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Los Alamos Environmental Restoration Records Processing Facility

ER Record I.D.# 0021579

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LOS ALAMOS NATIONAL LABORATORY

ENVIRONMENTAL RESTORATION
Records Processing Facility
ER Record Index Form

PAGE COUNT: 1

Quick Index: Complete all fields; indicate if not applicable or appropriate; please write legibly.

DOCUMENT TO: _____ ORGANIZATION: _____

ORIGINATOR NAME: Stephen Self ORGANIZATION: University of Texas

SYMBOL: _____ DOCUMENT DATE: 02/10/86

SUBJECT/TITLE: "Explosive Rhyolitic Volcanism in the Jemez Mountains: Vent Locations, Caldera Development and Relation to Regional Structure Article Excerpt · Journal of Geophysical Research

RECORD TYPE (Circle relevant type for primary record; type of attachments should be selected on *Keywords List*):

Analytical Data	Excerpt	Map	Procedure	Summary
Article	FAX	Memo	Purchase Request	Table
Chain-of-Custody	Figure	Microform	Receipt Acknowledgment	Telephone Record
Chart	Form	Notebook	Report	TOC
Computer Output	Interview	Outline	Review	Transcription
Contract	Letter	Personal Notes	Sow	Video
Controlled Distribution	List	Photo	Study	Work Plan
Drawing	Logbook	Plan		Other _____

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D)_____ TO:_____ FROM:_____ SYMBOL:_____

SUBJECT:_____

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DATED:_____

E)_____ TO:_____ FROM:_____ SYMBOL:_____

SUBJECT:_____

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DATED:_____

F)_____ TO:_____ FROM:_____ SYMBOL:_____

SUBJECT:_____

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DATED:_____

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SUBJECT:_____

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ENVIRONMENTAL RESTORATION
Records Processing Facility
ER Record Index Form

ER Records Detail Index Form for ER Record I.D. # 21579

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TECH AREA(S)	ADS NO(S)	STRUCTURE NO(S)/MDA	SWMU/PRS NO(S)
LIST RELEVANT TECH AREA(S).	LIST RELEVANT ADS NO(S).	LIST RELEVANT STRUCTURE NO(S).	LIST RELEVANT SWMU NO(S)/PRS.
—	1129	—	—

DOCUMENT TO	ORIGINATOR NAMES
LIST RELEVANT RECIPIENTS.	LIST MULTIPLE ORIGINATORS.
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CORRECTION DESCRIPTION: —

KEYWORDS: Circle relevant KEYWORDS from the list below for ER Record #: 21579

MISCELLANEOUS (List other indexing criteria as necessary; please write legibly):

OU1129, Volcanism, Rhyolitic, Jemez mountains, Caldera, Bandelier, geothermal, eruption

Abandon
Aboveground Tank
Absorption
Abstract
Accelerator
Access
Accident
Acid
Active
Activities
Administrative
ADS (Activity Data Sheet)
Adsorption
AEC (Atomic Energy Commission)
Aerial
Agenda
Agreement
AIP (Agreement in Principle)
Air
Alpha
Americium
Analysis
Analytical
AOC (Area of Concern)
Approval
Aquifer
ARAR (Applicable, Relevant, or Appropriate Requirements)
Archaeology
Archive
Area
Arsenic
Asbestos
Asphalt
Assessment
Audit

Backfill
Background
Bacteria
Barium
Baseline
BCP (Baseline Change Proposal)
Beds
Bermed Area
Beryllium
Beta
Biology
Blivit
Boiler
Boneyard
Bunker
Buried
Burn

Cadmium
Caisson
Calibration
CAMU (Corrective Action Management Unit)
Canyon
Capacitor
Caustic
CEARP (Comprehensive Environmental Assessment and Response Program)
Cement
CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act)
Certification
Cesium
Chain of Custody
Chamber
Change Control
Change Order
Charge
Chart
Checklist
Chemical
Chromium
Cleanup
Clearance
Closure
Clothing
CMI/RA (Corrective Measures Implementation/Remedial Action)
CMS/FS (Corrective Measures Study/ Feasibility Study)
Cobalt
Comment
Committee
Community Relations
Company
Compliance
Compressed Gas
Computer Modeling
Computer Output
Concern
Concrete
Concurrence
Configuration
Construction
Container
Containment
Contaminant
Contract
Control
Controlled Distribution
Copper
Core
Corrective Action
Correspondence
Criteria
Cyanide
Cyanogen

