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Yucca Mountain Site Characterization Project

Mineralogy, Petrology and Whole-Rock Chemistry Data Compilation for Selected Samples of Yucca Mountain Tuffs

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ABSTRACT

Petrologic, bulk chemical, and mineralogic data are presented for 49 samples of tuffaceous rocks from core holes USW G-1 and UE-25a#1 at Yucca Mountain, Nevada. Included, in descending stratigraphic order, are 11 samples from the Topopah Spring Member of the Paintbrush Tuff, 12 samples from the Tuffaceous Beds of Calico Hills, 3 samples from the Prow Pass Member of the Crater Flat Tuff, 20 samples from the Bullfrog Member of the Crater Flat Tuff and 3 samples from the Tram Member of the Crater Flat Tuff. The suite of samples contains a wide variety of petrologic types, including zeolitized, glassy, and devitrified tuffs. Data vary considerably between groups of samples, and include thin section descriptions (some with modal analyses for which uncertainties are estimated), electron microprobe analyses of mineral phases and matrix, mineral identifications by X-ray diffraction, and major element analyses with uncertainty estimates.

The work contained in this report was done within WBS Element 1.2.3.2.7.1.3.

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1.0 INTRODUCTION

This document reports the results of petrologic, chemical (whole-rock and electron microprobe), and mineralogic analyses of rock samples from the deep coreholes UE-25a#1 and USW G-1 at Yucca Mountain, Nevada (Figure 1). The work was performed in the Department of Geology and Institute of Meteoritics (IOM) at the University of New Mexico (UNM), and was completed in support of the Yucca Mountain Site Characterization Project (YMP), which is administered by the Nevada Operations Office of the U.S. Department of Energy. The work was directed by verbal instructions from Allen R. Lappin of Sandia National Laboratories (SNL) to Klaus Keil and the author between about June, 1981 and December, 1983. Data were obtained between about July, 1981 and August, 1984.

The data were obtained prior to the development of a Quality Assurance (QA) plan for the YMP work, and no formal Nuclear Waste Repository Technology (NWRT) Department technical procedures (TPs) were followed. Procedures followed were those in use at the time in the laboratory facilities at UNM, and in many cases, the procedures were functionally identical to those later implemented in TPs. All TPs referred to in the discussion of analytical techniques (Section 3.0) are listed in Table 1.

The remainder of this report includes four sections. First, the objectives of the study are stated briefly. Second, a discussion of the analytical techniques used and the methods employed to estimate uncertainties is presented. The third section is a partly descriptive and partly interpretive summary of the characteristics of each of the samples. In some cases, only descriptive data are available, and these are presented here; when quantitative data were available (as tabulated in the appendices), limited interpretations of the data are presented. The last section is a series of appendices which present the thin section petrographic data, the whole-rock analyses, qualitative X-ray diffraction results, and the electron microprobe analyses.

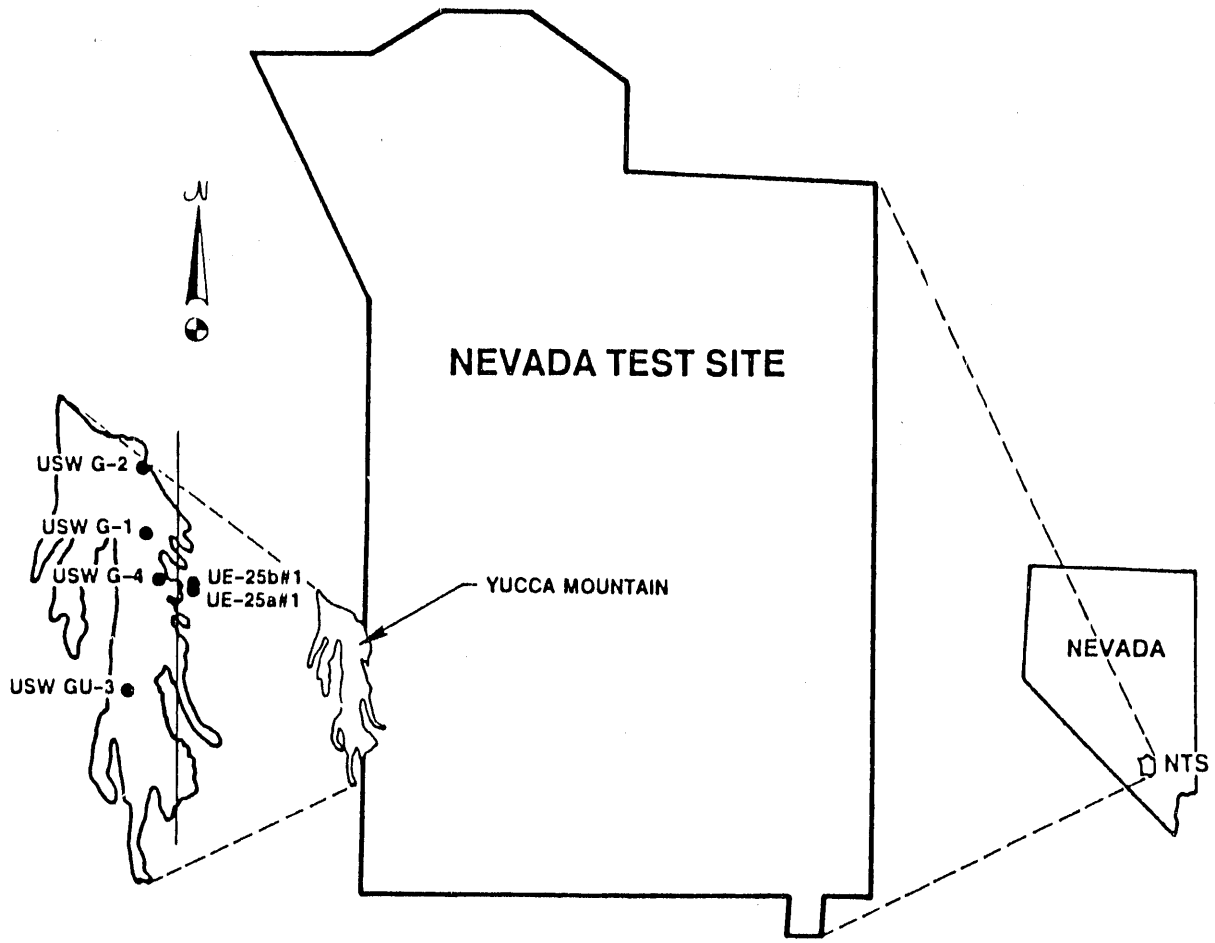

Figure 1: Location of the Nevada Test Site, Yucca Mountain, and Existing Deep Coreholes

Table 1

TECHNICAL PROCEDURES REFERRED TO IN TEXT

Title	Number
Procedures for Laboratory Sample Petrology Determination	TP-59
Procedures for Preparation of Polished Thin Sections	TP-60
Procedures for Laboratory Sample Bulk Chemical Determination	TP-61

2.0 OBJECTIVE

The purpose of this report is to present petrologic, mineralogic and geochemical data obtained at UNM in support of the YMP which have never been formally presented. This project has been formerly known as the Yucca Mountain Project and the Nevada Nuclear Waste Storage Investigations (NNWSI) Project. In these early stages of this work, a uniform approach to sample characterization and analysis had not been developed, and different analytical techniques were applied to different suites of samples. These analytical techniques included hand-sample descriptions, thin section descriptions of varying detail (some with modal analyses by point count), whole-rock chemical analysis, X-ray diffraction to identify finely crystalline mineral phases, and electron microprobe analysis to determine the chemical composition of constituent mineral phases and various types of matrix.

3.0 ANALYTICAL TECHNIQUES AND ASSOCIATED UNCERTAINTIES

3.1 Petrography

3.1.1 Methods

3.1.1.1 Preparation of Polished Thin Sections

Polished thin sections of rocks are used in optical petrographic studies, electron microprobe analysis and scanning electron microscopy. The sections used in the work presented here were prepared prior to the development of formal procedures for preparation of these sections (i.e., TP-60). All of the sections studied here are round, 1 in. (2.54 cm) diameter glass slides, and were polished with 1 μm (or finer) diamond paste to produce a polished surface acceptable for electron microprobe analysis (although all of the sections were not analyzed with the electron microprobe). The procedures used are generally the same as those which were later incorporated into TP-60 with the exception of sample custody and sample-preparation data-sheet requirements.

3.1.1.2 Petrographic Examination and Point Counting

The procedures used to examine the hand samples and thin sections discussed here were not formalized (in TP-59) until several years after the work was completed. Lacking in the data for most of these samples are detailed hand-sample descriptions. For all but 10 of the samples, detailed thin-section descriptions were prepared, in most cases including estimates of modal (volume percent) proportions of constituents by point count. For the one sample for which the modal proportions were estimated visually, the estimation was made by visual comparison utilizing the size/proportion charts from Lof (1982). For the ten samples not described in detail (USW G-1 407.1, USW G-1 448.9, USW G-1 504.6, USW G-1 631.6, USW G-1 811.1, USW G-1 939.0, USW G-1 1079.4, USW G-1 1208.7, USW G-1 1315.2, and USW G-1 1374.0), brief informal descriptions were prepared. These data are summarized in Appendix A.

Optical petrographic study of polished thin sections was done in the IOM using one of two Carl Zeiss Research Microscopes. These microscopes allow examination of sections in both transmitted and reflected light. Magnification range is between 31X and 500X,

and a micrometer eyepiece is used to measure grain sizes. The micrometer scale is a fixed, integral part of the microscope ocular, and calibration of that scale has been done using a glass Carl Zeiss micrometer scale with scale divisions to 0.1 mm. Though not used to produce images for this study, microscopic features of interest may be photographed with a 35mm camera built into one of the microscopes.

Detailed descriptions and modal analysis results (for all but the ten samples mentioned above) were recorded on "Tuff Thin Section Description" forms. The data presented in Appendix A are summarized from these description forms. The complete data forms are in SNL-YMP Data Records Management System (DRMS) data base 51/L04-4/19/90. Although these forms pre-date TP-59, that document's discussion of items included in a tuff sample description applies to work done on these samples.

Point counts were made using a Swift Model CD Automatic Point Counter with motorized mechanical stage (see TP-59 for details). The grid spacing for the point counts may be varied between 1/3mm and 1 1/3mm. The spacing used for individual section point counts was not recorded, but, in general, smaller grid sizes are required to produce the high number of points (typically about 1000) counted on many of these samples. For all point counts, only the total number of points and the modal percentage (usually rounded to the nearest 1.0 percent or 0.5 percent) are available for reporting.

3.1.2 Uncertainties

Uncertainties can be estimated only for point counts. The uncertainties for thin-section point counts were calculated using the method of Van der Plas and Tobi (1965). The uncertainties shown in Appendix A are $\pm 2\sigma$ standard deviations, calculated using the following equation, giving 95% confidence that the actual amount is within the range of uncertainty given:

$$\sigma = (p(100-p)/n)^{0.5} \qquad (1)$$

where p = calculated content of a mineral in volume percent, and
n = the total number of points counted.

In those cases in which the uncertainty exceeds the amount reported in the data sheets in Appendix A, the amount should be considered too low for accurate estimation. It must be emphasized that the estimated uncertainties are for the particular thin sections counted. Tuffaceous volcanic rocks are commonly inhomogeneous, and it is difficult to confirm that one or two sections can accurately represent the modal proportions of constituents in the sample as a whole. No uncertainty estimates could be made for visually estimated modes.

The precision of these error estimates may be affected by the unavailability of the original counting data, and by the presence of components which are significantly larger than the size of the grid used for counting. These potential sources of error have not been evaluated.

3.2 Whole-Rock Analyses

3.2.1 Methods

Although this work pre-dates the preparation of the technical procedure for major element whole-rock analyses (TP-61) by several years, the procedures followed were substantially the same those described in TP-61, except as discussed in the following sections.

3.2.1.1 Sample Preparation

Samples for whole-rock analyses are crushed to a fine powder (<100 mesh = <150 μm). This is done by breaking the whole-rock samples into small (pea-sized or smaller) pieces with a hardened steel mortar and pestle, followed by crushing in a tungsten-carbide ball-mixer mill and passing the sample through a 100-mesh nylon screen, using procedures to minimize any possibility of sample contamination. TP-59, which post-dates this work, contains details of the sample crushing procedure which is substantially the same as those used in the preparation of the samples discussed here.

3.2.1.2 Analytical Methods

Whole-rock chemical analyses are reported in Appendix B for five samples. These analyses were obtained in late 1981 in the Geo-

chemistry Laboratory in the Department of Geology at the University of New Mexico under the direction of staff chemist John W. Husler.

Weight percentages of TiO_2, Al_2O_3, total iron as Fe_2O_3, MnO, MgO, CaO, Na_2O, and K_2O were determined using atomic absorption spectrophotometry (AA). The AA procedures used are detailed in TP-61, Appendix C. Silica (as SiO_2) was determined gravimetrically using the "Long Method" as detailed in TP-61, Appendix G. Phosphorous (as P_2O_5) was determined by colorimetric spectrophotometry, following procedures detailed in TP-61, Appendix H. The proportions of ferrous iron (as FeO) and ferric iron (as Fe_2O_3) were determined volumetrically by titration with standard potassium dichromate, using sodium diphenylamine as an indicator, following procedures detailed in TP-61, Appendix F. The amount of unbound (pore) water (H_2O^-) lost upon heating to 110°C and bound water (H_2O^+) lost on ignition (LOI) at 1000°C were determined gravimetrically, following procedures detailed in TP-61, Appendix E.

Deviations from procedures detailed in TP-61 are not believed to have affected the quality of the data produced. These deviations are:

1. In-house standards traceable to internationally recognized rock standards were used for the AA determinations; National Institute of Standards and Technology (NIST)-certified rock standards were not used. Standards were not independently run as samples for a calibration check.
2. Strip charts, calibration curves, and laboratory notebooks were kept as detailed in TP-61, but have not been retained.
3. Multiple replicate analyses of standards were not done for FeO - Fe_2O_3 determinations.
4. Sample custody procedures were not implemented (and were not required) at the time this work was done.

3.2.2 Uncertainties

The criteria used for determining the accuracy of the analyses are that the analytical total for all components (for these samples, SiO_2, TiO_2, Al_2O_3, FeO, Fe_2O_3, MnO, MgO, CaO, Na_2O, K_2O, P_2O_5, H_2O^-, and H_2O^+) lie within the range of 99.0% and 101.0% by weight.

Expected uncertainties are estimated for all components determined (with the exception of H_2O) as follows: For components ≥1 wt% of the sample, the actual amount present should be within ±3% of the analyzed value. For components ≥0.1 wt% and <1 wt%, the actual amount present should be within ±10% of the analyzed value. For components ≥0.01% wt% and <0.1 wt%, the actual amount present should be within ±20% of the analyzed value. Components that are <0.01 wt% are considered to be present in an amount below the reliable detection limit for the methods used to produce the analysis.

For $H_2O(+)$ and $H_2O(-)$, the method used for determination is indirect. The presence of volatile elements not explicitly determined (i.e., CO_2, Cl, F) may produce inaccuracies in addition to the random variations inherent in the gravimetric loss-on-heating and loss-on-ignition techniques. For this reason, based on the experience of the analyst, the amounts of $H_2O(+)$ and $H_2O(-)$ reported are estimated to be correct within ±10% of the amount present if the amount is >1 wt%, and ±30% of the amount present if the amount is ≤1 wt% and ≥0.1%. Amounts under 0.1 wt% are considered below the detection limit. The amount of $H_2O(+)$ reported will include those volatile elements mentioned which have not been explicitly determined.

The errors discussed above have been calculated for the bulk chemical data and presented with the analyses in Appendix B.

3.3 X-Ray Diffraction

3.3.1 Methods

X-ray diffraction (XRD) of powdered samples was used to qualitatively identify clay, zeolite and other minerals in several of the samples analyzed in 1981 (UE-25a#1 1569, UE-25a#1 2000, UE-25a#1 2429, USW G-1 1245, and USW G-1 2939.3). Analyses were by Robert Lowy and John W. Husler. Results of the analyses are summarized in Appendix C.

The fine grained fraction was separated from the powdered sample (Section 3.2.1.1) for analysis by standard floatation and settling procedures outlined by Carroll (1970). The wet powdered sample was spread evenly on a microscope slide and allowed to dry. The slide was placed in an automated Phillips X-ray

diffractometer and analyzed using nickel-filtered copper Kα radiation. Scan rates were 2° 2θ per minute, over the angular range between 3° and 30°. If clays were identified in the initial run, samples were glycolated and rerun, and then heated to about 300°C for about an hour and rerun. X-ray peaks, in degrees 2θ, were recorded with an automated goniometer and strip chart recorder for all runs. X-ray peaks were marked and recorded. Zeolites were identified by comparing diffractometer patterns with patterns presented in Sheppard and Gude (1969). Quartz was identified by the presence of a characteristic peak at 26.8°. Feldspars were identified by peaks or groups of peaks clustered around 25° and 28°. Clay minerals were identified by the presence of peaks at 6.2° which shift to about 8° upon heating (montmorillonite), 8.8° (illite), broad peaks in the 6° to 8° range which shift to lower values upon heating (illite-montmorillonite), 6.2° and 24.8° peaks which shift less than montmorillonite upon heating (chlorite), and peaks at 12.4° and 24.8° which do not shift upon heating at less than 400°C (kaolinite). The original data were reexamined by the author in 1990, and original results reevaluated, resulting in the identification of opal-CT (21.8° 2θ), and re-evaluation of the abundance of some of the clay minerals based on peak intensities.

The XRD data are qualitative, and relative amounts given are rough estimates based on visual estimation of peak intensities in the strip charts.

3.3.2 Uncertainties

XRD data are qualitative. No estimate of uncertainties can be made.

3.4 Electron Microprobe Analysis

3.4.1 Methods

Chemical analyses of minerals and "bulk" analyses of polycrystalline matrix material were made using an electron microprobe. An automated ARL-EMX-SM electron microprobe was used for the suite of samples analyzed in 1981 (UE-25a#1 1569, UE-25a#1 2000, UE-25a#1 2389, UE-25a#1 2429, UE-25a#1 2499, USW G-1 1245, USW G-1 2928.6, and USW G-1 2939.3), and an automated five-spectrometer JEOL 733 Superprobe was used for analyses made in 1984 (USW G-1

407.1, USW G-1 448.9, USW G-1 504.6, USW G-1 631.6, USW G-1 811.1, USW G-1 939.0, USW G-1 1079.4, USW G-1 1208.7, USW G-1 1315.2). Analyses on both instruments were made by wavelength dispersive techniques, using a 15 kV acceleration potential and various beam currents. Feldspars, matrix and glass were analyzed with 0.01 microamp currents, and mafic silicates and oxides were analyzed with 0.02 microamp currents. A broad (10- to 15-micron-diameter) electron beam was used for most analyses to minimize heating and volatilization in samples during analyses. For analyses on the ARL instrument, time-decay for sodium and potassium was tested for analyses of glass and zeolitized matrix by counting Na and K over 2 second intervals for a period of 60 seconds or more; results showed that no notable loss occurred over this time interval. At the time these data were collected, the JEOL 733 Superprobe was automated by the SANDIA TASK-83 electron microprobe automation package (Chambers, 1983, unpublished manscript); this package was replaced in 1985 and later by enhanced versions of the program (Chambers, 1985; Chambers and Doyle, 1990) which enhance the performance of the system, but do the analytical calculations in an identical manner to SANDIA TASK-83. Volatilization checks for Na and K were not done for analyses performed on this instrument. Differential matrix effects on both instruments were corrected by the method of Bence and Albee (1968), as implemented in the automation software used to reduce the data.

Various feldspars, synthetic glasses, pyroxenes, and oxides were used as standards. The standards used are ones which are routinely used in these instruments and are, in general, widely used in numerous electron microprobe laboratories. Replicate analyses of the standards and consensus analyses are kept on file in the electron microprobe laboratory.

3.4.2 Uncertainties

Uncertainties involved in the individual analyses are calculated by the software used to operate the instruments and collect the data. These uncertainties are not presented in tables of individual analyses (Appendix D), but are included in the original data printouts in the appropriate DRMS data sets. The standard deviations shown on the original data printouts from the ARL instrument are sample standard deviations (N-1 weighting) calcu-

lated based on sample counts for each element/oxide determination as discussed by Goldstein et al. (1981, p. 430-431). For analyses with the JEOL instrument, these standard deviations are calculated in the same manner as discussed by Goldstein et al. (1981) as implemented by Chambers (1990; p. 97-100). These calculated standard deviations are an accurate measure of sample uncertainties only when all other conditions are optimal (no random electronic variations, perfect specimen position, perfect crystal detector position, etc.). For this reason, the actual uncertainties almost always will be larger than what is calculated.

The only uncertainties shown in the data in Appendix D are standard deviations calculated for the multiple analyses of matrix. These are calculated using a hand-calculator, applying the following formula for sample standard deviation, s:

$$s = \left(\sum_{i=1}^{n} (X_i - X_m)^2/(n - 1)\right)^{0.5} \qquad (2)$$

where n = the number of points analyzed in the group
X_i = individual analyzed amount in wt percent, and
X_m = mean of n individual analyses in wt percent.

The ± values shown in the data tables in Appendix D indicate a range of uncertainty with about 68% confidence; the variation of the size of these values are a measure of the chemical homogeneity of the analyzed areas.

4.0 SUMMARY OF SAMPLE CHARACTERISTICS

The following sections contain brief descriptions of each sample analyzed for this study. The descriptions are interpretive in the sense that there is an attempt to integrate whatever analytical data are available to deduce information about each sample as a whole. Because the amount and quality of data vary between samples, the discussions are quite variable. Each discussion is preceded by a geologic map acronym for the stratigraphic unit of the sample and a listing of the types of data used to make the interpretations. The acronyms used are as follows:

Tpt - Topopah Spring Member of the Paintbrush Tuff.

Tht - Tuffaceous Beds of Calico Hills.
Tcp - Prow Pass Member of the Crater Flat Tuff.
Tcb - Bullfrog Member of the Crater Flat Tuff.
Tct - Tram Member of the Crater Flat Tuff

The samples are listed in the following sections in descending stratigraphic order. All samples are from drill core. The sample numbers are the drill hole designation followed by the depth (in feet) from which the sample was obtained. The stratigraphic unit to which the sample is assigned is based on published positioning of contacts between rock units in Spengler et al. (1979) for UE-25a#1, and Spengler et al. (1981) for USW G-1. Although all unit assignments are believed to be correct, exact relative stratigraphic positioning of samples within stratigraphic units between USW G-1 and UE-25a#1 may not always be correct. In particular, samples UE-25a#1 2389 and UE-25a#1 2429 have felsic phenocryst proportions, lithic fragment contents, and matrix textures which make their exact placement relative to samples from USW G-1 questionable.

4.1 USW G-1 407.1

Stratigraphic Unit: Tpt.

Analytical Methods: Thin-section examination (brief), electron microprobe analysis (feldspar phenocrysts and matrix).

Description: The sample is a densely welded, devitrified, crystal-rich (relative to Tpt samples deeper in USW G-1), lithophysal ash-flow tuff. Plagioclase appears to exceed alkali feldspar (sanidine) in abundance. The matrix is a mixture of very-fine crystalline dark brown (to almost opaque) shard relics, and coarser crystalline lensoid zones of mosaic vapor-phase altered quartz and feldspar. High gas pressures during the welding and devitrification process are indicated by the combination of densely welded shard and matrix textures coexisting with abundant pores that are partly to completely filled with vapor-deposited tridymite. Fiamme (welded pumice) are typically spherulitically crystallized and contain abundant very finely crystalline (10 to 30 μm) opaque Fe-Ti oxides. One edge of the thin section is part of the vapor-phase altered shell of a lithophysal cavity. Feldspar phenocrysts in this sample include sanidine ($An_{3.3}$ $Ab_{49.4}$ $Or_{47.2}$) and oligoclase plagioclase (An_{21} $Ab_{69.7}$ $Or_{9.2}$). The matrix is

considerably less silicic (SiO_2 66.8 wt%) than in rhyolites from deeper in the section; this sample is from the caprock of quartz latitic composition described by Lipman et al. (1966). Some other analytical data obtained from this sample (analyses of allanite and chevkinite/ perrierite) for another study have been reported previously (Price et al., 1985).

4.2 USW G-1 448.9

Stratigraphic Unit: Tpt.

Analytical Methods: Thin-section examination (brief), electron microprobe analysis (feldspar phenocrysts and matrix). Two thin sections were made of this sample, designated "A" and "B"; all microprobe analyses were done on the "A" sample.

Description: The sample is a densely welded, devitrified, lithophysal ash-flow tuff. Total phenocryst content is notably less than in USW G-1 407.1, and sanidine appears to exceed plagioclase in modal (volumetric) abundance. In one section containing most of two small lithophysae, tabular crystals, probably tridymite (possibly with some alkali feldspar), are present. The tridymite is probably vapor-deposited (Price et al., 1985). Matrix consists primarily of devitrified shards (showing relict textures) with lensoid zones of more coarsely crystallized matrix, but includes pumice fiamme which are generally coarsely crystalline, and vapor-phase altered matrix adjacent to lithophysal cavities. Some dirty-brown areas showing locally high birefringence in the vicinity of lithophysae are probably clay-rich zones. Feldspar phenocrysts in this sample include sanidine ($An_{3.1}$ $Ab_{58.7}$ $Or_{38.2}$) and oligoclase plagioclase ($An_{14.2}$ $Ab_{78.4}$ $Or_{7.4}$). Devitrified shard matrix and vapor-phase altered matrix are chemically similar, with the main differences due to high porosity (resulting in low analytical totals) and higher potassium (K_2O) in the latter relative to Na_2O and CaO. Fiamme, presumed to represent devitrified pumice fragments, are slightly less silicic, but are otherwise chemically very similar to devitrified shard matrix. Matrix composition is that of a high-silica rhyolite (SiO_2 77.8 wt%). Some of these data have been reported previously in a slightly different format (Price et al., 1985).

