

**Los Alamos National Laboratory  
Groundwater Protection Program**

Presentation to the  
Northern New Mexico Citizens' Advisory Board  
Environmental Monitoring and Surveillance  
Committee  
February 11, 2003  
Charlie Nylander  
Program Manager

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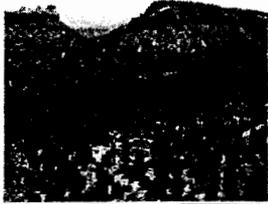
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**Groundwater Protection Program Beginning**



- Comprehensive Groundwater Protection Program created April 2002
- The goal was to bring together all groundwater activities and functions in one program
- Result in more effective integration of functions and approach

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**Groundwater Protection Vision**

Successful completion of characterization and source control and implementation of decision-focused monitoring make the Groundwater Protection Program a center of excellence for water resource research and management that relies on integrated partnerships to develop solutions to local, regional, national, and global water resource issues.

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## Groundwater Protection Mission

To be the Laboratory's long-term environmental steward for groundwater. Groundwater stewardship goals will be defined through partnerships with the community and will require completing hydrogeologic characterization, implementing source control, and maintaining monitoring programs to demonstrate that groundwater stewardship goals are met.



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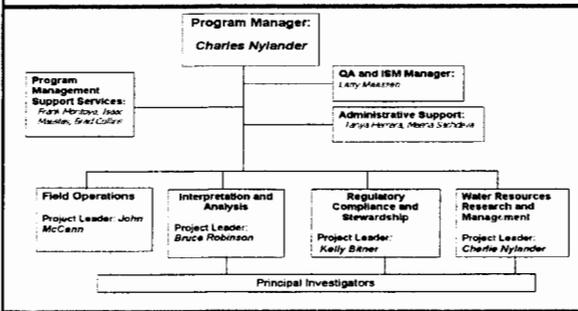
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## Groundwater Protection Organization



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## Draft Founding Documents

- Draft management documents currently undergoing internal review:
  - FY03 Program Plan (September, 2002)
  - Quality Assurance Plan (September, 2002)
  - Integrated baseline (February, 2003)
  - Programmatic Assumptions Document (February, 2003)



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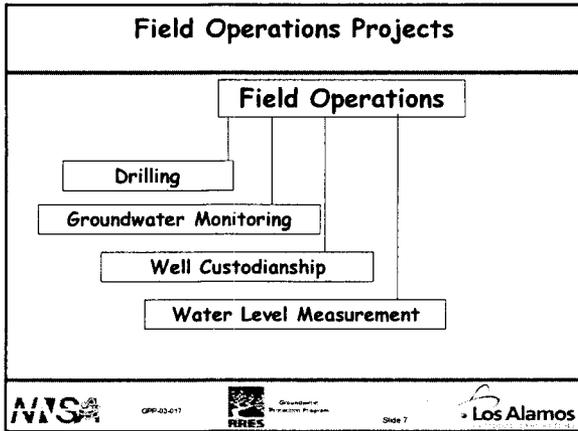
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### Drilling



- Drilling and installation of wells for hydrogeologic characterization (Hydrogeologic Workplan)
- Drilling and installation of wells to support corrective action process
- Well site restoration
- Management and disposal of drilling residuals

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### Groundwater Monitoring



- Groundwater Monitoring Plan developed using DQO process
- Plan will identify sampling locations, frequency, and analytes
- Sampling locations include monitoring wells, water supply wells, and springs
- Monitoring data available via the Internet

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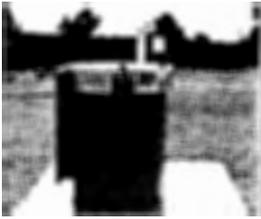
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## Well Custodianship



- ❑ Inventory of all wells within LANL and LANL-owned wells
- ❑ Wellhead protection survey and upgrading where necessary
- ❑ Well security survey and addition of security features
- ❑ Plugging and abandonment of wells no longer necessary or potential threats to environment