Data
Deadline
Debris
Decision Analysis
Decommission
Decontamination
Deficiency
Deliverable
Demolition
Description
Detection
Detonation
Development
Diesel
Discharge
Disposal
Documentation
DOE (Department of Energy)
Dose
DQO (Data Quality Objectives)
Draft
Drainage
Drainline
Drawing
Drilling
Drop Tower
Drum
Dry Well
Dump

Ecology
Effluent
EIS (Environmental Impact Statement)
Electrical
Emission
Engineering
Environmental
EOD (Explosive Ordnance Disposal)
EPA (Environmental Protection Agency)
Equipment
ERDA (Energy Research and Development Administration)
Erosion
ERPO (Environmental Restoration Program Office)
ES&H (Environment, Safety, and Health)
Estimate
Evacuation
Evaluation
Evaporator
Evidence
Excavation
Exclusion
Exhaust
Experiment
Explosive
Exposure
Extension
Extraction

Facility
Fallout
Farm
FAX
Fence
Field
Figure
Filter
FIMAD (Facility for Information Management, Analysis, and Display)
Finding
Fire
Firing Site
Fiscal
Fission
Five-Year Plan
Flow
Flow chart
Fluid
Form
Framework
Fuel
Fume

Gamma
Gas
Generation
Generic
Geochemistry
Geology
Geophysics
Glass Beaker
Glove Box
Graph
Guidance
Gun

Handling
Hazardous
Headquarters
Health
HE (High Explosive)
History
HMTA (Hazardous Material Transportation Act)
Hole
Home Owner
Hood
HSWA (Hazardous and Solid Waste Amendments)
Hydrology
Hygiene

Impact
Implementation
Implosion
Impoundment
Inactive
Incident
Incinerator
Industrial
Infiltration
Injection Well
Injury
Inorganic
Inspection
Installation
Interim
Interim Action
Internal
Interview
Inventory
Investigation
IRM (Interim Remedial Measure)
Isotope
IWP (Installation Work Plan)

Lab Job
Laboratory
Lagoon
Land
Landfill
Laundry
Leach
Lead
Leak
Legal
Letter
Limit
Lines
Liquid
List
Location
Log
Logbook

Magazine
Management
Manhole
Map
Material
MDA (Material Disposal Area)
Media
Meeting
Memo
Mercury
Metal
Microform
Minimization
Minutes
MIS (Management Information System)
Mixed Waste
MOA (Memo of Agreement)
Model
Modification
Money (Allocation, Appropriation, Budget, Cost, Funding, etc.)
Monitoring
Monthly Report
Mortar Impact Area
MOU (Memo of Understanding)
MSA (Major System Acquisition)

NEPA (National Environmental Policy Act)
NFA (No Further Action)
Nickel
Nitrate
NMED (New Mexico Environment Department)
NMEID (New Mexico Environmental Improvement Division)
NOD (Notice of Deficiency)
Nonexplosive
Nonradioactive
Notebook
Notification
NPDES (National Pollutant Discharge Elimination System)
NRC (Nuclear Regulatory Commission)
Nuclear

Observation
Off-gas
Oil
Open
Open Burning
Operation
Order
Organic
Organization
OSHA (Occupational Safety & Health Administration)
OSR (Operational Safety Requirements)
OU (Operable Unit)
Outfall
Outline

Pad
PA/RFA (Preliminary Assessment /RCRA Facility Assessment)
PCB (Polychlorinated Biphenyl)
Permit
Personal Notes
Personnel
Personnel Qualification
Photo
Pilot Study
Pipe
Pit
Plan
Plant
Plutonium
Point-of-Contact
Pollution
Polonium
Polaroid
Potential
Prevention
Priority
Procedure
Program
Programmatic
Project
Project Leader
Propellant
Property
Proposal
Protection
Protocol
PRS (Potential Release Site)
Public
Pump
Purchase Request