4.3 USW G-1 504.6

Stratigraphic Unit: Tpt.

Analytical Methods: Thin-section examination (brief), electron microprobe analysis (feldspar phenocrysts and matrix).

Description: The sample is a welded, devitrified ash-flow tuff. Lithophysal cavities are not evident, although coarse crystallization typical of the rims of lithophysal cavities is noted in what may be pumice fiamme or severely flattened lithophysae; a secondary mineral showing green color (epidote?) is associated with this crystallization. Shard relicts show textures indicative of dense welding, but are typically more coarsely crystalline (axiolitic) than shallower samples, and spherulites which cross relict fragment boundaries are present. Feldspar phenocrysts in this sample include sanidine ($An_{3.8}$ $Ab_{49.9}$ $Or_{46.3}$) and oligoclase plagioclase ($An_{18.1}$ $Ab_{74.1}$ $Or_{7.8}$). Devitrified shard matrix and fiamme tend to be less silicic than those from USW G-1 448.1, but more silicic than those from USW G-1 407.1. Some of these data have been reported previously in a slightly different format (Price et al., 1985).

4.4 USW G-1 631.6

Stratigraphic Unit: Tpt.

Analytical Methods: Thin-section examination (brief), electron microprobe analysis (feldspar phenocrysts and matrix).

Description: The sample is an extensively devitrified welded ash-flow tuff, which is notably phenocryst-poor. Devitrification of matrix is so extensive that faint relict shard forms are visible only in plane polarized light. Large (>1mm diameter) spherulites are locally common, with abundant coarsely crystalline mosaics of cristobalite (±tridymite) and feldspar. Feldspar phenocrysts in this sample include sanidine ($An_{1.5}$ $Ab_{42.5}$ $Or_{56.0}$) and oligoclase plagioclase ($An_{16.6}$ $Ab_{76.4}$ $Or_{7.0}$). Devitrified matrix is, on average, very silicic (SiO_2 77.4 wt%) even though the analyses show low totals due to microscopic-scale porosity; this is a high-silica rhyolite composition.

4.5 USW G-1 811.1

Stratigraphic Unit: Tpt.

Analytical Methods: Thin-section examination (brief), electron microprobe analysis (feldspar phenocrysts and matrix).

Description: The sample is an extensively devitrified welded ash-flow tuff, which is notably phenocryst-poor. The thin section is dominated by reddish-brown devitrified matrix in which only faint relict shard outlines are preserved. Lensoid zones of coarser devitrified areas show local vapor-deposited tridymite, and are similar to vapor-phase-altered areas around lithophysae. Feldspar phenocrysts in this sample include sanidine ($An_{2.1}$ $Ab_{46.0}$ $Or_{51.9}$) and oligoclase plagioclase ($An_{15.9}$ $Ab_{77.2}$ $Or_{6.9}$). Devitrified matrix is, on average, very silicic (SiO_2 73.6 wt%); if analyses are normalized to 100%, this is close to high-silica rhyolite composition. The vapor-phase-altered matrix is notably less silicic (SiO_2 66.0 wt%), and contains a much higher proportion of K_2O than the devitrified shard matrix.

4.6 USW G-1 939.0

Stratigraphic Unit: Tpt.

Analytical Methods: Thin-section examination (brief), electron microprobe analysis (feldspar phenocrysts and matrix).

Description: The sample is a densely welded, devitrified ash-flow tuff. Much of matrix is brown (in thin section), elongate shard relics with remainder consisting of small lensoid zones (up to 0.5 mm long) of vapor-phase-altered matrix (now mosaic-textured quartz and feldspar) with local central pores partly filled with tridymite. Large, elongate, spherulite-rich zones (up to several mm long) are probably pumice fiamme. Feldspar phenocrysts in this sample include sanidine ($An_{1.3}$ $Ab_{38.0}$ $Or_{60.8}$) and oligoclase plagioclase ($An_{16.7}$ $Ab_{76.8}$ $Or_{6.5}$); plagioclase is dominant in the section analyzed. Devitrified shard matrix indicates a high-silica rhyolite composition (SiO_2 75.7 wt%). The vapor-phase-altered matrix is notably less silicic (SiO_2 67.6 wt%), but contains very similar proportions of CaO, Na_2O and K_2O.

4.7 USW G-1 1079.4

Stratigraphic Unit: Tpt.

Analytical Methods: Thin-section examination (brief), electron microprobe analysis (feldspar phenocrysts and matrix).

Description: The sample is a densely welded, devitrified ash-flow tuff containing very few phenocrysts. Much of matrix is brown (in thin section) elongate shard relics. Zones showing vapor-phase alteration textures are less abundant than in shallower samples, and most (but not all) of the pore-filling tridymite has inverted to quartz. Fiamme are dominated by relatively coarse mosaic crystallization textures. This sample contains a very high density of microfractures in thin section, with an estimated density of about 1/2 to 1 fracture per millimeter; these microfractures are most commonly filled with quartz, and locally with some birefringent clays. Feldspar phenocrysts in this sample include sanidine ($An_{1.9}$ $Ab_{43.0}$ $Or_{55.1}$) and oligoclase plagicclase ($An_{16.5}$ $Ab_{76.4}$ $Or_{7.1}$). Devitrified matrix is near the low end for high-silica rhyolite (SiO_2 74.1 wt%) in analyses with low analytical totals (average 94 wt%).

4.8 USW G-1 1208.7

Stratigraphic Unit: Tpt.

Analytical Methods: Thin-section examination (brief), electron microprobe analysis (feldspar phenocrysts and matrix).

Description: The sample is a densely welded, devitrified ash-flow tuff. In thin section, matrix is dominated by elongate brown shard relics. Zones showing vapor-phase alteration textures are less abundant than in shallower samples, and all of the pore-filling tridymite has inverted to quartz (commonly retaining the tabular habit of tridymite). Coarse mosaic textures dominate crystallization in fiamme, although a few (apparently) relict spherulitic textures were noted. Feldspar phenocrysts in this sample include sanidine ($An_{1.5}$ $Ab_{43.1}$ $Or_{55.4}$) and oligoclase plagioclase ($An_{17.1}$ $Ab_{76.3}$ $Or_{6.3}$). Devitrified matrix is typical for high-silica rhyolite (SiO_2 75.8 wt%). The analyses of some areas of vapor-phase-altered matrix show the material to be extremely

silicic (SiO_2 84.5 wt%), indicating secondary silicification has occurred.

4.9 USW G-1 1245

Stratigraphic Unit: Tpt.

Analytical Methods: Detailed thin-section examination with point count, whole-rock analysis, electron microprobe analysis (feldspar phenocrysts, matrix, Fe-Ti oxides), qualitative XRD.

Description: The sample is a devitrified, partially welded ash-flow tuff. Textural indicators of welding have been obscured by subsequent crystallization, but rare shard relics are relatively undeformed except near rigid phenocrysts or lithic fragments. Shard relics are brown and semi-isotropic in thin section, but the low total H_2O content (a little more than 1 wt%) in whole-rock analyses, analytical totals in microprobe analyses of matrix materials near 100 wt%, and no indication of any amorphous material in the XRD pattern suggest that glass, if present, is not a significant constituent in the sample. Although not obvious in thin section, XRD analysis reveals the presence of a minor amount of clay (presumably in the devitrified shards), and the presence of cristobalite in addition to quartz as a devitrification product. Total felsic phenocryst modal content (quartz+plagioclase+alkali feldspar) is 2%, and the sample mode includes about 14% devitrified volcanic lithic fragments. The whole-rock analysis is that of a typical high-silica rhyolite (SiO_2 76.2 wt%). Microprobe analyses of sanidine phenocrysts show a fairly wide range in composition (An_1 Ab_{36} Or_{63}, to An_1 Ab_{45} Or_{54}). Plagioclase is typically oligoclase (An_{17} Ab_{76} Or_7), but ranges to labradorite (An_{40} Ab_{58} Or_2). The more calcic plagioclase is optically distinct and zoned. Analyses of cryptocrystalline matrix and devitrified shards are very similar to the whole-rock analyses, and coarsely crystalline feldspar analyzed in devitrified matrix is virtually identical to sanidine phenocrysts (An_0 Ab_{37} Or_{63}).

4.10 USW G-1 1315.2

Stratigraphic Unit: Tpt.

Analytical Methods: Thin-section examination (brief), electron microprobe analysis (feldspar phenocrysts and matrix).

Description: The sample is a welded, crystal-poor vitric tuff. The matrix texture is typical of welded vitrophyres illustrated by Ross and Smith (1961, p. 25). The glass is isotropic and free of any notable crystallization but does contain numerous perlitic cracks. No feldspar phenocrysts were located in thin section. Microprobe analysis of the glass indicates a high-silica rhyolite composition (SiO_2 74.1 wt%; higher when normalized to 100%), and relative and absolute amounts of CaO, Na_2O and K_2O are indistinguishable from other analyses of devitrified matrix from other Tpt samples.

4.11 USW G-1 1374.0

Stratigraphic Unit: Tpt.

Analytical Methods: Thin-section examination (brief).

Description: The sample is a nonwelded, shard-rich vitric tuff. The thin section contains very sparse lithic fragments and phenocrysts, including a few small feldspar, biotite and Fe-Ti oxide fragments. Glass is isotropic, pale brown in plane-polarized light, and contains tiny needle-like (up to 40 μm long) birefringent crystallites which are probably clays.

4.12 USW G-1 1442.0

Stratigraphic Unit: Tht.

Analytical Methods: Detailed thin-section examination with point count.

Description: The sample is a nonwelded, zeolitized ash-flow(?) tuff. Origin by ash flow is suggested by poor sorting in which very fine matrix and larger pumice fragments are mixed, but much of the fine matrix may have been produced by zeolitization of pumice. Zeolites tend to be finely crystalline (<15μm) even in pores and perlitic fragments, and centers of leached pores contain poorly reflective opaque material, possibly Mn-oxides. Zeolitization appears to have destroyed most primary shard forms. Total felsic phenocryst modal content (quartz+plagioclase+alkali

feldspar) is less than 3%, and devitrified lithic fragments comprise 7% of the mode.

4.13 USW G-1 1487.4

Stratigraphic Unit: Tht.

Analytical Methods: Detailed thin-section examination with point count.

Description: The sample is a nonwelded, zeolitized ash-flow tuff. Origin by ash flow is suggested by poor sorting, mixing very fine matrix with larger pumice fragments. The matrix is highly altered by zeolitization, but notable relict shard forms are present. Birefringent crystallites (probably clays) occur in pumice fragments. Total felsic phenocryst modal content (quartz+ plagioclase+alkali feldspar) is under 3%, and devitrified lithic fragments comprise about 5% of the mode.

4.14 USW G-1 1519.9

Stratigraphic Unit: Tht.

Analytical Methods: Detailed thin-section examination with point count.

Description: The sample is a nonwelded, zeolitized ash-flow(?) tuff. Origin by ash flow is suggested by poor sorting (mixed very fine matrix and larger pumice fragments), but extensive alteration of primary textures has occurred, and much fine matrix may have originated by alteration of pumice. Clay minerals are present, coating fragment surfaces and fractures, and appear to have formed following alteration of glass to perlite and most zeolitization. Zeolites are present throughout the matrix and in pores. Total felsic phenocryst modal content (quartz+ plagioclase+alkali feldspar) is about 4%, and devitrified lithic fragments comprise about 10% of the mode.

4.15 USW G-1 1550.4

Stratigraphic Unit: Tht.

Analytical Methods: Detailed thin-section examination with point count.

Description: The sample is a nonwelded, zeolitized ash-flow(?) tuff. Origin by ash flow is suggested by poor sorting, mixing very fine matrix with larger pumice fragments, but clast-matrix boundaries are commonly very obscure due to zeolitization. Zeolite is abundant. Clay and zeolite are developed in pores and locally in fractures; clays appear to have crystallized last. Total felsic phenocryst modal content (quartz+plagioclase+alkali feldspar) is about 2%, and lithic fragments are rare (about 1% of the mode).

4.16 USW G-1 1594.8

Stratigraphic Unit: Tht.

Analytical Methods: Detailed thin-section examination with point count, electron microprobe analyses (feldspars).

Description: The sample is a nonwelded, zeolitized tuff. Origin by ash flow is suggested by the poor sorting of matrix fragments, but primary textures are largely destroyed by zeolitization, and much of the fine matrix may have originated by alteration of pumice. Zeolite appears to dominate the sample and occurs as relatively coarse pore filling, and as finely crystalline replacement of pumice and matrix. Total felsic phenocryst modal content (quartz+plagioclase+alkali feldspar) is 5%, and lithic fragments are relatively rare (about 2%). Feldspars analyzed by electron microprobe include oligoclase plagioclase (average An_{24} Ab_{69} Or_{7}) and sanidine (average An_{1} Ab_{33} Or_{66}).

4.17 UE-25a#1 1569

Stratigraphic Unit: Tht.

Analytical Methods: Detailed thin-section examination with point count, whole-rock analysis, electron microprobe analysis (feldspar phenocrysts, matrix, Fe-Ti oxides), qualitative XRD.

Description: The sample is a nonwelded zeolitized silicic tuff. Matrix appears isotropic in thin section and is probably partially glassy, but birefringent crystallites (probably clays) are evident at high magnification. Abundant tabular crystals of clinoptilolite are present (confirmed by XRD analysis) both replacing matrix and in pores. No shard relics are noted, and

are assumed to have been destroyed by zeolitization. Although pumice appears to be thoroughly zeolitized, two varieties of pumice textures are preserved. Total felsic phenocryst modal content (quartz+plagioclase+alkali feldspar) is about 2%, and devitrified lithic fragments are abundant (but less than the 27% shown in Appendix A since this amount includes some glassy and zeolitized lithics). The whole rock analysis shows an elevated total H_2O content of about 7.6 wt%; this is less than that characteristic of more extensively zeolitized tuffs which typically have total H_2O between 10 and 13 wt% (Connolly et al., 1984), but this easily could be the result of the high percentage of devitrified lithic fragments in this sample. Relative to typical rhyolites, this sample is enriched in CaO and depleted in Na_2O, probably as a consequence of zeolitization (see Connolly et al., 1984). Microprobe analyses of matrix materials indicate that any glass which may be present is hydrated and probably extensively zeolitized.

4.18 USW G-1 1617.0

Stratigraphic Unit: Tht.

Analytical Methods: Detailed thin-section examination with point count, electron microprobe analyses (feldspars).

Description: The sample is a nonwelded, zeolitized ash-flow tuff. Origin by ash flow is suggested by poor sorting, mixing very fine matrix with larger pumice fragments. Zeolite (clinoptilolite) occurs as larger tabular crystals (5μm to 20μm) in pores and replacing pumice and perlite, and as very finely crystalline (<1μm) material replacing matrix. Birefringent crystallites (probably clays) occur in minor amounts in pumice fragments. Total felsic phenocryst modal content (quartz+ plagioclase+alkali feldspar) is less than 4%, and devitrified lithic fragments comprise about 5% of the mode. Feldspars analyzed by electron microprobe include oligoclase plagioclase (An_{19} Ab_{71} Or_{10}) and sanidine (An_1 Ab_{32} Or_{67}).

4.19 USW G-1 1665.5

Stratigraphic Unit: Tht.

Analytical Methods: Detailed thin-section examination with point count.

Description: The sample is a nonwelded, zeolitized ash-flow tuff. Ash-flow origin is suggested by poor sorting, mixing fine matrix and coarser pumice fragments, but relict shards are not recognizable in the zeolitized matrix. Coarse (20μm to 50μm) clinoptilolite crystals partly fill leached pores in altered perlite fragments. Birefringent clay minerals are rare and largely confined to pumice fragments. Total felsic phenocryst modal content (quartz+plagioclase+alkali feldspar) is 5%, and devitrified volcanic lithic fragments are about 4% of the mode.

4.20 USW G-1 1668.5

Stratigraphic Unit: Tht.

Analytical Methods: Detailed thin-section examination with point count.

Description: The sample is a nonwelded, zeolitized ash-flow tuff. Ash-flow origin is suggested by poor sorting, mixing fine matrix and coarser pumice fragments. Shard outlines are commonly altered by zeolitization, but some are recognizable in the matrix. Opal (recognized as low-relief, semi-isotropic material) occurs as pore filling in pumice and matrix and as a lining in microscopic cracks and fractures; textural relations in pores suggest that opal largely postdates clinoptilolite. Total felsic phenocryst modal content (quartz+plagioclase+alkali feldspar) is about 3%, and devitrified volcanic lithic fragments are about 6% of the mode.

4.21 USW G-1 1719.7

Stratigraphic Unit: Tht.

Analytical Methods: Detailed thin-section examination with point count.

Description: The sample is a nonwelded, zeolitized ash-flow tuff. Ash-flow origin is suggested by poor sorting, mixing fine matrix and coarser pumice fragments. Shard outlines are commonly altered by zeolitization, but some are recognizable in the matrix. Felsic phenocrysts show local development of shock-

related effects: extreme fracturing of quartz and plagioclase and rare kink bands in sanidine. Total felsic phenocryst modal content (quartz+plagioclase+alkali feldspar) is 6%, and modal content of devitrified volcanic lithic fragments is about 9%.

4.22 USW G-1 1741.8

Stratigraphic Unit: Tht.

Analytical Methods: Detailed thin-section examination with point count.

Description: The sample is a nonwelded, zeolitized ash-flow tuff. Ash-flow origin is suggested by poor sorting, mixing fine matrix and coarser pumice fragments, but relict shards are not recognizable in the zeolitized matrix. Coarse (up to 60μm) clinoptilolite crystals partly fill pores in altered perlite fragments and pumice. Development of clay minerals rimming most non-phenocryst clasts and within pumice is extensive, and may be indicative of some weathering of the zeolitized tuff. Total felsic phenocryst modal content (quartz+plagioclase+alkali feldspar) is 7%, and devitrified volcanic lithic fragments are rare (about 1% of the mode).

4.23 USW G-1 1784.8

Stratigraphic Unit: Tht.

Analytical Methods: Detailed thin-section examination with point count.

Description: This sample is a tuffaceous (or volcaniclastic) sandstone. Matrix contains a high percentage of very fine material, but this is primarily the result of alteration of unstable (i.e., glassy) lithic fragments. Total felsic phenocryst modal content (quartz+plagioclase+alkali feldspar) is 22%. Recognizable volcanic lithic fragments are generally well-sorted, and include both zeolitic and devitrified tuff; together they comprise 26% of the mode. Clay minerals occur as a rim around virtually all clasts in a similar (but more extensive) manner to that observed in USW G-1 1741.8, and most fragments are rounded to some extent, indicating probable reworking.

4.24 UE-25a#1 2000

Stratigraphic Unit: Tcp.

Analytical Methods: Detailed thin-section examination with point count, whole-rock analysis, electron microprobe analysis (feldspar phenocrysts, matrix), qualitative XRD.

Description: The sample is a densely to moderately welded, devitrified ash-flow tuff. Shard relics are texturally distinct and show axiolitic crystallization. Total felsic phenocryst modal content (quartz+plagioclase+alkali feldspar) is about 12%, and devitrified lithic fragments comprise about 3% of the mode. The sample contains almost 9% disseminated Fe oxides which is reflected in an elevated amount of Fe_2O_3 (1.75 wt%) in the whole-rock analysis. The whole-rock analysis is that of a high-silica rhyolite (75.9 wt% SiO_2), with low H_2O content (about 1 wt%) typical of devitrified samples. Low relative Al_2O_3 is reflected in low corundum in the CIPW Norm (0.15), and high ferric iron is reflected in high hematite (1.55). Sanidine analyses are very homogeneous with an average composition of $An_{1.4}$ $Ab_{45.5}$ $Or_{53.1}$. Plagioclase is predominantly a potassic variety of oligoclase (about An_{12} Ab_{78} Or_{10}); subordinate, less potassic oligoclase to andesine ranges between $An_{28.5}$ $Ab_{68.1}$ $Or_{3.4}$ and $An_{42.9}$ $Ab_{55.1}$ $Or_{2.0}$. Devitrified shards are much more silicic (83 to 87 wt% SiO_2) than the whole-rock, and analyses of axiolitically crystallized fragmental material (identified as altered pumice and counted as 19% of the mode) appear to be dominated by a potassic feldspar with low analytical totals due to micro-scale porosity.

4.25 USW G-1 2067

Stratigraphic Unit: Tcp.

Analytical Methods: Detailed thin-section examination with point count.

Description: The sample is a partially welded zeolitized ash-flow tuff. Matrix is semi-isotropic and may be partly glassy, but appears microcrystalline at high magnification with the development of $\leq 10\mu m$ zeolite locally replacing shards in matrix and partially filling pores in pumice. Partial welding is recognized from weak preferred orientation of shards and pumice fragments.

Although altered extensively by zeolitization, relict shards are recognizable. Some clay minerals (as birefringent microlitic aggregates) are present locally, replacing pumice and matrix. Total felsic phenocryst modal content (quartz+ plagioclase+alkali feldspar) is 8%, and devitrified lithic fragments comprise about 5% of the mode.

4.26 USW G-1 2170

Stratigraphic Unit: Tcp.

Analytical Methods: Detailed thin-section examination with point count.

Description: The sample is a nonwelded zeolitized tuff, which may have been somewhat reworked. All components are randomly oriented, with no indication of welding. Matrix appears largely amorphous, but is clearly zeolitized when viewed in thin section under high magnification. All fragments except phenocrysts and devitrified volcanic lithics are altered and boundaries between matrix and other components can be indistinct. Unlike some other samples, however, relict shard and pumice structures are locally fairly well preserved. Ash-flow (versus air-fall) origin is suggested by the presence of abundant fine matrix, but a tendency for pumice, perlite and lithic fragments to be somewhat rounded and the presence of hematitic alteration rims 20 to 40μm thick around fragments suggest some reworking. Geopetal structure, in which pores are partially filled with zeolite first and then with opal, is well developed and suggests that deposition of these phases occurred while the rock was in a partially saturated condition. The paragenetic alteration sequence indicated is 1. development of oxide rims, 2. zeolitization and 3. deposition of opal. Total felsic phenocryst modal content (quartz+plagioclase+ alkali feldspar) is 11% and all phases are commonly fractured. Devitrified volcanic lithics are 5% of the mode.

4.27 USW G-1 2274

Stratigraphic Unit: Tcb.

Analytical Methods: Detailed thin-section examination with point count.

Description: The sample is a partially welded zeolitized (and oxidized) ash-flow tuff. Alteration includes replacement of matrix by a mixture of tabular zeolite and brown, semi-opaque non-reflective (probably Fe_2O_3-rich) material overprinting primary textures. Zeolite is common and partly fills pores in pumice. Oxidation is evident throughout, including extensive marginal alteration of Fe-Ti oxide phenocrysts. Total felsic phenocryst modal content (quartz+plagioclase+alkali feldspar) is 11%, and devitrified lithic fragments are notably absent.

4.28 USW G-1 2276

Stratigraphic Unit: Tcb.

Analytical Methods: Detailed thin-section examination with point count.

Description: The sample is a nonwelded to partially welded zeolitized ash-flow tuff. This sample is very similar to USW G-1 2274; notable differences include higher proportions of felsic phenocrysts (modal content of quartz+plagioclase+alkali feldspar is about 17%), more biotite, more extensive filling of pores by zeolite, and late filling of some pores by opal.

4.29 USW G-1 2284

Stratigraphic Unit: Tcb.

Analytical Methods: Detailed thin-section examination with point count.

Description: The sample is a partially welded zeolitized ash-flow tuff. In thin section, shards and pumice fragments show notable preferred orientation but minimal deformation, with intact bubble walls common. Fine matrix is isotropic and brown in color suggesting that it is at least partly glassy, but zeolite is abundant in pores in pumice (up to 50μm tabular clinoptilolite crystals with minor mordenite needles), and may be present as a very finely crystalline replacement of some of glassy matrix. High porosity (7%) is due to extensive leaching of glassy fragments. Total felsic phenocryst modal content (quartz+ plagioclase+alkali feldspar) is 16%, and devitrified lithic fragments are rare or absent.

4.30 UE-25a#1 2389

Stratigraphic Unit: Tcb.

Analytical Methods: Detailed thin-section examination with point count, electron microprobe analysis (feldspar phenocrysts, matrix, Fe-Ti oxides).

Description: The sample is a moderately(?) welded, devitrified ash-flow tuff. Matrix is completely devitrified, and devitrification textures commonly obliterate original fragmental textures. Total felsic phenocryst modal content (quartz+ plagioclase+alkali feldspar) is 20%, and all show some resorption textures. Devitrified lithic fragments comprise 2% of the mode. Sanidine phenocryst compositions average An_1 Ab_{39} Or_{60}. Plagioclase varies between oligoclase (An_{15} Ab_{78} Or_7) and andesine (An_{32} Ab_{65} Or_3). Microprobe analyses of both coarsely and finely devitrified matrix appear to indicate mixture of alkali feldspars and silica, with some local micro-scale porosity producing low analytical totals.

4.31 UE-25a#1 2429

Stratigraphic Unit: Tcb.

Analytical Methods: Detailed thin-section examination with point count, whole-rock analysis, electron microprobe analysis (feldspar phenocrysts, matrix, Fe-Ti oxides), qualitative XRD.