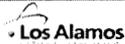


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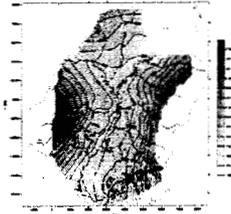
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## Water Level Measurement



- ❑ Water Level Measurement Plan and associated QA plan will be developed using DQO process
- ❑ The plans will be updated annually to incorporate new information and new measurement locations
- ❑ Water levels are critical element of calibrating hydrologic model
- ❑ Data available via Internet

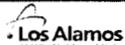


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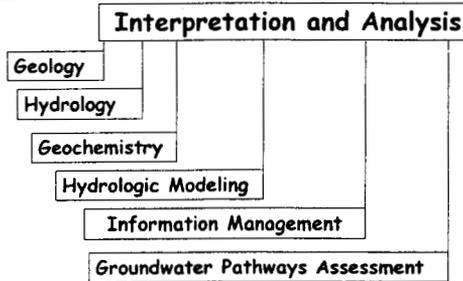
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## Interpretation and Analysis



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## Geology Interpretation and Analysis



- Development and updating of 3-D geologic model
- Geologic and geophysical logging of boreholes and surface geologic mapping input to 3-D geologic model
- Develop alternate conceptual geologic models to quantify uncertainty in model
- 3-D geologic model provides framework for hydrologic models



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## Hydrology Interpretation and Analysis



- Ensure appropriate development of wells
- Conduct hydrologic testing of characterization wells
- Report hydrologic test data and analysis
- Provide input to selection of screened intervals in wells



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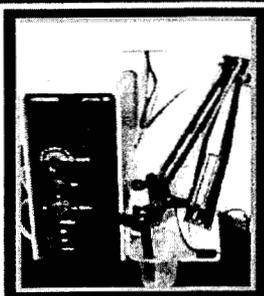
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## Geochemistry Interpretation and Analysis



- Analysis of pore water in core and water from saturated zones
- Recommend analytical suites and analytical techniques
- Interpretation of four characterization sampling events, analytical results, documented in reports
- Modeling chemical data to predict geochemical reactions



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## Modeling Interpretation and Analysis



- Most important analytical tool available to interpret geologic, hydrologic, and geochemical data
- Separate models have been developed for the regional aquifer and the vadose zone
- Regional aquifer model encompasses the Espanola Basin
- All modeling utilizes the LANL-developed code: Finite Element Heat & Mass (FEHM)



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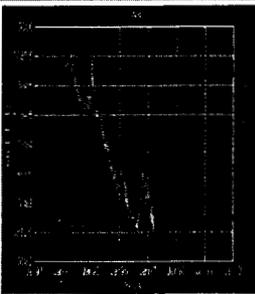
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## Information Management



- All groundwater data available from the Water Quality Database via Internet at <http://wqdbworld.lanl.gov>
- Water Quality Database development and programming nearly done
- Continuing to add new data as they are available
- Spatially displayed data not allowed due to security concerns



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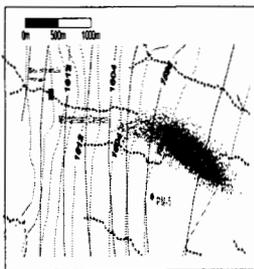
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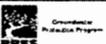
## Groundwater Pathways Assessment



- First-order (most conservative) analysis of areas with highest risk
- Tool for prioritizing and focusing data collection
- Links source models with vadose zone model with regional aquifer model to estimate the travel paths of contaminants over a 100-year period
- Draft report expected in July



