainties
- Other activities modeling, testing