Description: The sample is a partially to moderately(?) welded devitrified ash-flow tuff. Matrix is completely devitrified, and devitrification textures obliterate original fragmental textures. Total felsic phenocryst modal content (quartz+plagioclase+alkali feldspar) is 15%, and devitrified lithic fragments comprise 1% of the mode. The whole-rock analysis indicates high-silica rhyolite composition (SiO_2 75.2 wt%) and low H_2O content (about 1 wt%) typical of devitrified tuff. Sanidine phenocryst compositions average An_1 Ab_{39} Or_{60}. Plagioclase phenocrysts are oligoclase (An_{17} Ab_{78} Or_6), and although compositional zoning is indicated optically, this could not be verified by microprobe analyses. Microprobe analyses of both coarsely and finely devitrified matrix suggest a mixture of alkali feldspars and silica. Some microcrystalline areas show low analytical totals, probably due

primarily to micro-scale porosity, but possibly due, in part, to the presence of minor clay minerals identified by XRD.

4.32 USW G-1 2312

Stratigraphic Unit: Tcb.

Analytical Methods: Detailed thin-section examination with point count.

Description: The sample is a moderately welded zeolitized and glassy ash-flow tuff. Welding is indicated by shard deformation textures in matrix and strong flattening of pumice clasts. Matrix is semi-isotropic but largely zeolitized (clinoptilolite with minor mordenite in pores) showing the development of some brownish cryptocrystalline opal replacing glassy fragments. The style of crystallization of matrix is very similar to USW G-1 2274 and USW G-1 2276, although the combination of moderate welding with zeolitization is unusual. Total felsic phenocryst modal content (quartz+plagioclase+alkali feldspar) is 11%, and devitrified lithic fragments are absent.

4.33 USW G-1 2338

Stratigraphic Unit: Tcb.

Analytical Methods: Detailed thin-section examination with point count.

Description: The sample is a moderately welded, devitrified ash-flow tuff. Welding is indicated by distortion of shards around phenocrysts, and flattening of pumice fragments. Extensive devitrification includes axiolitic crystallization of shards, coarse mosaic-type matrix crystallization, spherulites in pumice, finely microcrystalline matrix, and quartz and feldspar crystallized in pores. Total felsic phenocryst modal content (quartz+plagioclase+alkali feldspar) is 16%, and devitrified lithic fragments are absent.

4.34 UE-25a#1 2499

Stratigraphic Unit: Tcb.

Analytical Methods: Detailed thin-section examination with point count, electron microprobe analysis (feldspar phenocrysts, matrix, Fe-Ti oxides).

Description: The sample is a partially to moderately(?) welded devitrified ash-flow tuff. Matrix is completely devitrified, and primary matrix textures are difficult to recognize in thin section. Probable moderate welding is recognized by large-scale fabric in hand specimen and preferred orientation of fragments in thin section. Total felsic phenocryst modal content (quartz+ Plagioclase+Alkali Feldspar) is 22%, and devitrified lithic fragments are absent. Sanidine phenocryst compositions cluster tightly around An_1 $Ab_{38.5}$ $Or_{60.5}$; plagioclase tends to be somewhat more variable in composition (An_{13} Ab_{79} Or_8, to An_{18} Ab_{76} Or_6). Microprobe analyses of matrix are all very silicic. The analyses could indicate secondary silicification or magmatic fractionation of SiO_2 into the matrix (with Al, Ca, K, and Na going into feldspar phenocrysts). Fe-Ti oxides analyzed by microprobe are unusual in that they contain high amounts of MnO in both titaniferous magnetite (3 to 4 wt%) and ilmenite (2 wt%).

4.35 USW G-1 2367

Stratigraphic Unit: Tcb.

Analytical Methods: Detailed thin-section examination with point count.

Description: The sample is a moderately(?) welded, devitrified ash-flow tuff. Degree of welding suggested by strong preferred orientation of elongate spherulitic and axiolitic crystallized areas in matrix (inferred to be areas of relict pumice and shards); primary depositional textures have been destroyed by thorough devitrification of matrix. Devitrification textures include fine microcrystalline and coarse spherulitic crystallization locally overprinted by coarser mosaic-style development of alkali feldspar and quartz. Total felsic phenocryst modal content (quartz+plagioclase+alkali feldspar) is 15%, and devitrified lithic fragments are extremely rare.

4.36 USW G-1 2380

Stratigraphic Unit: Tcb.

Analytical Methods: Detailed thin-section examination with point count.

Description: The sample is a moderately(?) welded, devitrified ash-flow tuff. Textures in this sample are virtually identical to those in USW G-1 2367. Fine matrix is microscopically crystalline with crystals under 5μm, and coarse spherulitic matrix (alkali feldspar plus a silica phase) occurs in distinctly elongate areas, and locally appears to be pseudomorphic after shards. Coarse (0.03 to 0.2 mm crystals) mosaic-textured matrix occurs replacing fine matrix. Total felsic phenocryst modal content (quartz+plagioclase+alkali feldspar) is 14%, and devitrified lithic fragments are rare.

4.37 USW G-1 2406

Stratigraphic Unit: Tcb.

Analytical Methods: Detailed thin-section examination with point count.

Description: The sample is a welded, devitrified ash-flow tuff. In this sample, the degree of welding cannot be estimated by thin-section textures because of virtually complete destruction of primary depositional textures by devitrification, but position between demonstrably welded units suggests at least moderate welding. As with USW G-1 2367 and USW G-1 2380, early fine microcrystalline and spherulitic devitrification textures have been partly replaced by coarse mosaic-style zones of alkali feldspar and quartz. This sample contains a high percentage of coarse matrix (37%); abundant coarse matrix is characteristic samples down to USW G-1 2493, and presumably represents the most slowly-cooled part of the interior of this cooling unit. Total felsic phenocryst modal content (quartz+ plagioclase+alkali feldspar) is 16%, and quartz commonly contains visible multi-phase fluid inclusions. Devitrified lithic fragments are absent.

4.38 USW G-1 2415

Stratigraphic Unit: Tcb.

Analytical Methods: Detailed thin-section examination with point count.

Description: The sample is a welded, devitrified ash-flow tuff. The rock is virtually identical to USW G-1 2406, and the same comments regarding welding and devitrification apply; in this sample, the modal percentage of coarse crystalline matrix is slightly less at 33%. Total felsic phenocryst modal content (quartz+plagioclase+alkali feldspar) is 14%, and devitrified lithic fragments are very rare.

4.39 USW G-1 2428

Stratigraphic Unit: Tcb.

Analytical Methods: Detailed thin-section examination with point count.

Description: The sample is a moderately(?) welded devitrified ash-flow tuff. Degree of welding is suggested by elongation of spherulitic matrix (presumed to be devitrified pumice); primary depositional textures have been destroyed by thorough devitrification of matrix. Devitrification includes a fine microcrystalline texture (in fine matrix) grading into finely crystalline spherulitic and axiolitic structures; the latter commonly occur in elongate shapes suggesting replacement of shards. Elongate dark reddish-brown zones rich in poorly reflective Fe_2O_3-rich opaque minerals are present. As in other samples in this interval, coarse mosaic-textured quartz-feldspar matrix (32% of mode) appears to replace other types of matrix. Total felsic phenocryst modal content (quartz+plagioclase+alkali feldspar) is 19%; alkali feldspars show the development of optically continuous overgrowth rims 10 to 50 μm thick. The thin section contains minor (1% of mode) volcanic lithic fragments.

4.40 USW G-1 2493

Stratigraphic Unit: Tcb.

Analytical Methods: Detailed thin-section examination with point count.

Description: The sample is a devitrified, welded ash-flow tuff. Indicators of the degree of welding are absent due to destruction of primary depositional textures by extensive crystallization. Devitrification includes fine microcrystalline textures and rela-

tively rare coarse spherulitic crystallization; the former commonly is gradational with a coarse blocky mosaic of alkali feldspar and quartz (37% of the mode). Total felsic phenocryst modal content (quartz+plagioclase+alkali feldspar) is 19%; overgrowth rims around alkali feldspars are present, but are thinner (10 to 20 μm) and less abundant than in USW G-1 2428. No lithic fragments were observed in thin section.

4.41 USW G-1 2502

Stratigraphic Unit: Tcb.

Analytical Methods: Detailed thin-section examination with point count.

Description: The sample is a moderately welded, devitrified ash-flow tuff. Degree of welding is indicated by some deformation and flow in the shard matrix; this deformation is particularly pronounced around rigid phenocrysts. Although devitrified, the sample contains very clearly defined shard relics. A few shards are brown and appear isotropic (possibly glassy), but could be very finely crystalline. Other devitrification textures include elongate spherulitic zones (pumice fiamme), and a much lower modal percentage (15%) of mosaic-textured coarse matrix (compared with USW G-1 2493). Total felsic phenocryst modal content (quartz+ plagioclase+alkali feldspar) is 11%, and 3% lithic fragments are included in the mode. Well-defined shard relics mark a distinct break in the style of devitrification (compared with USW G-1 2493), and the change in phenocryst abundance and appearance of lithic fragments suggest that this crystallization break may be an eruptive flow break as well.

4.42 USW G-1 2510

Stratigraphic Unit: Tcb.

Analytical Methods: Detailed thin-section examination with point count.

Description: The sample is a moderately welded, devitrified ash-flow tuff. Shard relics and flattened crystallized pumice (now fiamme) show strong preferred orientation and elongation; flow deformation of shards is very limited except around phenocrysts.

Devitrification textures include brown axiolitically crystallized shard relics, finely crystalline non-shard matrix, and coarse spherulitic crystallization in pumice fiamme. Fiamme commonly display dark oxidized rims. Coarse mosaic crystallization (feldspar ± quartz) occurs overprinting other matrix types, but commonly respects relict fragment boundaries. Total felsic phenocryst modal content (quartz+plagioclase+alkali feldspar) is 12%, and the mode includes 1% lithic fragments.

4.43 USW G-1 2538

Stratigraphic Unit: Tcb.

Analytical Methods: Detailed thin-section examination with point count.

Description: The sample is a moderately to partially welded, devitrified ash-flow tuff. Shard relics are deformed around phenocrysts, but show very little flow deformation and only moderate preferred orientation in other areas of the matrix. Devitrification is extensive: crypto- to microcrystalline in fine matrix, axiolitic in relict shards, and more coarsely spherulitic in elongate areas interpreted to be formerly pumice. Coarsely crystalline mosaic-textured matrix appears to occur only as a partial replacement of spherulitic matrix. Rare brown isotropic (glassy?) shards are present. Overall, crystallization is skewed towards finer crystal sizes relative to USW G-1 2502, and appears less intense. Total felsic phenocryst modal content (quartz+plagioclase+alkali feldspar) is 11%, and the mode includes 2% lithic fragments (mostly devitrified volcanics).

4.44 USW G-1 2550

Stratigraphic Unit: Tcb.

Analytical Methods: Detailed thin-section examination with point count.

Description: The sample is a partially to moderately welded, zeolitized ash-flow tuff. Welding is indicated by preferred orientation of shards in matrix and deformation of shards around phenocrysts. Devitrification textures (spherulites, axiolites or coarse mosaics present in Tcb samples above this one) are absent,

but zeolitization is evident throughout. Although some isotropic shards and matrix areas suggest that some glass probably remains, most shards have been leached and partially replaced by aggregates of small (average 3μm) tabular zeolites leaving pores in the central part of the shards. Zeolite development is irregular within single thin sections, both in abundance and crystal size; in some areas tabular clinoptilolite crystals as large as 20μm are noted. Total felsic phenocryst modal content (quartz+plagioclase+alkali feldspar) is 14%; plagioclase phenocrysts are strongly zoned and show an optically distinct core-rim break. Lithic fragments comprise 6% of the mode and are texturally very different from the devitrified tuff lithics present in rock units above Tcb; they are mostly very fine grained with occasional phenocrysts that suggest a volcanic origin.

4.45 USW G-1 2563

Stratigraphic Unit: Tcb.

Analytical Methods: Detailed thin-section examination with point count.

Description: The sample is a moderately welded, partly(?) zeolitized ash-flow tuff. Welding is indicated by extensive shard deformation around phenocrysts and some flow deformation throughout the shard matrix. Porosity has largely been eliminated from pumice fragments by welding, but is present in and between shards, probably as a consequence of zeolitization. Yellowish, almost isotropic glass shards, which have been partly leached and replaced by tabular zeolites, are common in the matrix. The thin section contains a prominent micro-scale fault 50 to 100 μm wide, filled with dark fine-grained material, and across which phenocrysts are terminated and brecciated. Total felsic phenocryst modal content (quartz+ plagioclase+alkali feldspar) is 14%. Lithic fragments comprise about 2.5% of the sample, and most of these show crystallization textures (axiolites, spherulites, etc.) typical for devitrified, welded tuff.

4.46 USW G-1 2585

Stratigraphic Unit: Tcb.

Analytical Methods: Detailed thin-section examination with point count.

Description: The sample is a partially welded, zeolitized ash-flow tuff. Welding is indicated by minor shard deformation around phenocrysts, and notable flattening of pumice fragments. Zeolitization is extensive throughout fine-grained non-shard matrix, as pore lining and filling in large pumice and unbroken bubble walls, and, most prominently, as partial replacement of leached shard fragments. Interiors of partially filled pores contain a late-stage opal fill. Brown oxidized rims outlining pumice and lithic fragments are common, and occur locally within pumice fragments. Total felsic phenocryst modal content (quartz+plagioclase+alkali feldspar) is 11%, and lithic fragments comprise about 1% of the mode.

4.47 USW G-1 2658

Stratigraphic Unit: Tct.

Analytical Methods: Detailed thin-section examination with point count.

Description: The sample is a nonwelded, zeolitized(?) and partly glassy(?) ash-flow tuff. There are no textures present which would suggest any welding, but original textures have been extensively modified by zeolitization and other low-temperature alteration. In thin section, the matrix appears almost isotropic under low magnification, but at high magnification numerous small (≤ 3 μm) crystallites are apparent, along with some very poorly developed small (≤ 50 μm) spherulites. Undeformed altered pumice fragments are present which contain pores partially filled with a low-birefringence material, probably zeolite. Total felsic phenocryst modal content (quartz+plagioclase+alkali feldspar) is 9%. Lithic fragments comprise about 2% of the mode, and include some devitrified welded tuff fragments.

4.48 USW G-1 2928.6

Stratigraphic Unit: Tct.

Analytical Methods: Detailed thin-section examination with point count, electron microprobe analysis (feldspar phenocrysts, matrix, Fe-Ti oxides).

Description: The sample is a moderately welded, devitrified ash-flow tuff. Moderate welding is inferred from preferred orientation of elongate crystallized pumice fiamme, but devitrification has obscured most primary textures. Total felsic phenocryst modal content (quartz+plagioclase+alkali feldspar) is 15%, and devitrified lithic fragments comprise about 5% of the mode. Overall, the sample is very similar to USW G-1 2939.3. Sanidine compositions cluster tightly around An_1 Ab_{33} Or_{66}. Plagioclase ranges in composition from An_{19} Ab_{75} Or_6 to An_{40} Ab_{57} Or_3, and calcite is noted locally replacing cores of more calcic, zoned plagioclases. Microprobe analyses of matrix show a range of compositions indicative of extensive devitrification to quartz and feldspar.

4.49 USW G-1 2939.3

Stratigraphic Unit: Tct.

Analytical Methods: Detailed thin-section examination with point count, whole-rock analysis, electron microprobe analysis (feldspar phenocrysts, matrix, Fe-Ti oxides), qualitative XRD.

Description: The sample is a moderately to partially(?) welded, devitrified ash-flow tuff. Welding texture is ambiguous due to the preservation of delicate "Y" and "V" shard shapes in relics in the matrix which also contains elongate fiamme. Total felsic phenocryst modal content (quartz+plagioclase+alkali feldspar) is 15%, and Fe-Ti oxides (3%) and Biotite (1%) are also notable. Devitrified lithic fragments comprise about 5% of the mode. The whole-rock analysis indicates high-silica rhyolite composition (SiO_2 76.6 wt%), and low H_2O content (about 1 wt%) typical of devitrified tuff. Sanidine composition is typically An_1 Ab_{33} Or_{66}, but varies some in Ab-Or content. Plagioclase shows a range in composition which is roughly bimodal: oligoclase (An_{17} Ab_{76} Or_7) and andesine (An_{47} Ab_{51} Or_2). The more calcic plagioclase is optically and chemical zoned, and plagioclase cores are locally altered to calcite. Microprobe analyses show the matrix to be more silicic than the whole rock, reflecting enrichment of SiO_2 in the residuum as feldspar crystallized in the magma. Some

areas of matrix analyzed show clay-like chemistry, supporting the presence of minor amounts of clays identified by XRD. Fe-Ti oxide analyses show notable amounts of MnO in the analyses.

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APPENDIX A

DATA COMPILATION FOR THIN-SECTION ANALYSES

Petrographic Data Compilation for the Yucca Mountain Project SEPDB
(Thin-Section Data)

Part 1. SAMPLE LOCATION AND IDENTIFICATION

Sample ID: G1-1245 Sample Origin: Drill Hole USW G-1
Location: Depth 1,245 ft Test #: 1

Part 2. PARAMETERS

Thin-Section Description

Thin-Section ID #s: G1-1245

Welding: Partial
Lithologic Type: Silica-feldspar
Type of Pore-Filling Material: Quartz

Thin-Section Mode Estimated by: Point Count--#Points: 600

Constituents	Amount (%)	Est Error (95% Conf)
Matrix:	83.0	+/- 3.1
Shards:	0.0	
Pumice:	0.0	
Altered Perlite:	0.0	
Devitrified Lithics:	14.0	+/- 2.8
Zeolitized Lithics:	0.0	
Glassy Lithics:	0.0	
Alkali Feldspar:	1.0	+/- 0.8
Plagioclase Feldspar:	1.0	+/- 0.8
Quartz:	0.0	
Biotite:	0.0	
Fe-Ti Oxides:	1.0	+/- 0.8
Others (See below):	0.0	
Porosity (Visible):	0.0	
Total:	100.0	

Included
in "Others": Trace quartz, biotite.

Note: Error calculation uses method of Van der Plas and Tobi (1965)
and estimates counting errors at a 95% confidence level.
Thin-Section Comments:
Possible partial welding, but textural indicators not good.
Spherulitic, axiolitic, & mosaic (pore filling?) devitrification.
Opaques are mostly fine, disseminated in matrix.

Part 3. EXPERIMENT CONDITIONS
Standard. See SAND91-7031 for details of procedures followed.

Part 4. REFERENCE AND SUPPORTING INFORMATION

QA LEVEL OF DATA-GATHERING ACTIVITY: TBD
YMP DRMS DATA SET ID: 51/L04-4/19/90
SNL DATA REPT #: SAND91-7031

DCF COMPILED BY: J.R. Connolly DIV: 6315 (UNM) Date: 9/24/91

Petrographic Data Compilation for the Yucca Mountain Project SEPDB
(Thin-Section Data)

Part 1. SAMPLE LOCATION AND IDENTIFICATION

Sample ID: G1-1442.0 Sample Origin: Drill Hole USW G-1
Location: Depth 1,442 ft Test #: 1

Part 2. PARAMETERS

Thin-Section Description

Thin-Section ID #s: G1-1442-A, G1-1442-B

Welding: Nonwelded
Lithologic Type: Zeolitized
Type of Pore-Filling Material: Zeolite

Thin-Section Mode Estimated by: Point Count--#Points: 881

Constituents	Amount (%)	Est Error (95% Conf)
Matrix:	48.0	+/- 3.4
Shards:	0.0	
Pumice:	28.0	+/- 3.0
Altered Perlite:	5.0	+/- 1.5
Devitrified Lithics:	7.0	+/- 1.7
Zeolitized Lithics:	0.0	
Glassy Lithics:	0.0	
Alkali Feldspar:	1.0	+/- 0.7
Plagioclase Feldspar:	1.0	+/- 0.7
Quartz:	1.0	+/- 0.7
Biotite:	0.0	
Fe-Ti Oxides:	0.0	
Others (See below):	0.0	
Porosity (Visible):	9.0	+/- 1.9
Total:	100.0	

Included
in "Others": Trace biotite, opaque oxides.

Note: Error calculation uses method of Van der Plas and Tobi (1965) and estimates counting errors at a 95% confidence level.

Thin-Section Comments:
Clays not noted with abundant clinoptilolite. Shard forms very rare--most destroyed by zeolitization. Some Fe-Mn oxides may be present in pores.

Part 3. EXPERIMENT CONDITIONS

Standard. See SAND91-7031 for details of procedures followed.

Part 4. REFERENCE AND SUPPORTING INFORMATION

QA LEVEL OF DATA- YMP DRMS DATA SET SNL DATA
GATHERING ACTIVITY: TBD ID: 51/L04-4/19/90 REPT #: SAND91-7031

DCF COMPILED BY: J.R. Connolly DIV: 6315 (UNM) Date: 9/24/91

Petrographic Data Compilation for the Yucca Mountain Project SEPDB
(Thin-Section Data)

Part 1. SAMPLE LOCATION AND IDENTIFICATION

Sample ID: G1-1487.4 Sample Origin: Drill Hole USW G-1
Location: Depth 1,487.4 ft Test #: 1

Part 2. PARAMETERS

Thin-Section Description

Thin-Section ID #s: G1-1487.4-A, G1-1487.4-B

Welding: Nonwelded
Lithologic Type: Zeolitized, clay(?)
Type of Pore-Filling Material: Zeolite

Thin-Section Mode Estimated by: Point Count--#Points:1022

Constituents	Amount (%)	Est Error (95% Conf)
Matrix:	52.0	+/- 3.1
Shards:	0.0	
Pumice:	33.0	+/- 2.9
Altered Perlite:	1.0	+/- 0.6
Devitrified Lithics:	5.0	+/- 1.4
Zeolitized Lithics:	0.0	
Glassy Lithics:	0.0	
Alkali Feldspar:	1.0	+/- 0.6
Plagioclase Feldspar:	0.0	
Quartz:	1.0	+/- 0.6
Biotite:	0.0	
Fe-Ti Oxides:	0.0	
Others (See below):	0.0	
Porosity (Visible):	8.0	+/- 1.7
Total:	101.0	

Included
in "Others": Trace plagioclase, biotite, opaque oxides.

Note: Error calculation uses method of Van der Plas and Tobi (1965) and estimates counting errors at a 95% confidence level.
Thin-Section Comments:
Altered perlite clasts (2 to 20 mm across) noted in hand sample. Zeolite commonly fills pores in pumice, and some clay noted. Matrix and pumice division on arbitrary 30 micron size.

Part 3. EXPERIMENT CONDITIONS
Standard. See SAND91-7031 for details of procedures followed.

Part 4. REFERENCE AND SUPPORTING INFORMATION

QA LEVEL OF DATA-GATHERING ACTIVITY: TBD
YMP DRMS DATA SET ID: 51/L04-4/19/90
SNL DATA REPT #: SAND91-7031

DCF COMPILED BY: J.R. Connolly DIV: 6315 (UNM) Date: 9/24/91

Petrographic Data Compilation for the Yucca Mountain Project SEPDB
(Thin-Section Data)

Part 1. SAMPLE LOCATION AND IDENTIFICATION

Sample ID: G1-1519.9 Sample Origin: Drill Hole USW G-1
Location: Depth 1,519.9 ft Test #: 1

Part 2. PARAMETERS

Thin-Section Description

Thin-Section ID #s: G1-1519.9-A, G1-1519.9-B

Welding: Nonwelded
Lithologic Type: Zeolitized, clays
Type of Pore-Filling Material: Zeolite, clay

Thin-Section Mode Estimated by: Point Count--#Points:1134

Constituents	Amount (%)	Est Error (95% Conf)
Matrix:	45.0	+/- 3.0
Shards:	28.0	+/- 2.7
Pumice:	0.0	
Altered Perlite:	7.0	+/- 1.5
Devitrified Lithics:	10.0	+/- 1.8
Zeolitized Lithics:	0.0	
Glassy Lithics:	0.0	
Alkali Feldspar:	2.0	+/- 0.8
Plagioclase Feldspar:	1.0	+/- 0.6
Quartz:	1.0	+/- 0.6
Biotite:	1.0	+/- 0.6
Fe-Ti Oxides:	0.0	
Others (See below):	0.0	
Porosity (Visible):	5.0	+/- 1.3
Total:	100.0	

Included
in "Others": Trace biotite. Clays present in pumice.

Note: Error calculation uses method of Van der Plas and Tobi (1965) and estimates counting errors at a 95% confidence level.
Thin-Section Comments:
Clays commonly coat zeolites, and are most abundant in smaller pumice fragments, matrix, and lining pores in altered perlite. Perlite paragenesis is: hydration, leaching, zeolite, clay.

Part 3. EXPERIMENT CONDITIONS
Standard. See SAND91-7031 for details of procedures followed.

Part 4. REFERENCE AND SUPPORTING INFORMATION

QA LEVEL OF DATA-GATHERING ACTIVITY: TBD
YMP DRMS DATA SET ID: 51/L04-4/19/90
SNL DATA REPT #: SAND91-7031

DCF COMPILED BY: J.R. Connolly DIV: 6315 (UNM) Date: 9/24/91

Petrographic Data Compilation for the Yucca Mountain Project SEPDB
(Thin-Section Data)

Part 1. SAMPLE LOCATION AND IDENTIFICATION

Sample ID: G1-1550.4 Sample Origin: Drill Hole USW G-1
Location: Depth 1,550.4 ft Test #: 1

Part 2. PARAMETERS

Thin-Section Description

Thin-Section ID #s: G1-1550.4-A, G1-1550.4-B

Welding: Nonwelded
Lithologic Type: Zeolitized, clays
Type of Pore-Filling Material: Zeolite, clay

Thin-Section Mode Estimated by: Point Count--#Points:1267

Constituents	Amount (%)	Est Error (95% Conf)
Matrix:	43.0	+/- 2.8
Shards:	0.0	
Pumice:	47.0	+/- 2.8
Altered Perlite:	2.0	+/- 0.8
Devitrified Lithics:	1.0	+/- 0.6
Zeolitized Lithics:	0.0	
Glassy Lithics:	0.0	
Alkali Feldspar:	1.0	+/- 0.6
Plagioclase Feldspar:	0.0	
Quartz:	1.0	+/- 0.6
Biotite:	0.0	
Fe-Ti Oxides:	0.0	
Others (See below):	0.0	
Porosity (Visible):	5.0	+/- 1.2
Total:	100.0	

Included
in "Others": Trace plagioclase, biotite, oxides.