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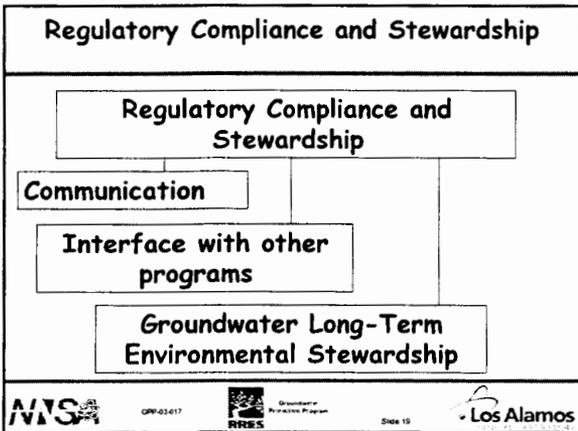
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**Communication**

- Interpretation of regulatory requirements, facilitate interactions with regulators
- Outreach and stakeholder involvement through meetings, web site, tours, reports
- Increase credibility of work conducted by publishing in peer-reviewed journals

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**Interface with Other Programs**

- Some groundwater activities will continue to be conducted by groups other than the Groundwater Protection Program, e.g. pollution prevention, remediation, discharge plans
- The Groundwater Protection Program will actively work with the other groups to ensure consistent approaches to protecting groundwater

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## Groundwater Long-Term Stewardship



- Groundwater stewardship requires funding for activities for as long as contaminants may remain dangerous
- Activities include monitoring to demonstrate the effectiveness of corrective actions
- Action-oriented, decision-based plan to ensure that appropriate actions are taken if monitoring data show a problem



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## Hydrogeologic Characterization Progress

- Hydrogeologic Workplan approved by NMED in 1998. First well was started in 1997.
- The work plan describes a 7-year program to refine the understanding of the hydrogeologic setting sufficient to design a monitoring network
- Major elements of the Hydrogeologic Workplan are
  - Data collection
  - Data analysis and interpretation
  - Data management

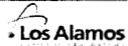


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## Hydrogeologic Workplan Data Collection

### Regional Aquifer wells

- Proposed in Hydrogeologic Workplan: up to 32 wells
- Completed: 17 wells, plus one intermediate
- Planned for FY03 (pending funding): 6 wells -
  - Pueblo Canyon (R-2, R-4)
  - Los Alamos Canyon (R-6)
  - Sandia Canyon (R-11)
  - Water Canyon (R-26)
  - Potrillo Canyon (R-18)
- Geologic and geophysical logging, chemical analyses of core, hydrologic testing, characterization water sampling, water-level measurements, vertical gradient

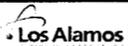


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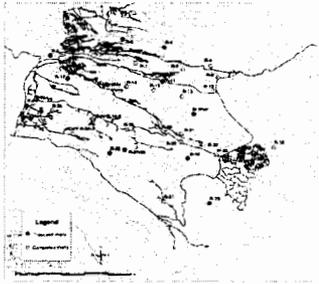
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## Hydrogeologic Workplan Wells



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## Hydrogeologic Workplan Analysis

- Regional Aquifer Model
  - Calibrated to pre-development (static) and post-development (transient) water levels and stream flow (aquifer discharge) in Espanola Basin
  - Applied to estimate capture zones for Buckman well field and Pajarito Plateau
- Vadose Zone Modeling
  - Los Alamos Canyon calibrated to moisture profiles and tritium levels in alluvial aquifer
- Geochemical Analyses and Modeling
  - "Background" or "baseline" water chemistry
  - Effects of drilling fluids on water chemistry
  - Infiltration rates from anion profiles
  - Speciation and reaction predictions

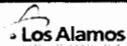


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## Hydrogeologic Workplan Data Management

- Water Quality Database developed**
- Water levels for 34 wells from October of 1992 through the present
  - Chemical analysis of water from wells, springs, surface water, storm water
  - Stream-flow data at all gages (>50)
  - Well-construction information for the R-wells, including geophysical logs
  - Hydrologic data from the R-wells
  - Available at <http://wqdbworld.lanl.gov>



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