QA (Quality Assurance)
QP (Quality Procedure)
Quality
Quarterly Report

Radioactive
Radiochemistry
Radionuclide
Radium
Rationale
RCRA (Resource, Conservation, and Recovery Act)
Reactor
Receipt Acknowledgment
Recommendation
Reconnaissance
Records
Recovery
Recycle
Reduction
Reference
Regulation
Release
Remediation
Removal
Report
Request
Requirements
Research
Resin Bed
Resolution
Resource
Respirator
Response
Restoration
Restriction
Results
Review
Revision
RFI/RI (RCRA Facility Investigation/Remedial Investigation)
Risk
RPF (Records-Processing Facility)

Safety
Salamander
Salvage
Sample
Sampling Plan
Sanitary
Satellite
Schedule
Scope
Scrap
Scrap Detonation Site
Screening
Scrubber
Search
Security
Seep
Semivolatile
Septic
Sewer
Shaft
Sheet
Shell
Shot
Silver
Site
Sludge
Soil
Solid
Solvent
SOP (Standard Operating Procedure)
SOW (Statement of Scope of Work)
Specific
Spill
Stack
Standard
Statistics
Status
Steamline
Steel
Storage
Strontium
Structure
Study
Subcontractor
Subsurface
Summary
Sump
Support
Surface
Surveillance
Survey
Swipe
SWMU (Solid Waste Management Unit)
System

Table
Tank
Task
TCLP (Toxicity Characteristic Leaching Procedure)
TDD (Technical Document Description)
Technical
Technical Team
Technology
Telephone Record
Test Area
Testing
TLD (Thermoluminescent Dosimeter)
TOC (Table of Contents)
Townsite
Toxic
Tracking
Training
Transcription
Transfer
Transformer
Transmittal
Transport
Treatment
Trench
Trip Report
Tritium
TRU (Transuranic)
TSCA (Toxic Substances Control Act)
Tuballoy
Tuff

Underground
Update
Uranium
Urine
USGS (United States Geological Survey)
UST (Underground Storage Tank)
Utility

Validation
Variance
VE (Value Engineering)
Ventilation
Verification
Volatile
Volume

Warehouse
Waste
Water
WBS (Work Breakdown Structure)
Weapon
Well
Work
Working Group

Zinc

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Explosive Rhyolitic Volcanism in the Jemez Mountains: Vent Locations, Caldera Development and Relation to Regional Structure

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The Jemez volcanic field straddles the western margin of the Rio Grande rift where the rift is intersected by the Jemez lineament in north central New Mexico. The field has a record of volcanism extending back to before 13 Ma. Initial basaltic activity was related to active rifting, with minor rhyolitic eruptions occurring along N-S rift-bounding faults. Between 10 and 7 Ma, voluminous andesitic volcanism took place in the central Jemez Mountains area, overwhelming contemporaneous basaltic and rhyolitic magmatism. An apparent tectonic lull took place from 7 to 4 Ma, accompanied by lower eruption rates. During this interval, dacitic magmas were erupted to form the Tschicoma volcanic center, but mafic and rhyolitic volcanism virtually ceased. Since 4 Ma, accompanying resumption of rifting, a growing silicic magma system has been present under the central part of the Jemez Mountains, ultimately evolving to the magma body that produced the voluminous rhyolitic Bandelier tuffs. Explosive rhyolitic eruptions from this large magma body have occurred many times since 3 to 4 Ma. Early eruptions, 3.6–2.8 Ma, produced high-silica rhyolite ignimbrites restricted to the southwest part of the Jemez Mountains; formation of these units may have been accompanied by caldera collapse. These events were followed by the two caldera-forming Bandelier Tuff ignimbrite eruptions, 1.45 and 1.12 Ma. Post caldera explosive and effusive rhyolite eruptions have also tapped the magma body from vents generally located along ring fractures after both Bandelier events. Vent and caldera locations for the rhyolitic eruptions during 3–4 Ma have been inferred from grain size characteristics, dispersal patterns, and facies variations in the Plinian deposits and ignimbrites. Lithic breccia zones of the pre-Bandelier ignimbrites indicate possible caldera sources in the southwest part of the present Valles caldera. During the eruption of both Bandelier tuffs, initial plinian falls and early pyroclastic flows emanated from vents centrally located in the Jemez Mountains. In the lower Bandelier Tuff eruption a transition to ring fracture vents occurred before the emission of later pyroclastic flows, but there is no strong evidence to suggest such a transition occurred during the upper Bandelier eruption. Calderas associated with the lower and upper Bandelier tuffs (Toledo and Valles, respectively) are almost identical in location, as are the Plinian vent sites for these two large eruptions. The Toledo embayment, northeast of the Valles caldera, contains lava domes from up to 3.6 Ma and may be a caldera or crater associated with early explosive dacitic volcanism in the Tschicoma volcanic center. Post-1.4 Ma lava domes also fill this depression. The main volcanic features of the Jemez Mountains field, including the Valles caldera complex, eruption vents, and the apical graben of the post-Valles-Redondo resurgent block, appear to be aligned along the NE-SW trending Jemez fault zone. This zone, the local expression of a Precambrian basement feature (the Jemez lineament), has exerted strong control on the location and style of eruptions from the Bandelier rhyolitic magma system.