Note: Error calculation uses method of Van der Plas and Tobi (1965) and estimates counting errors at a 95% confidence level.
Thin-Section Comments:
Several-clay filled fractures noted. Pumice-matrix division is arbitrary, based on 30 micron size. Perlite paragenesis is: hydration (perlitization), leaching, zeolite, clay.

Part 3. EXPERIMENT CONDITIONS
Standard. See SAND91-7031 for details of procedures followed.

Part 4. REFERENCE AND SUPPORTING INFORMATION

QA LEVEL OF DATA-GATHERING ACTIVITY: TBD
YMP DRMS DATA SET ID: 51/L04-4/19/90
SNL DATA REPT #: SAND91-7031

DCF COMPILED BY: J.R. Connolly DIV: 6315 (UNM) Date: 9/24/91

Petrographic Data Compilation for the Yucca Mountain Project SEPDB
(Thin-Section Data)

Part 1. SAMPLE LOCATION AND IDENTIFICATION

Sample ID: G1-1594.8 Sample Origin: Drill Hole USW G-1
Location: Depth 1,594.8 ft Test #: 1

Part 2. PARAMETERS

Thin-Section Description

Thin-Section ID #s: G1-1594.8-A, G1-1594.8-B

Welding: Nonwelded
Lithologic Type: Zeolitized
Type of Pore-Filling Material: Zeolite

Thin-Section Mode Estimated by: Point Count--#Points: 871

Constituents	Amount (%)	Est Error (95% Conf)
Matrix:	42.0	+/- 3.3
Shards:	0.0	
Pumice:	39.0	+/- 3.3
Altered Perlite:	4.0	+/- 1.3
Devitrified Lithics:	2.0	+/- 0.9
Zeolitized Lithics:	0.0	
Glassy Lithics:	0.0	
Alkali Feldspar:	2.0	+/- 0.9
Plagioclase Feldspar:	1.0	+/- 0.7
Quartz:	2.0	+/- 0.9
Biotite:	0.0	
Fe-Ti Oxides:	0.0	
Others (See below):	0.0	
Porosity (Visible):	8.0	+/- 1.8
Total:	100.0	

Included
in "Others": Trace biotite, opaque oxides.

Note: Error calculation uses method of Van der Plas and Tobi (1965) and estimates counting errors at a 95% confidence level.
Thin-Section Comments:
Matrix-pumice size division 30 microns. Much matrix created by zeolitization of pumice. Perlite leached and replaced by zeolite. Point count on one section due to plucking in other.

Part 3. EXPERIMENT CONDITIONS
Standard. See SAND91-7031 for details of procedures followed.

Part 4. REFERENCE AND SUPPORTING INFORMATION

QA LEVEL OF DATA- YMP DRMS DATA SET SNL DATA
GATHERING ACTIVITY: TBD ID: 51/L04-4/19/90 REPT #: SAND91-7031

DCF COMPILED BY: J.R. Connolly DIV: 6315 (UNM) Date: 9/24/91

Petrographic Data Compilation for the Yucca Mountain Project SEPDB
(Thin-Section Data)

Part 1. SAMPLE LOCATION AND IDENTIFICATION

Sample ID: A1-1569 Sample Origin: Drill Hole UE-25a#1
Location: Depth 1,569 ft Test #: 1

Part 2. PARAMETERS

Thin-Section Description

Thin-Section ID #s: A1-1569

Welding: Nonwelded
Lithologic Type: Zeolitized
Type of Pore-Filling Material: Zeolite

Thin-Section Mode Estimated by: Point Count--#Points: 637

Constituents	Amount (%)	Est Error (95% Conf)
Matrix:	59.3	+/- 3.9
Shards:	0.0	
Pumice:	8.0	+/- 2.1
Altered Perlite:	0.0	
Devitrified Lithics:	27.3	+/- 3.5
Zeolitized Lithics:	0.0	
Glassy Lithics:	0.0	
Alkali Feldspar:	1.1	+/- 0.8
Plagioclase Feldspar:	0.1	+/- 0.3
Quartz:	0.8	+/- 0.7
Biotite:	0.1	+/- 0.3
Fe-Ti Oxides:	0.8	+/- 0.7
Others (See below):	0.0	
Porosity (Visible):	2.4	+/- 1.2
Total:	99.9	

Included in "Others": N/A

Note: Error calculation uses method of Van der Plas and Tobi (1965) and estimates counting errors at a 95% confidence level.

Thin-Section Comments:
About 12% of matrix is relatively coarsely crystalline zeolite. "Devitrified Lithics" includes subordinate glassy & zeolitic fragments. Porosity count is probably low.

Part 3. EXPERIMENT CONDITIONS

Standard. See SAND91-7031 for details of procedures followed.

Part 4. REFERENCE AND SUPPORTING INFORMATION

QA LEVEL OF DATA-GATHERING ACTIVITY: TBD
YMP DRMS DATA SET ID: 51/L04-4/19/90
SNL DATA REPT #: SAND91-7031

DCF COMPILED BY: J.R. Connolly DIV: 6315 (UNM) Date: 9/24/91

Petrographic Data Compilation for the Yucca Mountain Project SEPDB
(Thin-Section Data)

Part 1. SAMPLE LOCATION AND IDENTIFICATION

Sample ID: G1-1617.0 Sample Origin: Drill Hole USW G-1
Location: Depth 1,617.0 ft Test #: 1

Part 2. PARAMETERS

Thin-Section Description

Thin-Section ID #s: G1-1617.0-A, G1-1617.0-B

Welding: Nonwelded
Lithologic Type: Zeolitized, minor clay
Type of Pore-Filling Material: Zeolite

Thin-Section Mode Estimated by: Point Count--#Points:1218

Constituents	Amount (%)	Est Error (95% Conf)
Matrix:	49.0	+/- 2.9
Shards:	0.0	
Pumice:	37.0	+/- 2.8
Altered Perlite:	1.0	+/- 0.6
Devitrified Lithics:	5.0	+/- 1.2
Zeolitized Lithics:	0.0	
Glassy Lithics:	0.0	
Alkali Feldspar:	2.0	+/- 0.8
Plagioclase Feldspar:	1.0	+/- 0.6
Quartz:	1.0	+/- 0.6
Biotite:	0.0	
Fe-Ti Oxides:	0.0	
Others (See below):	0.0	
Porosity (Visible):	4.0	+/- 1.1
Total:	100.0	

Included in "Others": Trace biotite, opaque oxides.

Note: Error calculation uses method of Van der Plas and Tobi (1965) and estimates counting errors at a 95% confidence level.

Thin-Section Comments:
Pores include unfilled bubbles in pumice, partly filled leached areas in perlite (clinoptilolite), leached areas in pumice. Zeolites are commonly fairly large, 5 to 20 microns.

Part 3. EXPERIMENT CONDITIONS
Standard. See SAND91-7031 for details of procedures followed.

Part 4. REFERENCE AND SUPPORTING INFORMATION

QA LEVEL OF DATA-GATHERING ACTIVITY: TBD
YMP DRMS DATA SET ID: 51/L04-4/19/90
SNL DATA REPT #: SAND91-7031

DCF COMPILED BY: J.R. Connolly DIV: 6315 (UNM) Date: 9/24/91

Petrographic Data Compilation for the Yucca Mountain Project SEPDB
(Thin-Section Data)

Part 1. SAMPLE LOCATION AND IDENTIFICATION

Sample ID: G1-1665.5 Sample Origin: Drill Hole USW G-1
Location: Depth 1,665.5 ft Test #: 1

Part 2. PARAMETERS

Thin-Section Description

Thin-Section ID #s: G1-1665.5-A, G1-1665.5-B

Welding: Nonwelded
Lithologic Type: Zeolitized, minor clay
Type of Pore-Filling Material: Zeolite

Thin-Section Mode Estimated by: Point Count--#Points:1240

Constituents	Amount (%)	Est Error (95% Conf)
Matrix:	45.0	+/- 2.8
Shards:	0.0	
Pumice:	40.0	+/- 2.8
Altered Perlite:	1.0	+/- 0.6
Devitrified Lithics:	5.0	+/- 1.2
Zeolitized Lithics:	0.0	
Glassy Lithics:	0.0	
Alkali Feldspar:	2.5	+/- 0.9
Plagioclase Feldspar:	1.0	+/- 0.6
Quartz:	1.5	+/- 0.7
Biotite:	0.0	
Fe-Ti Oxides:	0.0	
Others (See below):	0.0	
Porosity (Visible):	4.0	+/- 1.1
Total:	100	

Included
in "Others": Trace biotite, opaque oxides.

Note: Error calculation uses method of Van der Plas and Tobi (1965) and estimates counting errors at a 95% confidence level.
Thin-Section Comments:
Leached areas in perlite and pumice pores commonly lined with clinoptilolite 20 to 50 microns across. Clays relatively minor, usually in pumice.

Part 3. EXPERIMENT CONDITIONS
Standard. See SAND91-7031 for details of procedures followed.

Part 4. REFERENCE AND SUPPORTING INFORMATION

QA LEVEL OF DATA-GATHERING ACTIVITY: TBD
YMP DRMS DATA SET ID: 51/L04-4/19/90
SNL DATA REPT #: SAND91-7031

DCF COMPILED BY: J.R. Connolly DIV: 6315 (UNM) Date: 9/24/91

Petrographic Data Compilation for the Yucca Mountain Project SEPDB
(Thin-Section Data)

Part 1. SAMPLE LOCATION AND IDENTIFICATION

Sample ID: G1-1668.1 Sample Origin: Drill Hole USW G-1
Location: Depth 1,668.1 ft Test #: 1

Part 2. PARAMETERS

Thin-Section Description

Thin-Section ID #s: G1-1668.1-A, G1-1668.1-B

Welding: Nonwelded
Lithologic Type: Zeolitized
Type of Pore-Filling Material: Zeolite

Thin-Section Mode Estimated by: Point Count--#Points: 593

Constituents	Amount (%)	Est Error (95% Conf)
Matrix:	53.0	+/- 4.1
Shards:	0.0	
Pumice:	32.0	+/- 3.8
Altered Perlite:	2.0	+/- 1.1
Devitrified Lithics:	6.0	+/- 2.0
Zeolitized Lithics:	0.0	
Glassy Lithics:	0.0	
Alkali Feldspar:	2.0	+/- 1.1
Plagioclase Feldspar:	0.0	
Quartz:	1.0	+/- 0.8
Biotite:	0.0	
Fe-Ti Oxides:	0.0	
Others (See below):	0.0	
Porosity (Visible):	4.0	+/- 1.6
Total:	100.0	

Included in "Others": Trace plagioclase, biotite, opaque oxides.

Note: Error calculation uses method of Van der Plas and Tobi (1965) and estimates counting errors at a 95% confidence level.

Thin-Section Comments:
Matrix incl minor recognizable shard relics, and local opaline silica as pore filling in pumice and microfractures. Only "A" section counted due to excessive plucking in "B".

Part 3. EXPERIMENT CONDITIONS

Standard. See SAND91-7031 for details of procedures followed.

Part 4. REFERENCE AND SUPPORTING INFORMATION

QA LEVEL OF DATA- YMP DRMS DATA SET SNL DATA
GATHERING ACTIVITY: TBD ID: 51/L04-4/19/90 REPT #: SAND91-7031

DCF COMPILED BY: J.R. Connolly DIV: 6315 (UNM) Date: 9/24/91

Petrographic Data Compilation for the Yucca Mountain Project SEPDB
(Thin-Section Data)

Part 1. SAMPLE LOCATION AND IDENTIFICATION

Sample ID: G1-1719.7 Sample Origin: Drill Hole USW G-1
Location: Depth 1,719.7 ft Test #: 1

Part 2. PARAMETERS

Thin-Section Description

Thin-Section ID #s: G1-1719.7-A, G1-1719.7-B

Welding: Nonwelded
Lithologic Type: Zeolitized
Type of Pore-Filling Material: Zeolite

Thin-Section Mode Estimated by: Point Count--#Points:1105

Constituents	Amount (%)	Est Error (95% Conf)
Matrix:	50.0	+/- 3.0
Shards:	0.0	
Pumice:	28.0	+/- 2.7
Altered Perlite:	3.0	+/- 1.0
Devitrified Lithics:	9.0	+/- 1.7
Zeolitized Lithics:	0.0	
Glassy Lithics:	0.0	
Alkali Feldspar:	2.0	+/- 0.8
Plagioclase Feldspar:	1.0	+/- 0.6
Quartz:	3.0	+/- 1.0
Biotite:	0.0	
Fe-Ti Oxides:	0.0	
Others (See below):	0.0	
Porosity (Visible):	4.0	+/- 1.2
Total:	100.0	

Included
in "Others": Trace biotite, opaque oxides.

Note: Error calculation uses method of Van der Plas and Tobi (1965) and estimates counting errors at a 95% confidence level.

Thin-Section Comments:
Matrix incl minor recognizable shard relics. Feldspar and quartz show prominent shock features (fractures, rare kink bands). Pores in pumice partly filled and perlite replaced with zeolite.

Part 3. EXPERIMENT CONDITIONS
Standard. See SAND91-7031 for details of procedures followed.

Part 4. REFERENCE AND SUPPORTING INFORMATION

QA LEVEL OF DATA-GATHERING ACTIVITY: TBD
YMP DRMS DATA SET ID: 51/L04-4/19/90
SNL DATA REPT #: SAND91-7031

DCF COMPILED BY: J.R. Connolly DIV: 6315 (UNM) Date: 9/24/91

Petrographic Data Compilation for the Yucca Mountain Project SEPDB
(Thin-Section Data)

Part 1. SAMPLE LOCATION AND IDENTIFICATION

Sample ID: G1-1741.8 Sample Origin: Drill Hole USW G-1
Location: Depth 1,741.8 ft Test #: 1

Part 2. PARAMETERS

Thin-Section Description

Thin-Section ID #s: G1-1741.8-A, G1-1741.8-B

Welding: Nonwelded
Lithologic Type: Zeolitized, clay
Type of Pore-Filling Material: Zeolite, clay

Thin-Section Mode Estimated by: Point Count--#Points:1111

Constituents	Amount (%)	Est Error (95% Conf)
Matrix:	47.0	+/- 3.0
Shards:	0.0	
Pumice:	34.0	+/- 2.8
Altered Perlite:	6.0	+/- 1.4
Devitrified Lithics:	1.0	+/- 0.6
Zeolitized Lithics:	2.0	+/- 0.8
Glassy Lithics:	0.0	
Alkali Feldspar:	3.0	+/- 1.0
Plagioclase Feldspar:	1.0	+/- 0.6
Quartz:	3.0	+/- 1.0
Biotite:	0.0	
Fe-Ti Oxides:	0.0	
Others (See below):	0.0	
Porosity (Visible):	3.0	+/- 1.0
Total:	100.0	

Included in "Others": Trace biotite, hornblende, opaque oxides.

Note: Error calculation uses method of Van der Plas and Tobi (1965) and estimates counting errors at a 95% confidence level.

Thin-Section Comments:
Zeolitization is very extensive and coarse (to 60 microns). Later argillic alteration produced clay rims on fragments and lining pores. Clinoptilolite clearly the dominant zeolite.

Part 3. EXPERIMENT CONDITIONS
Standard. See SAND91-7031 for details of procedures followed.

Part 4. REFERENCE AND SUPPORTING INFORMATION

QA LEVEL OF DATA- YMP DRMS DATA SET SNL DATA
GATHERING ACTIVITY: TBD ID: 51/L04-4/19/90 REPT #: SAND91-7031

DCF COMPILED BY: J.R. Connolly DIV: 6315 (UNM) Date: 9/24/91

Petrographic Data Compilation for the Yucca Mountain Project SEPDB
(Thin-Section Data)

Part 1. SAMPLE LOCATION AND IDENTIFICATION

Sample ID: G1-1784.8 Sample Origin: Drill Hole USW G-1
Location: Depth 1,784.8 ft Test #: 1

Part 2. PARAMETERS

Thin-Section Description

Thin-Section ID #s: G1-1784.8

Welding: Volcaniclastic
Lithologic Type: Zeolitized
Type of Pore-Filling Material: None noted

Thin-Section Mode Estimated by: Point Count--#Points: 557

Constituents	Amount (%)	Est Error (95% Conf)
Matrix:	44.0	+/- 4.2
Shards:	0.0	
Pumice:	0.0	
Altered Perlite:	2.0	+/- 1.2
Devitrified Lithics:	10.0	+/- 2.5
Zeolitized Lithics:	16.0	+/- 3.1
Glassy Lithics:	0.0	
Alkali Feldspar:	8.0	+/- 2.3
Plagioclase Feldspar:	10.0	+/- 2.5
Quartz:	4.0	+/- 1.7
Biotite:	0.0	
Fe-Ti Oxides:	0.0	
Others (See below):	3.0	+/- 1.4
Porosity (Visible):	3.0	+/- 1.4
Total:	100.0	

Included
in "Others": 3% "other" lithics; trace biotite, hornblende, opaques.

Note: Error calculation uses method of Van der Plas and Tobi (1965) and estimates counting errors at a 95% confidence level.
Thin-Section Comments:
Rock is volcaniclastic sandstone; zeolitized lithics and matrix dominant. Non-zeolitized fragments tend to be angular. Clays are common rimming all clast types.

Part 3. EXPERIMENT CONDITIONS
Standard. See SAND91-7031 for details of procedures followed.

Part 4. REFERENCE AND SUPPORTING INFORMATION

QA LEVEL OF DATA-GATHERING ACTIVITY: TBD
YMP DRMS DATA SET ID: 51/L04-4/19/90
SNL DATA REPT #: SAND91-7031

DCF COMPILED BY: J.R. Connolly DIV: 6315 (UNM) Date: 9/24/91

Petrographic Data Compilation for the Yucca Mountain Project SEPDB
(Thin-Section Data)

Part 1. SAMPLE LOCATION AND IDENTIFICATION

Sample ID: A1-2000 Sample Origin: Drill Hole UE25a#1
Location: Depth 2,000 ft Test #: 1

Part 2. PARAMETERS

Thin-Section Description

Thin-Section ID #s: A1-2000

Welding: Dense to moderate
Lithologic Type: Silica-feldspar
Type of Pore-Filling Material: None

Thin-Section Mode Estimated by: Point Count--#Points: 600

Constituents	Amount (%)	Est Error (95% Conf)
Matrix:	36.0	+/- 3.9
Shards:	22.0	+/- 3.4
Pumice:	19.0	+/- 3.2
Altered Perlite:	0.0	
Devitrified Lithics:	3.0	+/- 1.4
Zeolitized Lithics:	0.0	
Glassy Lithics:	0.0	
Alkali Feldspar:	6.0	+/- 1.9
Plagioclase Feldspar:	3.0	+/- 1.4
Quartz:	2.5	+/- 1.3
Biotite:	0.0	
Fe-Ti Oxides:	8.5	+/- 2.3
Others (See below):	0.0	
Porosity (Visible):	0.0	
Total:	100.0	

Included
in "Others": N/A

Note: Error calculation uses method of Van der Plas and Tobi (1965)
and estimates counting errors at a 95% confidence level.
Thin-Section Comments:
Matrix, shards, and pumice are all devitrified and identified by different cryst. textures. Fe-Ti oxides are disseminated in matrix, hematite dominates, highly oxidized. No large pores.

Part 3. EXPERIMENT CONDITIONS
Standard. See SAND91-7031 for details of procedures followed.

Part 4. REFERENCE AND SUPPORTING INFORMATION

QA LEVEL OF DATA-GATHERING ACTIVITY: TBD
YMP DRMS DATA SET ID: 51/L04-4/19/90
SNL DATA REPT #: SAND91-7031

DCF COMPILED BY: J.R. Connolly DIV: 6315 (UNM) Date: 9/24/91

Petrographic Data Compilation for the Yucca Mountain Project SEPDB
(Thin-Section Data)

Part 1. SAMPLE LOCATION AND IDENTIFICATION

Sample ID: G1-2067 Sample Origin: Drill Hole USW G-1
Location: Depth 2,067 ft Test #: 1

Part 2. PARAMETERS

Thin-Section Description

Thin-Section ID #s: G1-2067-A and G1-2067-B

Welding: Partial
Lithologic Type: Zeolitized
Type of Pore-Filling Material: Clay, some zeolite

Thin-Section Mode Estimated by: Point Count--#Points:1179

Constituents	Amount (%)	Est Error (95% Conf)
Matrix:	48.0	+/- 2.9
Shards:	6.0	+/- 1.4
Pumice:	28.0	+/- 2.6
Altered Perlite:	0.0	
Devitrified Lithics:	5.0	+/- 1.3
Zeolitized Lithics:	3.0	+/- 1.0
Glassy Lithics:	0.0	
Alkali Feldspar:	2.0	+/- 0.8
Plagioclase Feldspar:	3.0	+/- 1.0
Quartz:	3.0	+/- 1.0
Biotite:	0.0	
Fe-Ti Oxides:	0.0	
Others (See below):	0.0	
Porosity (Visible):	2.0	+/- 0.8
Total:	100.0	

Included
in "Others": N/A

Note: Error calculation uses method of Van der Plas and Tobi (1965) and estimates counting errors at a 95% confidence level.
Thin-Section Comments:
Extensively zeolitized, but may be partially glassy. Clays are dominant filling microfractures, and clay is abundant (with zeolites) replacing pumice and locally in matrix.

Part 3. EXPERIMENT CONDITIONS
Standard. See SAND91-7031 for details of procedures followed.

Part 4. REFERENCE AND SUPPORTING INFORMATION

QA LEVEL OF DATA- YMP DRMS DATA SET SNL DATA
GATHERING ACTIVITY: TBD ID: 51/L04-4/19/90 REPT #: SAND91-7031

DCF COMPILED BY: J.R. Connolly DIV: 6315 (UNM) Date: 9/24/91

Petrographic Data Compilation for the Yucca Mountain Project SEPDB
(Thin-Section Data)

Part 1. SAMPLE LOCATION AND IDENTIFICATION

Sample ID: G1-2170 Sample Origin: Drill Hole USW G-1
Location: Depth 2,170 ft Test #: 1

Part 2. PARAMETERS

Thin-Section Description

Thin-Section ID #s: G1-2170

Welding: Nonwelded
Lithologic Type: Zeolitized
Type of Pore-Filling Material: Zeolite, opal

Thin-Section Mode Estimated by: Point Count--#Points: 945

Constituents	Amount (%)	Est Error (95% Conf)
Matrix:	56.0	+/- 3.2
Shards:	5.0	+/- 1.4
Pumice:	20.0	+/- 2.6
Altered Perlite:	2.0	+/- 0.9
Devitrified Lithics:	5.0	+/- 1.4
Zeolitized Lithics:	0.0	
Glassy Lithics:	0.0	
Alkali Feldspar:	4.0	+/- 1.3
Plagioclase Feldspar:	4.0	+/- 1.3
Quartz:	3.0	+/- 1.1
Biotite:	0.0	
Fe-Ti Oxides:	0.0	
Others (See below):	0.0	
Porosity (Visible):	1.0	+/- 0.6
Total:	100.0	

Included
in "Others": Trace biotite, oxides, hornblende.

Note: Error calculation uses method of Van der Plas and Tobi (1965) and estimates counting errors at a 95% confidence level.

Thin-Section Comments:
Alteration includes zeolitization, hematitic oxidation, and brownish opal filling lower parts of pores. Fragments are well-sorted suggesting winnowing of fines or reworking.

Part 3. EXPERIMENT CONDITIONS
Standard. See SAND91-7031 for details of procedures followed.

Part 4. REFERENCE AND SUPPORTING INFORMATION

QA LEVEL OF DATA-GATHERING ACTIVITY: TBD
YMP DRMS DATA SET ID: 51/L04-4/19/90
SNL DATA REPT #: SAND91-7031

DCF COMPILED BY: J.R. Connolly DIV: 6315 (UNM) Date: 9/24/91

Petrographic Data Compilation for the Yucca Mountain Project SEPDB
(Thin-Section Data)

Part 1. SAMPLE LOCATION AND IDENTIFICATION

Sample ID: G1-2274 Sample Origin: Drill Hole USW G-1
Location: Depth 2,274 ft Test #: 1

Part 2. PARAMETERS

Thin-Section Description

Thin-Section ID #s: G1-2274

Welding: Partial
Lithologic Type: Zeolitized, oxidized
Type of Pore-Filling Material: Zeolite

Thin-Section Mode Estimated by: Point Count--#Points: 901

Constituents	Amount (%)	Est Error (95% Conf)
Matrix:	56.0	+/- 3.3
Shards:	9.0	+/- 1.9
Pumice:	14.0	+/- 2.3
Altered Perlite:	4.0	+/- 1.3
Devitrified Lithics:	0.0	
Zeolitized Lithics:	0.0	
Glassy Lithics:	0.0	
Alkali Feldspar:	4.0	+/- 1.3
Plagioclase Feldspar:	3.0	+/- 1.1
Quartz:	3.0	+/- 1.1
Biotite:	0.0	
Fe-Ti Oxides:	1.0	+/- 0.7
Others (See below):	0.0	
Porosity (Visible):	6.0	+/- 1.6
Total:	100.0	

Included
in "Others": Trace biotite.

Note: Error calculation uses method of Van der Plas and Tobi (1965) and estimates counting errors at a 95% confidence level.

Thin-Section Comments:
Matrix is altered to brown, semi-opaque, non-reflective material. Many "gas" pores in matrix. Zeolite fills many pores. Lithic fragments are notably absent; Fe-Ti oxides marginally oxidized.

Part 3. EXPERIMENT CONDITIONS

Standard. See SAND91-7031 for details of procedures followed.

Part 4. REFERENCE AND SUPPORTING INFORMATION

QA LEVEL OF DATA-GATHERING ACTIVITY: TBD
YMP DRMS DATA SET ID: 51/L04-4/19/90
SNL DATA REPT #: SAND91-7031

DCF COMPILED BY: J.R. Connolly DIV: 6315 (UNM) Date: 9/24/91

Petrographic Data Compilation for the Yucca Mountain Project SEPDB
(Thin-Section Data)

Part 1. SAMPLE LOCATION AND IDENTIFICATION

Sample ID: G1-2276 Sample Origin: Drill Hole USW G-1
Location: Depth 2,276 ft Test #: 1

Part 2. PARAMETERS

Thin-Section Description

Thin-Section ID #s: G1-2276

Welding: Nonwelded to partial
Lithologic Type: Zeolitized
Type of Pore-Filling Material: Zeolite, opal

Thin-Section Mode Estimated by: Point Count--#Points:1034

Constituents	Amount (%)	Est Error (95% Conf)
Matrix:	48.0	+/- 3.1
Shards:	11.0	+/- 1.9
Pumice:	15.0	+/- 2.2
Altered Perlite:	5.0	+/- 1.4
Devitrified Lithics:	0.0	
Zeolitized Lithics:	0.0	
Glassy Lithics:	0.0	
Alkali Feldspar:	6.5	+/- 1.5
Plagioclase Feldspar:	7.5	+/- 1.6
Quartz:	3.0	+/- 1.1
Biotite:	0.5	+/- 0.4
Fe-Ti Oxides:	0.5	+/- 0.4
Others (See below):	0.0	
Porosity (Visible):	3.0	+/- 1.1
Total:	100.0	

Included
in "Others": Trace hornblende, lithic fragments.

Note: Error calculation uses method of Van der Plas and Tobi (1965)
and estimates counting errors at a 95% confidence level.
Thin-Section Comments:
Very similar to G1-2274, but shows more extensive zeolite pore filling, more phenocrysts and more biotite. Alteration process incl hydration, zeolitization, "opalization" and late oxidation.

Part 3. EXPERIMENT CONDITIONS
Standard. See SAND91-7031 for details of procedures followed.

Part 4. REFERENCE AND SUPPORTING INFORMATION

QA LEVEL OF DATA-GATHERING ACTIVITY: TBD
YMP DRMS DATA SET ID: 51/L04-4/19/90
SNL DATA REPT #: SAND91-7031

DCF COMPILED BY: J.R. Connolly DIV: 6315 (UNM) Date: 9/24/91

Petrographic Data Compilation for the Yucca Mountain Project SEPDB
(Thin-Section Data)

Part 1. SAMPLE LOCATION AND IDENTIFICATION

Sample ID: G1-2284 Sample Origin: Drill Hole USW G-1
Location: Depth 2,284 ft Test #: 1

Part 2. PARAMETERS

Thin-Section Description

Thin-Section ID #s: G1-2284-A and G1-2284-B

Welding: Partial
Lithologic Type: Zeolitized, glassy
Type of Pore-Filling Material: Zeolite

Thin-Section Mode Estimated by: Point Count--#Points:1000

Constituents	Amount (%)	Est Error (95% Conf)
Matrix:	49.0	+/- 3.2
Shards:	14.0	+/- 2.2
Pumice:	13.0	+/- 2.1
Altered Perlite:	0.0	
Devitrified Lithics:	0.0	
Zeolitized Lithics:	0.0	
Glassy Lithics:	0.0	
Alkali Feldspar:	7.0	+/- 1.6
Plagioclase Feldspar:	7.0	+/- 1.6
Quartz:	2.0	+/- 0.9
Biotite:	1.0	+/- 0.6
Fe-Ti Oxides:	0.0	
Others (See below):	0.0	
Porosity (Visible):	7.0	+/- 1.6
Total:	100.0	

Included
in "Others": Trace lithic fragments and Fe-Ti oxides.

Note: Error calculation uses method of Van der Plas and Tobi (1965) and estimates counting errors at a 95% confidence level.
Thin-Section Comments:
Much matrix is brownish and isotropic (glass?). Clinoptilolite and lesser mordenite are prominent replacing leached glass, and probably in matrix. Fe-Ti oxides appear highly altered.

Part 3. EXPERIMENT CONDITIONS
Standard. See SAND91-7031 for details of procedures followed.

Part 4. REFERENCE AND SUPPORTING INFORMATION

QA LEVEL OF DATA-GATHERING ACTIVITY: TBD
YMP DRMS DATA SET ID: 51/L04-4/19/90
SNL DATA REPT #: SAND91-7031

DCF COMPILED BY: J.R. Connolly DIV: 6315 (UNM) Date: 9/24/91

Petrographic Data Compilation for the Yucca Mountain Project SEPDB
(Thin-Section Data)

Part 1. SAMPLE LOCATION AND IDENTIFICATION

Sample ID: A1-2389 Sample Origin: Drill Hole UE-25a#1
Location: Depth 2,389 ft Test #: 1

Part 2. PARAMETERS

Thin-Section Description

Thin-Section ID #s: A1-2389

Welding: Moderate?
Lithologic Type: Silica-feldspar
Type of Pore-Filling Material: None noted

Thin-Section Mode Estimated by: Point Count--#Points: 600

Constituents	Amount (%)	Est Error (95% Conf)
Matrix:	74.0	+/- 3.6
Shards:	0.0	
Pumice:	0.0	
Altered Perlite:	0.0	
Devitrified Lithics:	2.0	+/- 1.1
Zeolitized Lithics:	0.0	
Glassy Lithics:	0.0	
Alkali Feldspar:	9.0	+/- 2.3
Plagioclase Feldspar:	4.0	+/- 1.6
Quartz:	7.0	+/- 2.1
Biotite:	1.0	+/- 0.8
Fe-Ti Oxides:	1.0	+/- 0.8
Others (See below):	0.0	
Porosity (Visible):	2.0	+/- 1.1
Total:	100.0	

Included
in "Others": N/A

Note: Error calculation uses method of Van der Plas and Tobi (1965)
and estimates counting errors at a 95% confidence level.
Thin-Section Comments:
Welding and constituents indefinite because of devitrification.
Fiamme structure in hand specimen suggests moderate welding.
All but very distinct constituents counted as matrix.

Part 3. EXPERIMENT CONDITIONS
Standard. See SAND91-7031 for details of procedures followed.

Part 4. REFERENCE AND SUPPORTING INFORMATION

QA LEVEL OF DATA- YMP DRMS DATA SET SNL DATA
GATHERING ACTIVITY: TBD ID: 51/L04-4/19/90 REPT #: SAND91-7031

DCF COMPILED BY: J.R. Connolly DIV: 6315 (UNM) Date: 9/24/91

Petrographic Data Compilation for the Yucca Mountain Project SEPDB
(Thin-Section Data)

Part 1. SAMPLE LOCATION AND IDENTIFICATION

Sample ID: A1-2429 Sample Origin: Drill Hole UE-25a#1
Location: Depth 2,429 ft Test #: 1

Part 2. PARAMETERS

Thin-Section Description

Thin-Section ID #s: A1-2429

Welding: Partial to moderate
Lithologic Type: Silica-feldspar
Type of Pore-Filling Material: None noted

Thin-Section Mode Estimated by: Point Count--#Points: 600

Constituents	Amount (%)	Est Error (95% Conf)
Matrix:	81.0	+/- 3.2
Shards:	0.0	
Pumice:	0.0	
Altered Perlite:	0.0	
Devitrified Lithics:	1.0	+/- 0.8
Zeolitized Lithics:	0.0	
Glassy Lithics:	0.0	
Alkali Feldspar:	10.0	+/- 2.4
Plagioclase Feldspar:	2.0	+/- 1.1
Quartz:	3.0	+/- 1.4
Biotite:	1.0	+/- 0.8
Fe-Ti Oxides:	2.0	+/- 1.1
Others (See below):	0.0	
Porosity (Visible):	0.0	
Total:	100.0	

Included
in "Others": Trace zircon, apatite.

Note: Error calculation uses method of Van der Plas and Tobi (1965) and estimates counting errors at a 95% confidence level.
Thin-Section Comments:
Matrix textures largely destroyed by crystallization; welding based on examination of hand sample textures. Only texturally distinct lithics counted.

Part 3. EXPERIMENT CONDITIONS
Standard. See SAND91-7031 for details of procedures followed.

Part 4. REFERENCE AND SUPPORTING INFORMATION

QA LEVEL OF DATA-GATHERING ACTIVITY: TBD
YMP DRMS DATA SET ID: 51/L04-4/19/90
SNL DATA REPT #: SAND91-7031

DCF COMPILED BY: J.R. Connolly DIV: 6315 (UNM) Date: 9/24/91

Petrographic Data Compilation for the Yucca Mountain Project SEPDB
(Thin-Section Data)

Part 1. SAMPLE LOCATION AND IDENTIFICATION

Sample ID: G1-2312 Sample Origin: Drill Hole USW G-1
Location: Depth 2,312 ft Test #: 1

Part 2. PARAMETERS

Thin-Section Description

Thin-Section ID #s: G1-2312

Welding: Moderate
Lithologic Type: Glassy, zeolitized
Type of Pore-Filling Material: Zeolite, opal

Thin-Section Mode Estimated by: Point Count--#Points:1029

Constituents	Amount (%)	Est Error (95% Conf)
Matrix:	53.0	+/- 3.1
Shards:	10.0	+/- 1.9
Pumice:	19.0	+/- 2.4
Altered Perlite:	3.0	+/- 1.1
Devitrified Lithics:	0.0	
Zeolitized Lithics:	0.0	
Glassy Lithics:	0.0	
Alkali Feldspar:	4.5	+/- 1.3
Plagioclase Feldspar:	4.5	+/- 1.3
Quartz:	2.0	+/- 0.9
Biotite:	0.0	
Fe-Ti Oxides:	1.0	+/- 0.6
Others (See below):	0.0	
Porosity (Visible):	3.0	+/- 1.1
Total:	100.0	

Included in "Others": Trace biotite and pyroxene or amphibole.

Note: Error calculation uses method of Van der Plas and Tobi (1965) and estimates counting errors at a 95% confidence level.

Thin-Section Comments:
Welding texture without silica/feldspar devitrification is unusual. Clinoptilolite and minor mordenite are abundant but very fine, and brownish opal replaces some glass fragments.

Part 3. EXPERIMENT CONDITIONS
Standard. See SAND91-7031 for details of procedures followed.

Part 4. REFERENCE AND SUPPORTING INFORMATION

QA LEVEL OF DATA-GATHERING ACTIVITY: TBD
YMP DRMS DATA SET ID: 51/L04-4/19/90
SNL DATA REPT #: SAND91-7031

DCF COMPILED BY: J.R. Connolly DIV: 6315 (UNM) Date: 9/24/91

Petrographic Data Compilation for the Yucca Mountain Project SEPDB
(Thin-Section Data)

Part 1. SAMPLE LOCATION AND IDENTIFICATION

Sample ID: G1-2338 Sample Origin: Drill Hole USW G-1
Location: Depth 2,338 ft Test #: 1

Part 2. PARAMETERS

Thin-Section Description

Thin-Section ID #s: G1-2338-A and G1-2338-B

Welding: Moderate
Lithologic Type: Silica-feldspar
Type of Pore-Filling Material: None (See comments)

Thin-Section Mode Estimated by: Point Count--#Points:1000

Constituents	Amount (%)	Est Error (95% Conf)
Matrix:	65.0	+/- 3.0
Shards:	5.0	+/- 1.4
Pumice:	8.0	+/- 1.7
Altered Perlite:	0.0	
Devitrified Lithics:	0.0	
Zeolitized Lithics:	0.0	
Glassy Lithics:	0.0	
Alkali Feldspar:	6.0	+/- 1.5
Plagioclase Feldspar:	7.0	+/- 1.6
Quartz:	3.0	+/- 1.1
Biotite:	0.5	+/- 0.4
Fe-Ti Oxides:	0.5	+/- 0.4
Others (See below):	0.0	
Porosity (Visible):	5.0	+/- 1.4
Total:	100.0	

Included in "Others": N/A

Note: Error calculation uses method of Van der Plas and Tobi (1965) and estimates counting errors at a 95% confidence level.

Thin-Section Comments:
Devitrification textures include axiolitic, spherulitic, coarse "vapor phase" pore filling, and microcrystalline mosaics. Much counted porosity may be artifact of thin section preparation.

Part 3. EXPERIMENT CONDITIONS
Standard. See SAND91-7031 for details of procedures followed.

Part 4. REFERENCE AND SUPPORTING INFORMATION

QA LEVEL OF DATA-GATHERING ACTIVITY: TBD
YMP DRMS DATA SET ID: 51/L04-4/19/90
SNL DATA REPT #: SAND91-7031

DCF COMPILED BY: J.R. Connolly DIV: 6315 (UNM) Date: 9/24/91

Petrographic Data Compilation for the Yucca Mountain Project SEPDB
(Thin-Section Data)

Part 1. SAMPLE LOCATION AND IDENTIFICATION

Sample ID: A1-2499 Sample Origin: Drill Hole UE-25a#1
Location: Depth 2,499 ft Test #: 1

Part 2. PARAMETERS

Thin-Section Description

Thin-Section ID #s: A1-2499

Welding: Partial to moderate?
Lithologic Type: Silica-feldspar
Type of Pore-Filling Material: Silica-feldspar?

Thin-Section Mode Estimated by: Point Count--#Points: 600

Constituents	Amount (%)	Est Error (95% Conf)
Matrix:	77.0	+/- 3.4
Shards:	0.0	
Pumice:	0.0	
Altered Perlite:	0.0	
Devitrified Lithics:	0.0	
Zeolitized Lithics:	0.0	
Glassy Lithics:	0.0	
Alkali Feldspar:	9.0	+/- 2.3
Plagioclase Feldspar:	6.0	+/- 1.9
Quartz:	7.0	+/- 2.1
Biotite:	0.3	+/- 0.4
Fe-Ti Oxides:	1.0	+/- 0.8
Others (See below):	0.0	
Porosity (Visible):	0.0	
Total:	100.3	

Included
in "Others": Trace apatite, zircon.

Note: Error calculation uses method of Van der Plas and Tobi (1965) and estimates counting errors at a 95% confidence level.

Thin-Section Comments:
Devitrification has destroyed shard textures; welding indicated by examination of hand specimen. Pore filling is sperulitic, possibly cristobalite. All phenocrysts highly fractured.

Part 3. EXPERIMENT CONDITIONS
Standard. See SAND91-7031 for details of procedures followed.

Part 4. REFERENCE AND SUPPORTING INFORMATION

QA LEVEL OF DATA-GATHERING ACTIVITY: TBD
YMP DRMS DATA SET ID: 51/L04-4/19/90
SNL DATA REPT #: SAND91-7031

DCF COMPILED BY: J.R. Connolly DIV: 6315 (UNM) Date: 9/24/91

Petrographic Data Compilation for the Yucca Mountain Project SEPDB
(Thin-Section Data)

Part 1. SAMPLE LOCATION AND IDENTIFICATION

Sample ID: G1-2367 Sample Origin: Drill Hole USW G-1
Location: Depth 2,367 ft Test #: 1

Part 2. PARAMETERS

Thin-Section Description

Thin-Section ID #s: G1-2367

Welding: Moderate(?)
Lithologic Type: Silica-feldspar
Type of Pore-Filling Material: None noted

Thin-Section Mode Estimated by: Point Count--#Points:1000

Constituents	Amount (%)	Est Error (95% Conf)
Matrix:	77.0	+/- 2.7
Shards:	4.0	+/- 1.2
Pumice:	0.0	
Altered Perlite:	0.0	
Devitrified Lithics:	0.0	
Zeolitized Lithics:	0.0	
Glassy Lithics:	0.0	
Alkali Feldspar:	6.0	+/- 1.5
Plagioclase Feldspar:	4.0	+/- 1.2
Quartz:	5.0	+/- 1.4
Biotite:	1.0	+/- 0.6
Fe-Ti Oxides:	0.0	
Others (See below):	0.0	
Porosity (Visible):	3.0	+/- 1.1
Total:	100.0	

Included
in "Others": Trace Fe-Ti oxides, lithic fragments.

Note: Error calculation uses method of Van der Plas and Tobi (1965) and estimates counting errors at a 95% confidence level.
Thin-Section Comments:
Matrix is devitrified, obscuring original textures: "Shards" are discrete coarsely crystalline areas, and welding textures are largely destroyed. Some pores are from thin sect plucking.

Part 3. EXPERIMENT CONDITIONS
Standard. See SAND91-7031 for details of procedures followed.

Part 4. REFERENCE AND SUPPORTING INFORMATION

QA LEVEL OF DATA-GATHERING ACTIVITY: TBD
YMP DRMS DATA SET ID: 51/L04-4/19/90
SNL DATA REPT #: SAND91-7031

DCF COMPILED BY: J.R. Connolly DIV: 6315 (UNM) Date: 9/24/91

Petrographic Data Compilation for the Yucca Mountain Project SEPDB
(Thin-Section Data)

Part 1. SAMPLE LOCATION AND IDENTIFICATION

Sample ID: G1-2380 Sample Origin: Drill Hole USW G-1
Location: Depth 2,2380 ft Test #: 1

Part 2. PARAMETERS

Thin-Section Description

Thin-Section ID #s: G1-2380

Welding: Moderate(?)
Lithologic Type: Silica-feldspar
Type of Pore-Filling Material: None noted

Thin-Section Mode Estimated by: Point Count--#Points: 962

Constituents	Amount (%)	Est Error (95% Conf)
Matrix:	74.0	+/- 2.8
Shards:	8.0	+/- 1.7
Pumice:	0.0	
Altered Perlite:	0.0	
Devitrified Lithics:	0.5	+/- 0.5
Zeolitized Lithics:	0.0	
Glassy Lithics:	0.0	
Alkali Feldspar:	5.0	+/- 1.4
Plagioclase Feldspar:	5.0	+/- 1.4
Quartz:	4.0	+/- 1.3
Biotite:	1.0	+/- 0.6
Fe-Ti Oxides:	0.5	+/- 0.5
Others (See below):	0.0	
Porosity (Visible):	2.0	+/- 0.9
Total:	100.0	

Included
in "Others": None.

Note: Error calculation uses method of Van der Plas and Tobi (1965)
and estimates counting errors at a 95% confidence level.
Thin-Section Comments:
Matrix is devitrified, obscuring original textures: "Shards"
are discrete coarsely crystalline areas, and welding textures
are largely destroyed. Some pores are from thin sect plucking.

Part 3. EXPERIMENT CONDITIONS
Standard. See SAND91-7031 for details of procedures followed.

Part 4. REFERENCE AND SUPPORTING INFORMATION

QA LEVEL OF DATA- YMP DRMS DATA SET SNL DATA
GATHERING ACTIVITY: TBD ID: 51/L04-4/19/90 REPT #: SAND91-7031

DCF COMPILED BY: J.R. Connolly DIV: 6315 (UNM) Date: 9/24/91

Petrographic Data Compilation for the Yucca Mountain Project SEPDB
(Thin-Section Data)

Part 1. SAMPLE LOCATION AND IDENTIFICATION

Sample ID: G1-2406 Sample Origin: Drill Hole USW G-1
Location: Depth 2,406 ft Test #: 1

Part 2. PARAMETERS

Thin-Section Description

Thin-Section ID #s: G1-2406

Welding: Welded(?)-see comments
Lithologic Type: Silica-feldspar
Type of Pore-Filling Material: None noted

Thin-Section Mode Estimated by: Point Count--#Points:1000

Constituents	Amount (%)	Est Error (95% Conf)
Matrix:	76.0	+/- 2.7
Shards:	5.0	+/- 1.4
Pumice:	0.0	
Altered Perlite:	0.0	
Devitrified Lithics:	0.0	
Zeolitized Lithics:	0.0	
Glassy Lithics:	0.0	
Alkali Feldspar:	6.0	+/- 1.5
Plagioclase Feldspar:	6.0	+/- 1.5
Quartz:	5.0	+/- 1.4
Biotite:	0.5	+/- 0.4
Fe-Ti Oxides:	1.5	+/- 0.8
Others (See below):	0.0	
Porosity (Visible):	0.0	
Total:	100.0	

Included
in "Others": Trace porosity.

Note: Error calculation uses method of Van der Plas and Tobi (1965) and estimates counting errors at a 95% confidence level.
Thin-Section Comments:
Textural evidence for welding destroyed by devitrification but welding indicated by position between welded samples. Contains high percentage of coarsely crystalline matrix (37% of mode).

Part 3. EXPERIMENT CONDITIONS
Standard. See SAND91-7031 for details of procedures followed.

Part 4. REFERENCE AND SUPPORTING INFORMATION

QA LEVEL OF DATA-GATHERING ACTIVITY: TBD
YMP DRMS DATA SET ID: 51/L04-4/19/90
SNL DATA REPT #: SAND91-7031

DCF COMPILED BY: J.R. Connolly DIV: 6315 (UNM) Date: 9/24/91

Petrographic Data Compilation for the Yucca Mountain Project SEPDB
(Thin-Section Data)

Part 1. SAMPLE LOCATION AND IDENTIFICATION

Sample ID: G1-2415 Sample Origin: Drill Hole USW G-1
Location: Depth 2,415 ft Test #: 1

Part 2. PARAMETERS

Thin-Section Description

Thin-Section ID #s: G1-2415

Welding: Welded(?)-see comments
Lithologic Type: Silica-feldspar
Type of Pore-Filling Material: None noted

Thin-Section Mode Estimated by: Point Count--#Points:1127

Constituents	Amount (%)	Est Error (95% Conf)
Matrix:	82.0	+/- 2.3
Shards:	0.0	
Pumice:	0.0	
Altered Perlite:	0.0	
Devitrified Lithics:	0.0	
Zeolitized Lithics:	0.0	
Glassy Lithics:	0.0	
Alkali Feldspar:	5.0	+/- 1.3
Plagioclase Feldspar:	5.0	+/- 1.3
Quartz:	4.0	+/- 1.2
Biotite:	0.5	+/- 0.4
Fe-Ti Oxides:	0.5	+/- 0.4
Others (See below):	0.0	
Porosity (Visible):	3.0	+/- 1.0
Total:	100.0	

Included in "Others": Trace lithic fragments.

Note: Error calculation uses method of Van der Plas and Tobi (1965) and estimates counting errors at a 95% confidence level.

Thin-Section Comments:
Textural evidence for welding destroyed by devitrification but welding indicated by position between welded samples. Enhanced porosity (bubbles) in coarse spherulitic matrix (8% of mode).

Part 3. EXPERIMENT CONDITIONS

Standard. See SAND91-7031 for details of procedures followed.

Part 4. REFERENCE AND SUPPORTING INFORMATION

QA LEVEL OF DATA- YMP DRMS DATA SET SNL DATA
GATHERING ACTIVITY: TBD ID: 51/L04-4/19/90 REPT #: SAND91-7031

DCF COMPILED BY: J.R. Connolly DIV: 6315 (UNM) Date: 9/24/91

Petrographic Data Compilation for the Yucca Mountain Project SEPDB
(Thin-Section Data)

Part 1. SAMPLE LOCATION AND IDENTIFICATION

Sample ID: G1-2428 Sample Origin: Drill Hole USW G-1
Location: Depth 2,428 ft Test #: 1

Part 2. PARAMETERS

Thin-Section Description

Thin-Section ID #s: G1-2428-A and G1-2428-B

Welding: Moderate(?)
Lithologic Type: Silica-feldspar
Type of Pore-Filling Material: None noted

Thin-Section Mode Estimated by: Point Count--#Points:1286

Constituents	Amount (%)	Est Error (95% Conf)
Matrix:	78.0	+/- 2.3
Shards:	0.0	
Pumice:	0.0	
Altered Perlite:	0.0	
Devitrified Lithics:	1.0	+/- 0.6
Zeolitized Lithics:	0.0	
Glassy Lithics:	0.0	
Alkali Feldspar:	9.0	+/- 1.6
Plagioclase Feldspar:	7.0	+/- 1.4
Quartz:	3.0	+/- 1.0
Biotite:	1.0	+/- 0.6
Fe-Ti Oxides:	0.0	
Others (See below):	0.0	
Porosity (Visible):	1.0	+/- 0.6
Total:	100.0	

Included
in "Others": Trace Fe-Ti oxides.

Note: Error calculation uses method of Van der Plas and Tobi (1965) and estimates counting errors at a 95% confidence level.

Thin-Section Comments:
Welding textures obscured by devitrification. Coarsely cryst matrix is abundant (32 modal%) and includes Fe_2O_3-rich zones (2%). Alkali feldspars show 10-50 micron overgrowth rims.

Part 3. EXPERIMENT CONDITIONS
Standard. See SAND91-7031 for details of procedures followed.