INTRODUCTION

The Jemez Mountains volcanic field of New Mexico is located at the intersection of the western margin of the north-south trending Rio Grande rift and the northeast trending Jemez lineament (Figure 1). The field contains one of three recently active silicic resurgent caldera systems in the continental United States, the Valles Caldera. This caldera was created by a series of catastrophic ignimbrite eruptions, the most recent of which formed the Tshirege Member of the Bandelier Tuff (here called the Upper Bandelier Tuff, UBT) at about 1.12 Ma [*Smith and Bailey*, 1966; *Doell et al.*, 1968; *Izett et al.*, 1981]. An earlier ignimbrite eruption formed the 1.45 Ma Otowi Member of the Bandelier Tuff (Lower Bandelier Tuff, LBT), accompanied by formation of the older Toledo caldera [*Smith et al.*, 1970]. These two rhyolitic, ignimbrite-forming eruptions are regarded as the culminating phase of volcanism within the Jemez Mountains volcanic field [*Smith*, 1979]. The Valles caldera and its associated rocks are best known from the pioneering work of R. L. Smith, R. A. Bailey, and C. S. Ross on ring-dike emplacement, formation of resurgent calderas, and eruption of compositionally zoned ignimbrite sheets [*Smith et al.*, 1961; *Smith and Bailey*, 1966, 1968]. For these reasons, many geologists consider it to be the "type" resurgent caldera. The volcanic history of the Jemez Mountains field is quite diverse and long-lived; it has produced voluminous mafic, intermediate, and silicic pyroclastic rocks, lava flows, and domes almost continuously since 13 Ma [*Bailey et al.*, 1969; *Smith et al.*, 1970; *Gardner*, 1982, 1983; *Gardner and Goff*, 1984; *Gardner et al.*, this issue].

The Valles caldera is also a major target for geothermal resource development due to its recent volcanic activity (most rhyolites as young as 0.1 Ma [*Doell et al.*, 1968]) and hot springs. A neutral chloride liquid-dominated geothermal system at temperatures of 260°-330°C [*Dondanville*, 1978] has been extensively drilled by Union Oil Company beneath the apical graben in the resurgent dome. Exploration by both private and public organizations continues today [*Laughlin*, 1981; *Goff and Grigsby*, 1982]. Because of the high conductive heat flow associated with the caldera, the first Hot Dry Rock geothermal system has been engineered in the Precambrian basement underlying the west flank of the Jemez Mountains [*Heiken and Goff*, 1983]. Recently, the Valles caldera has been considered to be a prime candidate as a site for the Continental Scientific Drilling Program (CSDP) [*Riecker*, 1983; *Goff et al.*, 1984*b*] which proposes to drill into an active magma-hydrothermal system to study the roots of the heat transfer zone between crystallizing magma and overlying convecting hot waters. The first CSDP shallow hole has been drilled in the southwesternmost zone of the Valles caldera, and it penetrated several of the ignimbrites discussed herein [*Goff et al.*, this issue].

In this paper we summarize recently acquired data on the

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