Part 4. REFERENCE AND SUPPORTING INFORMATION

QA LEVEL OF DATA- YMP DRMS DATA SET SNL DATA
GATHERING ACTIVITY: TBD ID: 51/L04-4/19/90 REPT #: SAND91-7031

DCF COMPILED BY: J.R. Connolly DIV: 6315 (UNM) Date: 9/24/91

Petrographic Data Compilation for the Yucca Mountain Project SEPDB
(Thin-Section Data)

Part 1. SAMPLE LOCATION AND IDENTIFICATION

Sample ID: G1-2493 Sample Origin: Drill Hole USW G-1
Location: Depth 2,493 ft Test #: 1

Part 2. PARAMETERS

Thin-Section Description

Thin-Section ID #s: G1-2493

Welding: Welded(?)-See comment
Lithologic Type: Silica-feldspar
Type of Pore-Filling Material: None noted

Thin-Section Mode Estimated by: Point Count--#Points:1000

Constituents	Amount (%)	Est Error (95% Conf)
Matrix:	78.0	+/- 2.6
Shards:	0.0	
Pumice:	0.0	
Altered Perlite:	0.0	
Devitrified Lithics:	0.0	
Zeolitized Lithics:	0.0	
Glassy Lithics:	0.0	
Alkali Feldspar:	10.0	+/- 1.9
Plagioclase Feldspar:	5.0	+/- 1.4
Quartz:	4.0	+/- 1.2
Biotite:	1.5	+/- 0.8
Fe-Ti Oxides:	0.5	+/- 0.4
Others (See below):	0.0	
Porosity (Visible):	1.0	+/- 0.6
Total:	100.0	

Included
in "Others": N/A

Note: Error calculation uses method of Van der Plas and Tobi (1965)
and estimates counting errors at a 95% confidence level.
Thin-Section Comments:
Welding indicated by elongation of matrix; original textures are obscured by devitrification. Coarsely crystalline matrix is abundant (37 modal%) and includes discrete hematite (2%).

Part 3. EXPERIMENT CONDITIONS
Standard. See SAND91-7031 for details of procedures followed.

Part 4. REFERENCE AND SUPPORTING INFORMATION

QA LEVEL OF DATA- YMP DRMS DATA SET SNL DATA
GATHERING ACTIVITY: TBD ID: 51/L04-4/19/90 REPT #: SAND91-7031

DCF COMPILED BY: J.R. Connolly DIV: 6315 (UNM) Date: 9/24/91

Petrographic Data Compilation for the Yucca Mountain Project SEPDB
(Thin-Section Data)

Part 1. SAMPLE LOCATION AND IDENTIFICATION

Sample ID: G1-2502 Sample Origin: Drill Hole USW G-1
Location: Depth 2,502 ft Test #: 1

Part 2. PARAMETERS

Thin-Section Description

Thin-Section ID #s: G1-2502

Welding: Moderate
Lithologic Type: Silica-feldspar, glassy(?)
Type of Pore-Filling Material: None noted

Thin-Section Mode Estimated by: Point Count--#Points:1000

Constituents	Amount (%)	Est Error (95% Conf)
Matrix:	43.0	+/- 3.1
Shards:	28.0	+/- 2.8
Pumice:	13.0	+/- 2.1
Altered Perlite:	0.0	
Devitrified Lithics:	3.0	+/- 1.1
Zeolitized Lithics:	0.0	
Glassy Lithics:	0.0	
Alkali Feldspar:	5.0	+/- 1.4
Plagioclase Feldspar:	4.0	+/- 1.2
Quartz:	2.0	+/- 0.9
Biotite:	1.0	+/- 0.6
Fe-Ti Oxides:	1.0	+/- 0.6
Others (See below):	0.0	
Porosity (Visible):	0.0	
Total:	100.0	

Included in "Others": Trace pores, amphibole.

Note: Error calculation uses method of Van der Plas and Tobi (1965) and estimates counting errors at a 95% confidence level.

Thin-Section Comments:
Rare shards are brown and semi-isotropic and may be glass; most are crystalline. Shard percentage based on visual estimate. Some zeolite may be developed in fine matrix.

Part 3. EXPERIMENT CONDITIONS
Standard. See SAND91-7031 for details of procedures followed.

Part 4. REFERENCE AND SUPPORTING INFORMATION

QA LEVEL OF DATA-GATHERING ACTIVITY: TBD
YMP DRMS DATA SET ID: 51/L04-4/19/90
SNL DATA REPT #: SAND91-7031

DCF COMPILED BY: J.R. Connolly DIV: 6315 (UNM) Date: 9/24/91

Petrographic Data Compilation for the Yucca Mountain Project SEPDB
(Thin-Section Data)

Part 1. SAMPLE LOCATION AND IDENTIFICATION

Sample ID: G1-2510 Sample Origin: Drill Hole USW G-1
Location: Depth 2,510 ft Test #: 1

Part 2. PARAMETERS

Thin-Section Description

Thin-Section ID #s: G1-2510-A and G1-2510-B

Welding: Moderate
Lithologic Type: Silica-feldspar, glassy(?)
Type of Pore-Filling Material: None noted

Thin-Section Mode Estimated by: Point Count--#Points:1000

Constituents	Amount (%)	Est Error (95% Conf)
Matrix:	70.0	+/- 2.9
Shards:	7.0	+/- 1.6
Pumice:	9.0	+/- 1.8
Altered Perlite:	0.0	
Devitrified Lithics:	1.0	+/- 0.6
Zeolitized Lithics:	0.0	
Glassy Lithics:	0.0	
Alkali Feldspar:	4.0	+/- 1.2
Plagioclase Feldspar:	6.0	+/- 1.5
Quartz:	2.0	+/- 0.9
Biotite:	0.5	+/- 0.4
Fe-Ti Oxides:	0.0	
Others (See below):	0.0	
Porosity (Visible):	0.5	+/- 0.4
Total:	100.0	

Included
in "Others": Trace Fe-Ti oxides.

Note: Error calculation uses method of Van der Plas and Tobi (1965)
and estimates counting errors at a 95% confidence level.
Thin-Section Comments:
Only texturally distinct shards counted; indistinct relict shards are included with matrix. Pumice fiamme are large, flattened, spherulitic areas with oxidized rims.

Part 3. EXPERIMENT CONDITIONS
Standard. See SAND91-7031 for details of procedures followed.

Part 4. REFERENCE AND SUPPORTING INFORMATION

QA LEVEL OF DATA-GATHERING ACTIVITY: TBD
YMP DRMS DATA SET ID: 51/L04-4/19/90
SNL DATA REPT #: SAND91-7031

DCF COMPILED BY: J.R. Connolly DIV: 6315 (UNM) Date: 9/24/91

Petrographic Data Compilation for the Yucca Mountain Project SEPDB
(Thin-Section Data)

Part 1. SAMPLE LOCATION AND IDENTIFICATION

Sample ID: G1-2538 Sample Origin: Drill Hole USW G-1
Location: Depth 2,538 ft Test #: 1

Part 2. PARAMETERS

Thin-Section Description

Thin-Section ID #s: G1-2538-A and G1-2538-B

Welding: Moderate to partial
Lithologic Type: Silica-feldspar, glassy(?)
Type of Pore-Filling Material: None noted

Thin-Section Mode Estimated by: Point Count--#Points:1000

Constituents	Amount (%)	Est Error (95% Conf)
Matrix:	77.0	+/- 2.7
Shards:	0.0	
Pumice:	9.0	+/- 1.8
Altered Perlite:	0.0	
Devitrified Lithics:	2.0	+/- 0.9
Zeolitized Lithics:	0.0	
Glassy Lithics:	0.0	
Alkali Feldspar:	4.0	+/- 1.2
Plagioclase Feldspar:	5.0	+/- 1.4
Quartz:	2.0	+/- 0.9
Biotite:	0.0	
Fe-Ti Oxides:	1.0	+/- 0.6
Others (See below):	0.0	
Porosity (Visible):	0.0	
Total:	100.0	

Included
in "Others": Trace biotite, altered sphene, amphibole, pores.

Note: Error calculation uses method of Van der Plas and Tobi (1965) and estimates counting errors at a 95% confidence level.
Thin-Section Comments:
Relict shards are included with matrix in point count; rare brown semi-isotropic shards may be partly glassy. Elongate fiamme-like spherulitic areas are counted as pumice.

Part 3. EXPERIMENT CONDITIONS
Standard. See SAND91-7031 for details of procedures followed.

Part 4. REFERENCE AND SUPPORTING INFORMATION

QA LEVEL OF DATA-GATHERING ACTIVITY: TBD
YMP DRMS DATA SET ID: 51/L04-4/19/90
SNL DATA REPT #: SAND91-7031

DCF COMPILED BY: J.R. Connolly DIV: 6315 (UNM) Date: 9/24/91

Petrographic Data Compilation for the Yucca Mountain Project SEPDB
(Thin-Section Data)

Part 1. SAMPLE LOCATION AND IDENTIFICATION

Sample ID: G1-2550 Sample Origin: Drill Hole USW G-1
Location: Depth 2,550 ft Test #: 1

Part 2. PARAMETERS

Thin-Section Description

Thin-Section ID #s: G1-2550-A and G1-2550-B

Welding: Partial to moderate
Lithologic Type: Zeolitized
Type of Pore-Filling Material: Zeolite

Thin-Section Mode Estimated by: Point Count--#Points:1000

Constituents	Amount (%)	Est Error (95% Conf)
Matrix:	33.0	+/- 3.0
Shards:	24.0	+/- 2.7
Pumice:	19.0	+/- 2.5
Altered Perlite:	0.0	
Devitrified Lithics:	6.0	+/- 1.5
Zeolitized Lithics:	0.0	
Glassy Lithics:	0.0	
Alkali Feldspar:	5.0	+/- 1.4
Plagioclase Feldspar:	6.0	+/- 1.5
Quartz:	0.0	
Biotite:	3.0	+/- 1.1
Fe-Ti Oxides:	0.0	
Others (See below):	1.0	+/- 0.6
Porosity (Visible):	3.0	+/- 1.1
Total:	100.0	

Included in "Others": 1% hornblende counted, trace biotite.

Note: Error calculation uses method of Van der Plas and Tobi (1965) and estimates counting errors at a 95% confidence level.

Thin-Section Comments:
Some glass may remain, but all matrix is strongly zeolitized with shards and pumice identified by relict textures. Shards have been leached and partly replaced by zeolite, leaving pores.

Part 3. EXPERIMENT CONDITIONS
Standard. See SAND91-7031 for details of procedures followed.

Part 4. REFERENCE AND SUPPORTING INFORMATION

QA LEVEL OF DATA- YMP DRMS DATA SET SNL DATA
GATHERING ACTIVITY: TBD ID: 51/L04-4/19/90 REPT #: SAND91-7031

DCF COMPILED BY: J.R. Connolly DIV: 6315 (UNM) Date: 9/24/91

Petrographic Data Compilation for the Yucca Mountain Project SEPDB
(Thin-Section Data)

Part 1. SAMPLE LOCATION AND IDENTIFICATION

Sample ID: G1-2563 Sample Origin: Drill Hole USW G-1
Location: Depth 2,563 ft Test #: 1

Part 2. PARAMETERS

Thin-Section Description

Thin-Section ID #s: G1-2563

Welding: Moderate
Lithologic Type: Zeolitized, glassy
Type of Pore-Filling Material: Zeolite

Thin-Section Mode Estimated by: Point Count--#Points: 817

Constituents	Amount (%)	Est Error (95% Conf)
Matrix:	39.0	+/- 3.4
Shards:	28.0	+/- 3.1
Pumice:	13.0	+/- 2.4
Altered Perlite:	0.0	
Devitrified Lithics:	2.5	+/- 1.1
Zeolitized Lithics:	0.0	
Glassy Lithics:	0.0	
Alkali Feldspar:	5.0	+/- 1.5
Plagioclase Feldspar:	5.0	+/- 1.5
Quartz:	4.0	+/- 1.4
Biotite:	0.5	+/- 0.5
Fe-Ti Oxides:	0.0	
Others (See below):	0.0	
Porosity (Visible):	3.0	+/- 1.2
Total:	100.0	

Included
in "Others": Trace hornblende, Fe-Ti oxides.

Note: Error calculation uses method of Van der Plas and Tobi (1965) and estimates counting errors at a 95% confidence level.
Thin-Section Comments:
Zeolitization is extensive throughout matrix, pumice and shards although some glass may remain. Pores commonly zeolite-lined. Section contains a prominent microfault (with fine, dark fill).

Part 3. EXPERIMENT CONDITIONS
Standard. See SAND91-7031 for details of procedures followed.

Part 4. REFERENCE AND SUPPORTING INFORMATION

QA LEVEL OF DATA-GATHERING ACTIVITY: TBD
YMP DRMS DATA SET ID: 51/L04-4/19/90
SNL DATA REPT #: SAND91-7031

DCF COMPILED BY: J.R. Connolly DIV: 6315 (UNM) Date: 9/24/91

Petrographic Data Compilation for the Yucca Mountain Project SEPDB
(Thin-Section Data)

Part 1. SAMPLE LOCATION AND IDENTIFICATION

Sample ID: G1-2585 Sample Origin: Drill Hole USW G-1
Location: Depth 2,585 ft Test #: 1

Part 2. PARAMETERS

Thin-Section Description

Thin-Section ID #s: G1-2585

Welding: Partial
Lithologic Type: Zeolitized
Type of Pore-Filling Material: Zeolite

Thin-Section Mode Estimated by: Point Count--#Points:1000

Constituents	Amount (%)	Est Error (95% Conf)
Matrix:	45.0	+/- 3.1
Shards:	17.0	+/- 2.4
Pumice:	24.0	+/- 2.7
Altered Perlite:	0.0	
Devitrified Lithics:	0.0	
Zeolitized Lithics:	1.0	+/- 0.6
Glassy Lithics:	0.0	
Alkali Feldspar:	5.0	+/- 1.4
Plagioclase Feldspar:	3.0	+/- 1.1
Quartz:	3.0	+/- 1.1
Biotite:	0.0	
Fe-Ti Oxides:	1.0	+/- 0.6
Others (See below):	0.0	
Porosity (Visible):	1.0	+/- 0.6
Total:	100.0	

Included in "Others": Trace hornblende, biotite, epidote(?).

Note: Error calculation uses method of Van der Plas and Tobi (1965) and estimates counting errors at a 95% confidence level.

Thin-Section Comments:
Zeolite (clinoptilolite w/ minor mordenite) is extensive possibly with some opal-CT. Zeolitic lithics are usually indistinct from matrix. Visible porosity (>30 micron) reduced by zeolite fill.

Part 3. EXPERIMENT CONDITIONS
Standard. See SAND91-7031 for details of procedures followed.

Part 4. REFERENCE AND SUPPORTING INFORMATION

QA LEVEL OF DATA-GATHERING ACTIVITY: TBD
YMP DRMS DATA SET ID: 51/L04-4/19/90
SNL DATA REPT #: SAND91-7031

DCF COMPILED BY: J.R. Connolly DIV: 6315 (UNM) Date: 9/24/91

Petrographic Data Compilation for the Yucca Mountain Project SEPDB
(Thin-Section Data)

Part 1. SAMPLE LOCATION AND IDENTIFICATION

Sample ID: G1-2658 Sample Origin: Drill Hole USW G-1
Location: Depth 2,658 ft Test #: 1

Part 2. PARAMETERS

Thin-Section Description

Thin-Section ID #s: G1-2658

Welding: Nonwelded(?)
Lithologic Type: Zeolitized, glassy(?)
Type of Pore-Filling Material: Zeolite(?)

Thin-Section Mode Estimated by: Visual Estimate

Constituents	Amount (%)	Est Error (95% Conf)
Matrix:	81.0	
Shards:	0.0	
Pumice:	5.0	
Altered Perlite:	0.0	
Devitrified Lithics:	1.0	
Zeolitized Lithics:	1.0	
Glassy Lithics:	0.0	
Alkali Feldspar:	3.0	
Plagioclase Feldspar:	4.0	
Quartz:	2.0	
Biotite:	1.0	
Fe-Ti Oxides:	0.0	
Others (See below):	0.0	
Porosity (Visible):	2.0	
Total:	100.0	

Included in "Others": Trace Fe-Ti oxides, zircon

Note: Error calculation uses method of Van der Plas and Tobi (1965) and estimates counting errors at a 95% confidence level.

Thin-Section Comments:
Matrix appears nonwelded, but textures are obscured by alteration. Coarse zeolite is uncommon but matrix appears crystalline under high magnification. Matrix may be partially glassy.

Part 3. EXPERIMENT CONDITIONS
Standard. See SAND91-7031 for details of procedures followed.

Part 4. REFERENCE AND SUPPORTING INFORMATION

QA LEVEL OF DATA-GATHERING ACTIVITY: TBD
YMP DRMS DATA SET ID: 51/L04-4/19/90
SNL DATA REPT #: SAND91-7031

DCF COMPILED BY: J.R. Connolly DIV: 6315 (UNM) Date: 9/24/91

Petrographic Data Compilation for the Yucca Mountain Project SEPDB
(Thin-Section Data)

Part 1. SAMPLE LOCATION AND IDENTIFICATION

Sample ID: G1-2928.6 Sample Origin: Drill Hole USW G-1
Location: Depth 2,928.6 ft Test #: 1

Part 2. PARAMETERS

Thin-Section Description

Thin-Section ID #s: G1-2928.6

Welding: Moderate
Lithologic Type: Silica-feldspar
Type of Pore-Filling Material: None noted

Thin-Section Mode Estimated by: Point Count--#Points: 470

Constituents	Amount (%)	Est Error (95% Conf)
Matrix:	47.0	+/- 4.6
Shards:	20.0	+/- 3.7
Pumice:	10.0	+/- 2.8
Altered Perlite:	0.0	
Devitrified Lithics:	5.0	+/- 2.0
Zeolitized Lithics:	0.0	
Glassy Lithics:	0.0	
Alkali Feldspar:	6.0	+/- 2.2
Plagioclase Feldspar:	6.0	+/- 2.2
Quartz:	3.0	+/- 1.6
Biotite:	1.0	+/- 0.9
Fe-Ti Oxides:	1.0	+/- 0.9
Others (See below):	0.0	
Porosity (Visible):	1.0	+/- 0.9
Total:	100.0	

Included
in "Others": Trace calcite.

Note: Error calculation uses method of Van der Plas and Tobi (1965)
and estimates counting errors at a 95% confidence level.
Thin-Section Comments:
Shards, pumice recognized by shapes; now all devitrified.
Welding indicated by elongation of relict fragments. All
lithic fragments are devitrified.

Part 3. EXPERIMENT CONDITIONS
Standard. See SAND91-7031 for details of procedures followed.

Part 4. REFERENCE AND SUPPORTING INFORMATION

QA LEVEL OF DATA-GATHERING ACTIVITY: TBD
YMP DRMS DATA SET ID: 51/L04-4/19/90
SNL DATA REPT #: SAND91-7031

DCF COMPILED BY: J.R. Connolly DIV: 6315 (UNM) Date: 9/24/91

Petrographic Data Compilation for the Yucca Mountain Project SEPDB
(Thin-Section Data)

Part 1. SAMPLE LOCATION AND IDENTIFICATION

Sample ID: G1-2939.3 Sample Origin: Drill Hole USW G-1
Location: Depth 2,939.3 ft Test #: 1

Part 2. PARAMETERS

Thin-Section Description

Thin-Section ID #s: G1-2939

Welding: Moderate?
Lithologic Type: Silica-feldspar
Type of Pore-Filling Material: None noted

Thin-Section Mode Estimated by: Point Count--#Points: 521

Constituents	Amount (%)	Est Error (95% Conf)
Matrix:	46.0	+/- 4.4
Shards:	30.0	+/- 4.0
Pumice:	0.0	
Altered Perlite:	0.0	
Devitrified Lithics:	5.0	+/- 1.9
Zeolitized Lithics:	0.0	
Glassy Lithics:	0.0	
Alkali Feldspar:	5.0	+/- 1.9
Plagioclase Feldspar:	6.0	+/- 2.1
Quartz:	4.0	+/- 1.7
Biotite:	1.0	+/- 0.9
Fe-Ti Oxides:	3.0	+/- 1.5
Others (See below):	0.0	
Porosity (Visible):	0.0	
Total:	100.0	

Included
in "Others": Trace porosity, calcite.

Note: Error calculation uses method of Van der Plas and Tobi (1965) and estimates counting errors at a 95% confidence level.
Thin-Section Comments:
Overall fabric suggests moderate welding, but delicate Y and V shaped shards are well preserved and only slightly deformed. All phenocrysts fractured. Calcite replaces plagioclase cores.

Part 3. EXPERIMENT CONDITIONS
Standard. See SAND91-7031 for details of procedures followed.

Part 4. REFERENCE AND SUPPORTING INFORMATION

QA LEVEL OF DATA-GATHERING ACTIVITY: TBD
YMP DRMS DATA SET ID: 51/L04-4/19/90
SNL DATA REPT #: SAND91-7031

DCF COMPILED BY: J.R. Connolly DIV: 6315 (UNM) Date: 9/24/91

APPENDIX B

DATA COMPILATION FOR WHOLE-ROCK CHEMICAL ANALYSES

Bulk Chemistry Data Compilation for the Yucca Mountain Project SEPDB

Part 1. SAMPLE LOCATION AND IDENTIFICATION

SAMPLE ID: G1-1245 SAMPLE ORIGIN: Drill Hole USW G-1
LOCATION: Depth 1,245 ft TEST #: 1

Part 2. PARAMETERS

Whole-Rock Analysis Results

Whole-Rock Analysis IDs: G1-1245
Comments: Low H2O typical for devitrified sample. High-silica rhyolite composition.

Element/Oxide	Amount(%)	Estimated Error	Analysis Method	CIPW Normative Minerals	
SiO2:	76.2	+/- 2.3	G	Quartz:	37.83
TiO2:	0.060	+/- 0.012	AA	Corundum:	0.87
Al2O3:	12.42	+/- 0.37	AA	Orthoclase:	29.24
Fe2O3:	0.78	+/- 0.08	AA,V	Albite:	28.28
FeO:	0.08	+/- 0.02	V	Anorthite:	2.43
MnO:	0.057	+/- 0.011	AA	Hypersthene:	0.36
MgO:	0.14	+/- 0.01	AA	Magnetite:	0.27
CaO:	0.48	+/- 0.05	AA	Hematite:	0.60
Na2O:	3.29	+/- 0.10	AA	Ilmenite:	0.12
K2O:	4.86	+/- 0.15	AA	Rutile:	
P2O5:		+/-	C	Apatite:	
H2O(+):	0.75	+/- 0.23	G	H2O:	
H2O(-):	0.52	+/- 0.16	G		
Total:	99.637			Norm Total:	100.00
				Differentiation index:	
Total Fe as Fe2O3:	0.87	+/- 0.09	AA	Qtz+Orth+Alb=	95.35
Loss on Ignition:	0.75	+/- 0.23	G		

Notes: 1. H2O(+) includes H2O, CO2 & other volatiles.
2. Norms for samples are based on analyses normalized to 100% excluding all H2O from the norm. CIPW normative minerals are reported in weight percents.
3. Error values shown are based on acceptance criteria for whole-rock analyses specified in SAND91-7031. Decimal places shown approximate the precision for that element.

Key to Analysis Method: XRF=X-ray fluorescence; V=volumetric analysis; AA=atomic absorption; G=gravimetric analysis; C=colorimetric analysis.

Part 3. EXPERIMENT CONDITIONS

Standard. See SAND91-7031 for details of procedures followed.

Part 4. REFERENCE AND SUPPORTING INFORMATION

QA LEVEL OF DATA GATHERING ACTIVITY: TBD
YMP DATA SET ID: 51/L04-4/19/90
SNL DATA REP #: SAND91-7031

DCF COMPILED BY: J.R. Connolly DIV: 6315 (UNM) Date: 9/23/91

Bulk Chemistry Data Compilation for the Yucca Mountain Project SEPDB

Part 1. SAMPLE LOCATION AND IDENTIFICATION

SAMPLE ID: A1-1569 SAMPLE ORIGIN: Drill Hole UE25a#1
LOCATION: Depth 1,569 ft TEST #: 1

Part 2. PARAMETERS

Whole-Rock Analysis Results

Whole-Rock Analysis IDs: A1-1569
Comments: About 8% total H2O content indicates partial zeolitization. Shows higher CaO and less Na2O than to devitrified samples.

Element/Oxide	Amount(%)	Estimated Error	Analysis Method	CIPW Normative Minerals	
SiO2:	72.0	+/- 2.2	G	Quartz:	46.15
TiO2:	0.060	+/- 0.012	AA	Corundum:	1.50
Al2O3:	11.73	+/- 0.35	AA	Orthoclase:	28.79
Fe2O3:	0.86	+/- 0.09	AA,V	Albite:	13.35
FeO:	0.01	+/-	V	Anorthite:	9.02
MnO:	0.065	+/- 0.013	AA	Hypersthene:	0.09
MgO:	0.04	+/- 0.01	AA	Magnetite:	0.08
CaO:	1.69	+/- 0.05	AA	Hematite:	0.88
Na2O:	1.46	+/- 0.04	AA	Ilmenite:	0.12
K2O:	4.50	+/- 0.14	AA	Rutile:	
P2O5:	0.010	+/-	C	Apatite:	0.03
H2O(+):	4.68	+/- 0.47	G	H2O:	
H2O(-):	2.91	+/- 0.29	G		
Total:	100.015			Norm Total:	100.01
				Differentiation index:	
Total Fe as Fe2O3:	0.87	+/- 0.09	AA	Qtz+Orth+Alb=	88.29
Loss on Ignition:	4.68	+/- 0.47	G		

Notes: 1. H2O(+) includes H2O, CO2 & other volatiles.
2. Norms for samples are based on analyses normalized to 100% excluding all H2O from the norm. CIPW normative minerals are reported in weight percents.
3. Error values shown are based on acceptance criteria for whole-rock analyses specified in SAND91-7031. Decimal places shown approximate the precision for that element.

Key to Analysis Method: XRF=X-ray fluorescence; V=volumetric analysis; AA=atomic absorption; G=gravimetric analysis; C=colorimetric analysis.

Part 3. EXPERIMENT CONDITIONS

Standard. See SAND91-7031 for details of procedures followed.

Part 4. REFERENCE AND SUPPORTING INFORMATION

QA LEVEL OF DATA YMP DATA SET SNL DATA
GATHERING ACTIVITY: TBD ID: 51/L04-4/19/90 REP #: SAND91-7031

DCF COMPILED BY: J.R. Connolly DIV: 6315 (UNM) Date: 9/23/91

Bulk Chemistry Data Compilation for the Yucca Mountain Project SEPDB

Part 1. SAMPLE LOCATION AND IDENTIFICATION

SAMPLE ID: A1-2000 SAMPLE ORIGIN: Drill Hole UE25a#1
LOCATION: Depth 2,000 ft TEST #: 1

Part 2. PARAMETERS

Whole-Rock Analysis Results

Whole-Rock Analysis IDs: A1-2000
Comments: Low H2O content typical for devitrified sample.

Element/Oxide	Amount(%)	Estimated Error	Analysis Method	CIPW Normative Minerals	
SiO2:	75.9	+/- 2.3	G	Quartz:	36.38
TiO2:	0.080	+/- 0.016	AA	Corundum:	0.15
Al2O3:	11.90	+/- 0.36	AA	Orthoclase:	28.61
Fe2O3:	1.75	+/- 0.05	AA,V	Albite:	30.77
FeO:	0.14	+/- 0.01	V	Anorthite:	1.84
MnO:	0.032	+/- 0.006	AA	Hypersthene:	0.19
MgO:	0.07	+/- 0.01	AA	Magnetite:	0.33
CaO:	0.38	+/- 0.04	AA	Hematite:	1.55
Na2O:	3.59	+/- 0.11	AA	Ilmenite:	0.15
K2O:	4.77	+/- 0.14	AA	Rutile:	
P2O5:	0.012	+/- 0.002	C	Apatite:	0.03
H2O(+):	0.77	+/- 0.23	G	H2O:	
H2O(-):	0.22	+/- 0.07	G		
Total:	99.614			Norm Total:	100.00
				Differentiation index:	
Total Fe as Fe2O3:	1.91	+/- 0.06	AA	Qtz+Orth+Alb=	95.76
Loss on Ignition:	0.76	+/- 0.23	G		

Notes: 1. H2O(+) includes H2O, CO2 & other volatiles.
2. Norms for samples are based on analyses normalized to 100% excluding all H2O from the norm. CIPW normative minerals are reported in weight percents.
3. Error values shown are based on acceptance criteria for whole-rock analyses specified in SAND91-7031. Decimal places shown approximate the precision for that element.

Key to Analysis Method: XRF=X-ray fluorescence; V=volumetric analysis; AA=atomic absorption; G=gravimetric analysis; C=colorimetric analysis.

Part 3. EXPERIMENT CONDITIONS

Standard. See SAND91-7031 for details of procedures followed.

Part 4. REFERENCE AND SUPPORTING INFORMATION

QA LEVEL OF DATA YMP DATA SET SNL DATA
GATHERING ACTIVITY: TBD ID: 51/I04-4/19/90 REP #: SAND91-7031

DCF COMPILED BY: J.R. Connolly DIV: 6315 (UNM) Date: 9/23/91

Bulk Chemistry Data Compilation for the Yucca Mountain Project SEPDB

Part 1. SAMPLE LOCATION AND IDENTIFICATION

SAMPLE ID: A1-2429 SAMPLE ORIGIN: Drill Hole UE25a#1
LOCATION: Depth 2,429 ft TEST #: 1

Part 2. PARAMETERS

Whole-Rock Analysis Results

Whole-Rock Analysis IDs: A1-2429
Comments: Low H2O typical for devitrified sample. High-silica rhyolite composition, highly oxidized.

Element/Oxide	Amount(%)	Estimated Error	Analysis Method	CIPW Normative Minerals	
SiO2:	75.2	+/- 2.3	G	Quartz:	36.70
TiO2:	0.080	+/- 0.016	AA	Corundum:	1.69
Al2O3:	13.22	+/- 0.40	AA	Orthoclase:	30.74
Fe2O3:	1.22	+/- 0.04	AA,V	Albite:	26.89
FeO:	0.01	+/-	V	Anorthite:	2.26
MnO:	0.076	+/- 0.015	AA	Hypersthene:	0.26
MgO:	0.10	+/- 0.01	AA	Magnetite:	0.05
CaO:	0.47	+/- 0.05	AA	Hematite:	1.20
Na2O:	3.14	+/- 0.09	AA	Ilmenite:	0.15
K2O:	5.13	+/- 0.15	AA	Rutile:	
P2O5:	0.020	+/- 0.004	C	Apatite:	0.05
H2O(+):	0.85	+/- 0.26	G	H2O:	
H2O(-):	0.32	+/- 0.10	G		
				Norm Total:	99.99
Total:	99.836				
				Differentiation index:	
Total Fe as Fe2O3:	1.23	+/- 0.04	AA	Qtz+Orth+Alb=	94.33
Loss on Ignition:	0.85	+/- 0.26	G		

Notes: 1. H2O(+) includes H2O, CO2 & other volatiles.
2. Norms for samples are based on analyses normalized to 100% excluding all H2O from the norm. CIPW normative minerals are reported in weight percents.
3. Error values shown are based on acceptance criteria for whole-rock analyses specified in SAND91-7031. Decimal places shown approximate the precision for that element.

Key to Analysis Method: XRF=X-ray fluorescence; V=volumetric analysis; AA=atomic absorption; G=gravimetric analysis; C=colorimetric analysis.

Part 3. EXPERIMENT CONDITIONS

Standard. See SAND91-7031 for details of procedures followed.

Part 4. REFERENCE AND SUPPORTING INFORMATION

QA LEVEL OF DATA YMP DATA SET SNL DATA
GATHERING ACTIVITY: TBD ID: 51/L04-4/19/90 REP #: SAND91-7031

DCF COMPILED BY: J.R. Connolly DIV: 6315 (UNM) Date: 9/23/91

Bulk Chemistry Data Compilation for the Yucca Mountain Project SEPDB

Part 1. SAMPLE LOCATION AND IDENTIFICATION

SAMPLE ID: G1-2939.3 SAMPLE ORIGIN: Drill Hole USW G-1
LOCATION: Depth 2,939.3 ft TEST #: 1

Part 2. PARAMETERS

Whole-Rock Analysis Results

Whole-Rock Analysis IDs: G1-2939
Comments: Low H2O typical for devitrified sample. High-silica rhyolite composition.

Element/Oxide	Amount(%)	Estimated Error	Analysis Method	CIPW Normative Minerals	
SiO2:	76.6	+/- 2.3	G	Quartz:	38.21
TiO2:	0.110	+/- 0.011	AA	Corundum:	0.67
Al2O3:	12.40	+/- 0.37	AA	Orthoclase:	29.21
Fe2O3:	1.17	+/- 0.04	AA,V	Albite:	26.52
FeO:	0.16	+/- 0.02	V	Anorthite:	3.49
MnO:	0.041	+/- 0.008	AA	Hypersthene:	0.34
MgO:	0.14	+/- 0.01	AA	Magnetite:	0.33
CaO:	0.73	+/- 0.07	AA	Hematite:	0.95
Na2O:	3.12	+/- 0.09	AA	Ilmenite:	0.21
K2O:	4.91	+/- 0.15	AA	Rutile:	
P2O5:	0.028	+/- 0.006	C	Apatite:	0.07
H2O(+):	0.90	+/- 0.27	G	H2O:	
H2O(-):	0.28	+/- 0.08	G		
Total:	100.589			Norm Total:	100.00
				Differentiation index:	
Total Fe as Fe2O3:	1.35	+/- 0.04	AA	Qtz+Orth+Alb=	93.94
Loss on Ignition:	0.90	+/- 0.27	G		

Notes: 1. H2O(+) includes H2O, CO2 & other volatiles.
2. Norms for samples are based on analyses normalized to 100% excluding all H2O from the norm. CIPW normative minerals are reported in weight percents.
3. Error values shown are based on acceptance criteria for whole-rock analyses specified in SAND91-7031. Decimal places shown approximate the precision for that element.

Key to Analysis Method: XRF=X-ray fluorescence; V=volumetric analysis; AA=atomic absorption; G=gravimetric analysis; C=colorimetric analysis.

Part 3. EXPERIMENT CONDITIONS

Standard. See SAND91-7031 for details of procedures followed.

Part 4. REFERENCE AND SUPPORTING INFORMATION

QA LEVEL OF DATA
GATHERING ACTIVITY: TBD

YMP DATA SET
ID: 51/L04-4/19/90

SNL DATA
REP #: SAND91-7031

DCF COMPILED BY: J.R. Connolly DIV: 6315 (UNM) Date: 9/23/91

APPENDIX C

DATA COMPILATION FOR QUALITATIVE X-RAY DIFFRACTION ANALYSES

X-Ray Diffraction Data Compilation, Yucca Mountain Project SEPDB
(Qualitative Results only)

Part 1. SAMPLE LOCATION AND IDENTIFICATION

SAMPLE ID: G1-1245 SAMPLE ORIGIN: Drill Hole USW G-1
LOCATION: Depth 1,245 ft TEST #: 1

Part 2. PARAMETERS

X-Ray Diffraction (XRD) Analysis Results

XRD Analysis IDs: G1-1245-KK
Initial data collected on 9/30/81 using filename: NA

Mineral and Glass Identification by X-Ray Diffraction

Mineral	Criteria for ID**	Amount Est.(@)	Mineral	Criteria for ID**	Amount Est.(@)
Silica Phases--------			Clays----------		
Quartz:	Yes	Maj	Montmorillonite:	Yes	Min
Cristobalite:	Yes	Maj	Illite:		
Tridymite:			Smectite:		
Opal-CT:			Saponite:		
Feldspars----------			Chlorite:		
Plagioclase:	Prob	Maj?	Other Clays:		
Sanidine:	Prob	Maj?	Other Phases---------		
Anorthoclase:	Prob	Maj?	Glass:		
Orthoclase:			Calcite:		
Microcline:			Aragonite:		
Zeolites----------			All Others:		
Clinoptilolite:					
Mordenite:			** ID Criteria:		
Phillipsite:			Yes = Positive ID		
Heulandite:			Prob = Probably Present		
Analcime:			Poss = Possibly Present		
			Blank = Not identified		

XRD Data Restrictions: None
Note @: Qualitative Estimate. Maj=Major Phase; Min=Minor; Tr=Trace
Other Clays: Not Identified
Other Phases: None Identified
Notes on XRD Analysis:
Feldspar presence definite, but no individual phases identified hence "Prob" and "Maj?" designations above. Montmorillonite ID by prominent broad peak centered at about 5.2 deg 2-theta. Cristobalite identified by re-examination of original data. Quartz provides strongest peak in pattern.

Part 3. EXPERIMENT CONDITIONS

See SAND91-7031 experiment conditions and procedures.

Part 4. REFERENCE AND SUPPORTING INFORMATION

QA LEVEL OF DATA YMP DRMS DATA SET ID: 51/L04-4/19/90 SNL DATA REPT #: SAND91-7031
GATHERING ACTIVITY: TBD

DCF COMPILED BY: J.R. Connolly DIV: 6315 (UNM) Date: 9/24/91

X-Ray Diffraction Data Compilation, Yucca Mountain Project SEPDB
(Qualitative Results only)

Part 1. SAMPLE LOCATION AND IDENTIFICATION

SAMPLE ID: A1-1569 SAMPLE ORIGIN: Drill Hole UE-25a#1
LOCATION: Depth 1,569 ft TEST #: 1

Part 2. PARAMETERS

X-Ray Diffraction (XRD) Analysis Results

XRD Analysis IDs: A1-1569-MM
Initial data collected on 9/30/81 using filename: NA

Mineral and Glass Identification by X-Ray Diffraction

Mineral	Criteria for ID**	Amount Est.(@)
Silica Phases		
Quartz:	Poss	Tr
Cristobalite:		
Tridymite:		
Opal-CT:	Prob	Tr
Feldspars		
Plagioclase:	Prob	Min
Sanidine:	Prob	Min
Anorthoclase:	Prob	Min
Orthoclase:		
Microcline:		
Zeolites		
Clinoptilolite:	Yes	Maj
Mordenite:		
Phillipsite:		
Heulandite:		
Analcime:		
Clays		
Montmorillonite:	Yes	Min
Illite:	Poss	Tr
Smectite:		
Saponite:		
Chlorite:	Poss	Tr
Other Clays:		
Other Phases		
Glass:	Yes	Maj?
Calcite:		
Aragonite:		
All Others:		

** ID Criteria:
Yes = Positive ID
Prob = Probably Present
Poss = Possibly Present
Blank = Not identified

XRD Data Restrictions: None
Note @: Qualitative Estimate. Maj=Major Phase; Min=Minor; Tr=Trace
Other Clays: Not Identified
Other Phases: None Identified
Notes on XRD Analysis:
Feldspar is definitely present; individual phases NOT identified. Glass "hump" in XRD pattern is notable but not large. Opal-CT is identified by peak at 21.8 deg 2-theta. Montmorillonite peak is broad but definite; other clays are not well defined in pattern. Quartz and opal-CT not identified in original 1982 report.

Part 3. EXPERIMENT CONDITIONS

See SAND91-7031 experiment conditions and procedures.

Part 4. REFERENCE AND SUPPORTING INFORMATION

QA LEVEL OF DATA YMP DRMS DATA SET SNL DATA
GATHERING ACTIVITY: TBD ID: 51/L04-4/19/90 REPT #: SAND91-7031

DCF COMPILED BY: J.R. Connolly DIV: 6315 (UNM) Date: 9/24/91

X-Ray Diffraction Data Compilation, Yucca Mountain Project SEPDB
(Qualitative Results only)

Part 1. SAMPLE LOCATION AND IDENTIFICATION

SAMPLE ID: A1-2000 SAMPLE ORIGIN: Drill Hole UE25a#1
LOCATION: Depth 2,000 ft TEST #: 1

Part 2. PARAMETERS

X-Ray Diffraction (XRD) Analysis Results

XRD Analysis IDs: A1-2000-NN
Initial data collected on 9/30/81 using filename: NA

Mineral and Glass Identification by X-Ray Diffraction

Mineral	Criteria for ID**	Amount Est.(@)	Mineral	Criteria for ID**	Amount Est.(@)
Silica Phases--------			Clays----------		
Quartz:	Yes	Maj	Montmorillonite:		
Cristobalite:			Illite:		
Tridymite:			Smectite:		
Opal-CT:			Saponite:		
Feldspars----------			Chlorite:		
Plagioclase:	Prob	Maj?	Other Clays:		
Sanidine:	Prob	Maj?	Other Phases---------		
Anorthoclase:	Prob	Maj?	Glass:		
Orthoclase:			Calcite:		
Microcline:			Aragonite:		
Zeolites----------			All Others:		
Clinoptilolite:					
Mordenite:			** ID Criteria:		
Phillipsite:			Yes = Positive ID		
Heulandite:			Prob = Probably Present		
Analcime:			Poss = Possibly Present		
			Blank = Not identified		

XRD Data Restrictions: None
Note @: Qualitative Estimate. Maj=Major Phase; Min=Minor; Tr=Trace
Other Clays: Not Identified
Other Phases: None Identified
Notes on XRD Analysis:
Only quartz and feldspar identified in XRD pattern. Feldspar is definitely present, but individual phases were not identified, hence the probable and "Maj?" designations above. Chabazite, tentatively identified as possible phase in original 1982 report, is not supported by reexamination of the original data.

Part 3. EXPERIMENT CONDITIONS

See SAND91-7031 experiment conditions and procedures.

Part 4. REFERENCE AND SUPPORTING INFORMATION

QA LEVEL OF DATA YMP DRMS DATA SET SNL DATA
GATHERING ACTIVITY: TBD ID: 51/L04-4/19/90 REPT #: SAND91-7031

DCF COMPILED BY: J.R. Connolly DIV: 6315 (UNM) Date: 9/24/91

X-Ray Diffraction Data Compilation, Yucca Mountain Project SEPDB
(Qualitative Results only)

Part 1. SAMPLE LOCATION AND IDENTIFICATION

SAMPLE ID: A1-2429 SAMPLE ORIGIN: Drill Hole UE-25a#1
LOCATION: Depth 2,429 ft TEST #: 1

Part 2. PARAMETERS

X-Ray Diffraction (XRD) Analysis Results

XRD Analysis IDs: A1-2429-00
Initial data collected on 9/30/81 using filename: NA

Mineral and Glass Identification by X-Ray Diffraction

Mineral	Criteria for ID**	Amount Est.(@)	Mineral	Criteria for ID**	Amount Est.(@)
Silica Phases--------			Clays----------		
Quartz:	Yes	Maj	Montmorillonite:	Poss	Min?
Cristobalite:			Illite:	Poss	Min?
Tridymite:			Smectite:		
Opal-CT:			Saponite:		
Feldspars----------			Chlorite:		
Plagioclase:	Prob	Maj?	Other Clays:	Poss	Min?
Sanidine:	Prob	Maj?	Other Phases---------		
Anorthoclase:	Prob	Maj?	Glass:		
Orthoclase:			Calcite:		
Microcline:			Aragonite:		
Zeolites----------			All Others:		
Clinoptilolite:					
Mordenite:			** ID Criteria:		
Phillipsite:			Yes = Positive ID		
Heulandite:			Prob = Probably Present		
Analcime:			Poss = Possibly Present		
			Blank = Not identified		

XRD Data Restrictions: None
Note @: Qualitative Estimate. Maj=Major Phase; Min=Minor; Tr=Trace
Other Clays: Kaolinite (12.4 deg 2-theta) possible
Other Phases: None Identified
Notes on XRD Analysis:
Feldspar presence definite, but no individual phases identified hence "Prob" and "Maj?" designations above. Some clays present but original (3/82) identifications are not good; data above is reinterpretation of original data. Quartz dominates pattern.

Part 3. EXPERIMENT CONDITIONS

See SAND91-7031 experiment conditions and procedures.

Part 4. REFERENCE AND SUPPORTING INFORMATION

QA LEVEL OF DATA YMP DRMS DATA SET SNL DATA
GATHERING ACTIVITY: TBD ID: 51/L04-4/19/90 REPT #: SAND91-7031

DCF COMPILED BY: J.R. Connolly DIV: 6315 (UNM) Date: 9/24/91

X-Ray Diffraction Data Compilation, Yucca Mountain Project SEPDB
(Qualitative Results only)

Part 1. SAMPLE LOCATION AND IDENTIFICATION

SAMPLE ID: G1-2939.3 SAMPLE ORIGIN: Drill Hole USW G-1
LOCATION: Depth 2,939.3 ft TEST #: 1

Part 2. PARAMETERS

X-Ray Diffraction (XRD) Analysis Results

XRD Analysis IDs: G1-2939-LL
Initial data collected on 9/30/81 using filename: NA

Mineral and Glass Identification by X-Ray Diffraction

Mineral	Criteria for ID**	Amount Est.(@)	Mineral	Criteria for ID**	Amount Est.(@)
Silica Phases--------			Clays----------		
Quartz:	Yes	Maj	Montmorillonite:	Poss	Tr
Cristobalite:			Illite:	Poss	Min
Tridymite:			Smectite:		
Opal-CT:			Saponite:		
Feldspars----------			Chlorite:		
Plagioclase:	Prob	Maj?	Other Clays:		
Sanidine:	Prob	Maj?	Other Phases---------		
Anorthoclase:	Prob	Maj?	Glass:		
Orthoclase:			Calcite:		
Microcline:			Aragonite:		
Zeolites----------			All Others:		
Clinoptilolite:					
Mordenite:					
Phillipsite:					
Heulandite:					
Analcime:					

** ID Criteria:
Yes = Positive ID
Prob = Probably Present
Poss = Possibly Present
Blank = Not identified

XRD Data Restrictions: None
Note @: Qualitative Estimate. Maj=Major Phase; Min=Minor; Tr=Trace
Other Clays: Not Identified
Other Phases: None Identified
Notes on XRD Analysis:
Feldspar presence definite, but no individual phases identified hence "Prob" and "Maj?" designations above. Illite ID by broad peak centered at about 8.8 deg. Montmorillonite may be indicated by very weak peak at about 6 deg. Pattern is quartz and feldspar dominated.

Part 3. EXPERIMENT CONDITIONS

See SAND91-7031 experiment conditions and procedures.

Part 4. REFERENCE AND SUPPORTING INFORMATION

QA LEVEL OF DATA YMP DRMS DATA SET SNL DATA
GATHERING ACTIVITY: TBD ID: 51/L04-4/19/90 REPT #: SAND91-7031

DCF COMPILED BY: J.R. Connolly DIV: 6315 (UNM) Date: 9/24/91

APPENDIX D

DATA COMPILATION FOR ELECTRON MICROPROBE ANALYSES

Bence-Albee Corrected Feldspar Phenocryst and Matrix Analyses of Sample: USW G-1 407.1

Point IDs:	F1-F5 F7,F8	F6	M1,M2	+/- Std Dev
Element:				
SiO2	64.10	58.80	66.80	2.20
Al2O3	18.80	22.40	14.70	0.40
FeO*	0.02	0.37	1.17	0.50
MnO	B-0.00	B-0.00	0.05	
MgO	B-0.00	B-0.01	0.05	
CaO	0.69	4.37	0.60	0.08
Na2O	5.68	8.00	4.61	0.25
K2O	8.25	1.61	6.25	0.36
BaO	0.22	B-0.00	B-0.04	
Total:	97.76	95.55	94.23	
An	3.3	21.0	3.7	
Ab	49.4	69.7	50.9	
Or	47.2	9.2	45.4	
Notes:	1	1	2	
# Anal. Avgd.:	13	1	10	
Name:	Sanidine	Plag.		

An, Ab, Or are molecular amounts of Ca, Na and K, calculated from the weight percents of CaO, Na2O and K2O and normalized to 100%. An, Ab and Or are calculated for Matrix analyses ONLY for comparison with relative proportions of Ca, Na and K in feldspars.

Notes: 1 - Feldspar Phenocrysts
2 - Devitrified Shard Matrix

* All Fe is reported as FeO. Amounts shown as "B-" are reported as analyzed, but are below detection limit and not included in totals.

Standard deviations (calculated for matrix only) are (n-1) weighted, and estimate sample errors at a 68% confidence level.

YMP DRMS Data Set ID: L04.A-08/01/84

Bence-Albee Corrected Feldspar Phenocryst and Matrix Analyses of Sample: USW G-1 478.9

Point IDs:	F3-F8	F1,F2 F5,F9	Md1-Md3	+/- Std Dev	Ml1-Ml3	+/- Std Dev	MF1-Dark	+/- Std Dev	MF-1-Light	+/- Std Dev	MF1-All	+/- Std Dev
Element:												
SiO2	67.80	65.40	77.80	4.10	71.20	15.10	73.90	2.10	69.40	3.60	71.80	3.60
Al2O3	19.20	21.90	12.10	1.90	11.90	6.00	14.40	0.90	15.50	1.30	14.90	1.20
FeO*	0.16	0.15	0.87	0.97	0.38	0.37	1.03	0.33	1.05	0.81	1.04	0.59
MnO	B-0.02	B-0.01	B-0.04		0.03	0.03	0.07	0.03	0.07	0.05	0.07	0.04
MgO	B-0.00	B-0.00	0.14	0.17	0.40	0.96	0.05	0.03	0.54	1.01	0.28	0.72
CaO	0.52	2.72	0.44	0.10	0.48	0.39	0.41	0.04	0.50	0.13	0.45	0.10
Na2O	5.45	8.28	3.67	0.64	2.87	1.66	4.20	0.36	4.14	0.66	4.17	0.51
K2O	5.38	1.19	3.11	0.74	3.64	2.18	4.03	0.30	4.34	0.67	4.18	0.52
BaO	0.09	B-0.03	B-0.01		B-0.02		B-0.04		B-0.05		B-0.04	
Total:	98.60	99.54	98.13		90.90		98.09		95.54		96.89	
An	3.1	14.2	4.1		4.8		3.2		3.8		3.5	
Ab	58.7	78.4	61.6		51.9		59.3		56.9		58.2	
Or	38.2	7.4	34.3		43.3		37.5		39.3		38.4	
Notes:	1	1	2		3,5		4		4,5		4,5	
# Anal. Avgd.:	6	6	22		21		11		10		21	
Name:	Sanidine	Plag.	See Notes		See Notes		See Notes		See Notes		See Notes	

An, Ab, Or are molecular amounts of Ca, Na and K, calculated from the weight percents of CaO, Na2O and K2O and normalized to 100%. An, Ab and Or are calculated for Matrix analyses ONLY for comparison with relative proportions of Ca, Na and K in feldspars.

Notes: 1 - Feldspar Phenocrysts
2 - Devitrified Shard Matrix
3 - Coarsely crystalline or "vapor phase" altered lithophysal matrix
4 - Crystalline fiamme (dark and light colored areas differentiated)
5 - Low totals due to extensive porosity in areas analyzed

* All Fe is reported as FeO. Amounts shown as "B-" are reported as analyzed, but are below detection limit and not included in totals.

Standard deviations (calculated for matrix only) are (n-1) weighted, and estimate sample errors at a 68% confidence level.

YMP DRMS Data Set ID: L04.A-08/01/84

Bence-Albee Corrected Feldspar Phenocryst and Matrix Analyses of Sample: USW G-1 504.6

Point IDs:	F2-F4,F6 F7,F9	F1,F5,F8 F9	Md1	+/- Std Dev	M11	+/- Std Dev	MF1-Dark	+/- Std Dev
Element:								
SiO2	64.60	62.60	72.60	3.50	65.70	11.00	69.10	1.50
Al2O3	19.20	22.20	12.60	0.88	15.10	3.80	15.50	0.60
FeO*	0.21	0.22	0.86	1.10	0.38	0.49	1.13	0.23
MnO	B-0.00	B-0.00	B-0.03		B-0.01		0.07	0.02
MgO	B-0.00	B-0.00	0.16	0.15	B-0.00		0.09	0.05
CaO	0.79	3.84	0.39	0.17	0.37	0.11	0.66	0.38
Na2O	5.66	8.67	3.48	0.53	4.43	1.27	4.70	0.62
K2O	7.99	1.39	4.41	0.93	5.15	1.47	5.47	1.00
BaO	0.30	B-0.05	B-0.02		B-0.01		B-0.03	
Total:	98.75	98.92	94.50		91.13		96.72	
An	3.8	18.1	3.3		2.5		4.2	
Ab	49.9	74.1	52.7		55.2		54.2	
Or	46.3	7.8	44.0		42.2		41.5	
Notes:	1	1	2,5		3,5		4	
# Anal. Avgd.:	10	8	11		13		11	
Name:	Sanidine	Plag.	See Notes		See Notes		See Notes	

An, Ab, Or are molecular amounts of Ca, Na and K, calculated from the weight percents of CaO, Na2O and K2O and normalized to 100%. An, Ab and Or are calculated for Matrix analyses ONLY for comparison with relative proportions of Ca, Na and K in feldspars.

Notes: 1 - Feldspar Phenocrysts
2 - Devitrified Shard Matrix
3 - Coarsely crystalline or "vapor phase" altered lithophysal matrix
4 - Crystalline fiamme (light and dark areas differentiated)
5 - Low totals due to extensive porosity in areas analyzed

* All Fe is reported as FeO. Amounts shown as "B-" are reported as analyzed, but are below detection limit and not included in totals.

Standard deviations (calculated for matrix only) are (n-1) weighted, and estimate sample errors at a 68% confidence level.

YMP DRMS Data Set ID: L04.A-08/01/84

Bence-Albee Corrected Feldspar Phenocryst and Matrix Analyses of Sample: USW G-1 631.6

Point IDs:	F3	F4,F5	F2	M1	+/- Std Dev
Element:					
SiO2	64.40	62.60	57.90	77.40	8.00
Al2O3	18.80	22.30	25.60	9.81	4.70
FeO*	B-0.02	0.11	0.08	0.39	0.25
MnO	B-0.00	B-0.00	B-0.00	B-0.02	
MgO	B-0.00	B-0.00	B-0.00	0.10	0.12
CaO	0.31	3.55	7.79	0.26	0.12
Na2O	4.81	9.00	7.13	2.56	1.24
K2O	9.63	1.25	0.45	4.72	2.43
BaO	0.19	B-0.01	0.10	B-0.03	
Total:	98.14	99.01	99.25	95.24	
An	1.5	16.6	36.7	2.5	
Ab	42.5	76.4	60.8	44.1	
Or	56.0	7.0	2.5	53.5	
Notes:	1	1	1	2,5	
# Anal. Avgd.:	2	5	2	15	
Name:	Sanidine	Plag.	Ca-Plag.	See Notes	

An, Ab, Or are molecular amounts of Ca, Na and K, calculated from the weight percents of CaO, Na2O and K2O and normalized to 100%. An, Ab and Or are calculated for Matrix analyses ONLY for comparison with relative proportions of Ca, Na and K in feldspars.

Notes: 1 - Feldspar Phenocrysts
2 - Devitrified Shard Matrix
3 - Coarsely crystalline or "vapor phase" altered lithophysal matrix
4 - Crystalline fiamme (light and dark areas differentiated)
5 - Low totals due to extensive porosity in areas analyzed

* All Fe is reported as FeO. Amounts shown as "B-" are reported as analyzed, but are below detection limit and not included in totals.

Standard deviations (calculated for matrix only) are (n-1) weighted, and estimate sample errors at a 68% confidence level.

YMP DRMS Data Set ID: L04.A-08/01/84

Bence-Albee Corrected Feldspar Phenocryst and Matrix Analyses of Sample: USW G-1 811.1

Point IDs:	F1,F2,F6	F3-F5 F7,F8	Ms1	+/- Std Dev	Mv1	+/- Std Dev
Element:						
SiO2	62.30	62.30	73.60	3.30	66.00	5.30
Al2O3	18.70	21.60	12.00	1.70	14.60	2.50
FeO*	0.15	0.17	0.65	0.25	0.46	0.14
MnO	B-0.00	B-0.00	B-0.01		B-0.00	
MgO	B-0.00	B-0.00	0.11	0.07	0.11	0.15
CaO	0.43	3.39	0.64	0.33	0.42	0.11
Na2O	5.29	9.10	4.21	1.19	3.88	0.72
K2O	9.08	1.23	3.61	2.02	6.84	1.92
BaO	0.19	B-0.02	B-0.05		B-0.07	
Total:	96.14	97.79	94.82		92.31	
An	2.1	15.9	5.1		2.7	
Ab	46.0	77.2	60.7		45.0	
Or	51.9	6.9	34.2		52.3	
Notes:	1	1	2,5		3,5	
# Anal. Avgd.:	5	10	10		10	
Name:	Sanidine	Plag.	See Notes		See Notes	

An, Ab, Or are molecular amounts of Ca, Na and K, calculated from the weight percents of CaO, Na2O and K2O and normalized to 100%. An, Ab and Or are calculated for Matrix analyses ONLY for comparison with relative proportions of Ca, Na and K in feldspars.

Notes: 1 - Feldspar Phenocrysts
2 - Devitrified Shard Matrix
3 - Coarsely crystalline or "vapor phase" altered lithophysal matrix.
4 - Crystalline fiamme (light and dark areas differentiated)
5 - Low totals due to porosity in areas analyzed.

* All Fe is reported as FeO. Amounts shown as "B-" are reported as analyzed, but are below detection limit and not included in totals.

Standard deviations (calculated for matrix only) are (n-1) weighted, and estimate sample errors at a 68% confidence level.

YMP DRMS Data Set ID: L04.A-08/01/84

Bence-Albee Corrected Feldspar Phenocryst and Matrix Analyses of Sample: USW G-1 939.0

Point IDs:	F3	F1,F4-F8 F2,F10-F12	Md1	+/- Std Dev	Mv1	+/- Std Dev
Element:						
SiO2	65.10	62.90	75.70	3.40	67.60	10.90
Al2O3	18.60	22.00	11.70	1.70	13.90	5.10
FeO*	0.15	0.22	0.57	0.16	0.27	0.20
MnO	B-0.00	B-0.00	B-0.01		B-0.03	
MgO	B-0.00	B-0.00	0.07	0.04	0.49	0.44
CaO	0.26	3.56	0.45	0.18	0.65	0.33
Na2O	4.31	9.06	3.58	0.63	3.51	1.27
K2O	10.49	1.17	4.83	1.41	5.11	1.86
BaO	0.13	B-0.02	B-0.02		B-0.01	
Total:	99.04	98.91	96.90		91.53	
An	1.3	16.7	3.5		5.0	
Ab	38.0	76.8	51.1		48.5	
Or	60.8	6.5	45.4		46.5	
Notes:	1	1	2,5		3 or 4,5	
# Anal. Avgd.:	2	18	12		12	
Name:	Sanidine	Plag.	See Notes		See Notes	

An, Ab, Or are molecular amounts of Ca, Na and K, calculated from the weight percents of CaO, Na2O and K2O and normalized to 100%. An, Ab and Or are calculated for Matrix analyses ONLY for comparison with relative proportions of Ca, Na and K in feldspars.

Notes: 1 - Feldspar Phenocrysts
2 - Devitrified Shard Matrix
3 - Coarsely crystalline or "vapor phase" altered lithophysal matrix
4 - Crystalline fiamme (light and dark areas differentiated)
5 - Low totals due to porosity in areas analyzed

* All Fe is reported as FeO. Amounts shown as "B-" are reported as analyzed, but are below detection limit and not included in totals.

Standard deviations (calculated for matrix only) are (n-1) weighted, and estimate sample errors at a 68% confidence level.

YMP DRMS Data Set ID: L04.A-08/01/84

Bence-Albee Corrected Feldspar Phenocryst and Matrix Analyses of Sample: USW G-1 1079.4

Point IDs:	F2,F4	F1	Md1-Md2	+/- Std Dev
Element:				
SiO2	65.80	63.60	74.10	6.70
Al2O3	18.60	21.70	10.80	2.50
FeO*	0.21	0.19	0.90	1.49
MnO	B-0.00	B-0.00	0.08	0.18
MgO	B-0.00	B-0.00	0.15	0.19
CaO	0.40	3.47	0.45	0.24
Na2O	4.95	8.89	3.15	0.75
K2O	9.65	1.26	4.44	2.04
BaO	B-0.03	B-0.02	B-0.01	
Total:	99.61	99.11	94.07	
An	1.9	16.5	3.9	
Ab	43.0	76.4	49.8	
Or	55.1	7.1	46.2	
Notes:	1	1	2,5	
# Anal. Avgd.:	3	4	25	
Name:	Sanidine	Plag.	See Notes	

An, Ab, Or are molecular amounts of Ca, Na and K, calculated from the weight percents of CaO, Na2O and K2O and normalized to 100%. An, Ab and Or are calculated for Matrix analyses ONLY for comparison with relative proportions of Ca, Na and K in feldspars.

Notes: 1 - Feldspar Phenocrysts
2 - Devitrified Shard Matrix
3 - Coarsely crystalline or "vapor phase" altered lithophysal matrix.
4 - Crystalline fiamme (light and dark areas differentiated)
5 - Low totals due to porosity in areas analyzed.

* All Fe is reported as FeO. Amounts shown as "B-" are reported as analyzed, but are below detection limit and not included in totals.

Standard deviations (calculated for matrix only) are (n-1) weighted, and estimate sample errors at a 68% confidence level.

YMP DRMS Data Set ID: L04.A-08/01/84

Bence-Albee Corrected Feldspar Phenocryst and Matrix Analyses of Sample: USW G-1 1208.7

Point IDs:	F4,F6 F8	F1-F3 F5,F7	Md1-Md2	+/- Std Dev	Mv1	+/- Std Dev
Element:						
SiO2	67.00	64.60	75.80	4.30	84.50	13.10
Al2O3	18.60	22.10	12.40	2.50	6.51	7.37
FeO*	0.14	0.17	0.60	0.26	0.29	0.39
MnO	B-0.00	B-0.00	0.06	0.04	B-0.03	
MgO	B-0.00	B-0.00	0.12	0.10	0.28	0.43
CaO	0.30	3.73	0.39	0.22	0.29	0.37
Na2O	4.92	9.01	3.47	0.81	1.71	1.91
K2O	9.61	1.13	5.40	1.70	2.27	2.75
BaO	0.10	B-0.03	B-0.01		B-0.00	
Total:	100.67	100.74	98.24		95.85	
An	1.5	17.4	3.0		4.8	
Ab	43.1	76.3	47.9		50.8	
Or	55.4	6.3	49.1		44.4	
Notes:	1	1	2		3(?),5	
# Anal. Avgd.:	7	14	15		10	
Name:	Sanidine	Plag.	See Notes		See Notes	

An, Ab, Or are molecular amounts of Ca, Na and K, calculated from the weight percents of CaO, Na2O and K2O and normalized to 100%. An, Ab and Or are calculated for Matrix analyses ONLY for comparison with relative proportions of Ca, Na and K in feldspars.

Notes: 1 - Feldspar Phenocrysts
2 - Devitrified Shard Matrix
3 - Coarsely crystalline or "vapor phase" altered lithophysal matrix.
4 - Crystalline fiamme (light and dark areas differentiated)
5 - Low totals due to porosity in areas analyzed.

* All Fe is reported as FeO. Amounts shown as "B-" are reported as analyzed, but are below detection limit and not included in totals.

Standard deviations (calculated for matrix only) are (n-1) weighted, and estimate sample errors at a 68% confidence level.

IMP DRMS Data Set ID: L04.A-08/01/84

Bence-Albee Corrected Feldspar Phenocryst and Xenocryst Analyses of Sample: USW G-1 1245

Point ID:	1	2	3	4	5	6	7	8	9	10
Element:										
SiO2	66.80	64.02	64.24	63.47	64.19	66.31	66.61	62.69	66.81	57.37
Al2O3	18.96	22.72	22.78	22.91	22.84	19.22	19.10	23.85	19.27	27.57
FeO*	B-0.06	B-0.09	B-0.09	B-0.08	B-0.08	B-0.09	B-0.05	B-0.05	B-0.06	B-0.04
MgO	B-0.00	B-0.00	B-0.00	B-0.00	B-0.00	B-0.00	B-0.00	B-0.00	B-0.00	B-0.00
CaO	0.21	3.97	3.94	3.67	3.76	0.34	0.21	4.67	0.41	8.43
Na2O	4.25	8.54	8.59	8.72	8.89	4.93	4.14	8.39	6.35	6.67
K2O	10.90	1.10	1.01	1.26	1.08	8.89	10.30	0.96	6.99	0.36
BaO	B-0.12	B-0.00	B-0.00	B-0.00	B-0.00	B-0.00	B-0.01	B-0.01	0.20	B-0.00
Total:	101.12	100.35	100.56	100.03	100.76	99.69	100.36	100.56	100.03	100.40
An	1.0	19.1	19.0	17.5	17.8	1.7	1.1	22.2	2.0	40.3
Ab	36.8	74.5	75.1	75.3	76.1	45.0	37.5	72.3	56.8	57.7
Or	62.2	6.3	5.8	7.2	6.1	53.3	61.4	5.4	41.2	2.0
Name:	Sanidine	Plag.	Plag.	Plag.	Plag.	Sanidine	Sanidine	Plag.	Sanidine	Plag.

An, Ab, Or are molecular amounts of Ca, Na and K, calculated from the weight percents of CaO, Na2O and K2O and normalized to 100%.

* All Fe is reported as FeO. Amounts shown as "B-" are reported as analyzed, but are below detection limit and not included in totals.

YMP DRMS Data Set ID: 51/L04-4/19/90

Bence-Albee Corrected Feldspar Phenocryst and Xenocryst Analyses of Sample: USW G-1 1245 (Continued)

Point ID:	11	12
Element:		
SiO2	62.81	64.41
Al2O3	22.33	22.54
FeO*	B-0.07	B-0.08
MgO	B-0.00	B-0.00
CaO	3.30	3.48
Na2O	8.87	8.97
K2O	1.27	1.09
BaO	B-0.00	B-0.00
Total:	98.58	100.49
An	15.8	16.6
Ab	76.9	77.3
Or	7.2	6.2
Name:	Plag.	Plag.

An, Ab, Or are molecular amounts of Ca, Na and K, calculated from the weight percents of CaO, Na2O and K2O and normalized to 100%.

* All Fe is reported as FeO. Amounts shown as "B-" are reported as analyzed, but are below detection limit and not included in totals.

YMP DRMS Data Set ID: S1/L04-4/19/90

Bence-Albee Corrected Matrix and Glass Fragment Analyses of Sample: USW G-1 1245

Point ID:	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10
Element:										
SiO2	79.86	86.79	100.24	70.52	81.82	75.90	97.40	101.97	80.75	66.79
Al2O3	12.58	8.28	0.31	16.69	11.01	13.64	2.63	0.13	12.78	18.57
FeO*	0.62	0.50	B-0.03	B-0.06	0.72	0.71	B-0.05	B-0.04	0.55	0.32
MgO	0.07	B-0.04	B-0.00	B-0.00	0.09	0.07	B-0.01	B-0.00	B-0.02	B-0.00
CaO	0.30	0.11	B-0.00	0.36	0.61	0.15	0.20	B-0.00	0.18	B-0.05
Na2O	3.31	1.90	B-0.05	4.71	3.65	2.95	0.80	B-0.00	3.24	3.87
K2O	5.06	3.80	.04	6.80	2.49	6.00	0.32	B-0.01	5.80	9.89
MnO	B-0.10	B-0.00	B-0.00	B-0.02	0.05	B-0.01	B-0.00	B-0.00	B-0.06	B-0.00
TiO2	B-0.06	B-0.00	B-0.00	B-0.00	B-0.07	B-0.08	B-0.10	B-0.01	B-0.10	B-0.00
Total:	101.80	101.38	100.55	99.08	100.44	99.42	101.35	102.10	103.30	99.44
An	2.4	1.4		2.1	6.0	1.2			1.4	0.0
Ab	48.6	42.6		50.2	64.9	42.3			45.3	37.3
Or	48.9	56.0		47.7	29.1	56.6			53.3	62.7
Comment:	Quartz-Feldspar	Quartz-Feldspar	Tridymite?	Repl. Cryst.	Repl. Cryst.	Fracture Fill	Mostly Quartz	Quartz	Repl. Cryst.	Repl. Feldspar

An, Ab, Or are molecular amounts of Ca, Na and K, calculated from the weight percents of CaO, Na2O and K2O and normalized to 100%. These are calculated ONLY for comparison with feldspar data, and are not calculated if silica phases are dominant.

* All Fe is reported as FeO. Amounts shown as "B-" are reported as analyzed, but are below detection limit and not included in totals.

YMP DRMS Data Set ID: 51/L04-4/19/90

Bence-Albee Corrected Matrix and Glass Fragment Analyses of Sample: USW G-1 1245 (Continued)

Point ID:	D11	D12	D13	D14	SH-1	SH-2	SH-3	SH-4	SH-5	PU-1
Element:										
SiO2	102.74	101.44	73.69	88.22	77.83	79.03	79.65	80.14	79.26	79.52
Al2O3	0.19	0.92	14.88	8.33	13.38	12.54	12.74	12.65	11.62	12.64
FeO*	B-0.02	B-0.04	0.77	B-0.05	0.64	0.80	0.56	0.44	0.68	0.39
MgO	B-0.00	B-0.00	B-0.03	B-0.00	0.06	0.06	B-0.04	B-0.02	B-0.04	B-0.01
CaO	B-0.00	B-0.00	0.11	B-0.06	0.34	0.17	1.43	0.15	0.66	0.25
Na2O	B-0.00	0.07	3.11	1.91	3.00	3.01	4.30	3.01	3.96	3.00
K2O	B-0.01	0.27	7.67	3.91	5.73	5.93	2.33	5.99	2.71	5.65
MnO	B-0.03	B-0.00	B-0.01	B-0.06	B-0.06	B-0.03	B-0.00	B-0.00	B-0.08	B-0.06
TiO2	B-0.06	B-0.00	B-0.06	B-0.01	B-0.08	B-0.07	B-0.05	0.17	B-0.09	B-0.00
Total:	102.93	102.70	100.23	102.37	100.98	101.54	101.01	102.55	98.89	101.45
An			0.7	0.0	2.7	1.3	11.9	1.2	6.0	2.0
Ab			37.8	42.6	43.1	43.0	64.9	42.8	64.8	43.8
Or			61.4	57.4	54.2	55.7	23.1	56.0	29.2	54.2
Comment:	Quartz	Quartz	Quartz-Feldspar	Quartz-Feldspar	Devit. Shard	Devit. Shard	Devit. Shard	Devit. Shard	Devit. Shard	Devit. Pumice

An, Ab, Or are molecular amounts of Ca, Na and K, calculated from the weight percents of CaO, Na2O and K2O and normalized to 100%. These are calculated ONLY for comparison with feldspar data, and are not calculated if silica phases are dominant.

* All Fe is reported as FeO. Amounts shown as "B-" are reported as analyzed, but are below detection limit and not included in totals.

YMP DRMS Data Set ID: 51/L04-4/19/90

Bence-Albee Corrected Opaque Oxide Analyses of Sample: USW G-1 1245

Point ID:	O1
Element:	
SiO2	0.12
TiO2	9.06
Al2O3	0.94
V2O5	B-0.08
Cr3O3	B-0.00
FeO*	81.30
MnO	0.26
MgO	B-0.01
CaO	B-0.01
Total:	91.68
Comment:	Titano-Magnetite

* All Fe is reported as FeO. Amounts shown as "B-" are reported as analyzed, but are below detection limit and not included in totals.

YMP DRMS Data Set ID: 51/L04-4/19/90

Bence-Albee Corrected Matrix Analyses of Sample: USW G-1 1315.2

Point IDs:	G1-G2	+/- Std Dev
Element:		
SiO2	74.10	0.60
Al2O3	11.70	0.10
FeO*	0.51	0.20
MnO	B-0.04	
MgO	0.03	0.02
CaO	0.44	0.05
Na2O	3.27	0.17
K2O	4.88	0.08
BaO	B-0.00	
Total:	94.93	
An	3.6	
Ab	48.6	
Or	47.8	
Notes:	1,2	
# Anal. Avgd.:	20	
Name:	Glass	

An, Ab, Or are molecular amounts of Ca, Na and K, calculated from the weight percents of CaO, Na2O and K2O and normalized to 100%. An, Ab and Or are calculated for Matrix analyses ONLY for comparison with relative proportions of Ca, Na and K in feldspars.

Notes: 1 - Glassy Shards in Vitrophyre
2 - Low totals due to porosity in areas analyzed

* All Fe is reported as FeO. Amounts shown as "B-" are reported as analyzed, but are below detection limit and not included in totals.

Standard deviations are (n-1) weighted, and estimate sample errors at a 68% confidence level.

YMP DRMS Data Set ID: L04.A-08/01/84

Bence-Albee Corrected Feldspar Phenocryst and Xenocryst Analyses of Sample: USW G-1 1594.8

Point ID:	FPZ1	FPZ2B	FPZ2C	FPZ2D	FPZ2E	FS1A	FS1B	FS2A	FS2B
Element:									
SiO2	58.73	64.74	65.95	62.65	63.19	65.02	64.24	64.52	64.82
Al2O3	25.90	23.38	22.13	23.59	23.65	19.12	19.25	19.20	18.91
FeO*	0.13	0.19	0.17	0.16	0.14	0.10	0.11	0.10	0.10
MnO	B-0.00	B-0.00	B-0.00	B-0.00	B-0.00	B-0.01	B-0.01	B-0.04	B-0.00
MgO	B-0.00	B-0.00	B-0.00	B-0.00	B-0.00	B-0.00	B-0.00	B-0.00	B-0.00
CaO	7.27	3.99	3.43	4.37	4.42	0.23	0.20	0.20	0.19
Na2O	7.14	8.51	6.38	8.32	8.56	3.97	3.04	3.39	3.37
K2O	0.59	1.14	3.08	1.43	1.04	10.01	11.35	10.59	10.24
Total:	99.76	101.95	101.14	100.52	101.00	98.45	98.19	98.00	97.63
An	34.8	19.2	18.4	20.7	20.9	1.2	1.0	1.1	1.0
Ab	61.8	74.2	61.9	71.3	73.2	37.2	28.6	32.4	33.0
Or	3.4	6.5	19.7	8.1	5.9	61.7	70.3	66.6	66.0
Name:	Plag.	Plag.	Plag.	Plag.	Plag.	Sanidine	Sanidine	Sanidine	Sanidine
Notes:	1	2	2	2	2	3	3	4	4

An, Ab, Or are molecular amounts of Ca, Na and K, calculated from the weight percents of CaO, Na2O and K2O and normalized to 100%.

Notes: 1 - Optically unzoned phenocryst
2 - Optically zoned (distinct core) but chemically unzoned
3 - Two parts of glomerocryst
4 - Not notably zoned. FS3 and FS5 in lithic fragments.

* All Fe is reported as FeO. Amounts shown as "B-" are reported as analyzed, but are below detection limit and not included in totals.

YMP DRMS Data Set ID: 51/L04-4/19/90

Bence-Albee Corrected Feldspar Phenocryst and Xenocryst Analyses of Sample: USW G-1 1594.8 (Continued)

Point ID:	FS3A	FS3B	FS4	FS5
Element:				
SiO2	66.01	66.20	65.67	66.57
Al2O3	19.47	19.45	19.29	18.85
FeO*	0.13	0.10	0.10	0.09
MnO	B-0.00	B-0.04	B-0.00	B-0.02
MgO	B-0.00	B-0.00	B-0.00	B-0.00
CaO	0.24	0.23	0.24	0.20
Na2O	3.40	3.38	3.54	2.33
K2O	10.60	10.48	10.59	11.18
Total:	99.85	99.84	99.43	99.22
An	1.3	1.2	1.2	1.1
Ab	32.4	32.5	33.3	23.8
Or	66.4	66.3	65.5	75.1
Name:	Sanidine	Sanidine	Sanidine	Sanidine
Notes:	4	4	4	4

An, Ab, Or are molecular amounts of Ca, Na and K, calculated from the weight percents of CaO, Na2O and K2O and normalized to 100%.

Notes: 1 - Optically unzoned phenocryst
2 - Optically zoned (distinct core) but chemically unzoned
3 - Two parts of glomerocryst
4 - Not notably zoned. FS3 and FS5 in lithic fragments.

* All Fe is reported as FeO. Amounts shown as "B-" are reported as analyzed, but are below detection limit and not included in totals.

YMP DRMS Data Set ID: 51/L04-4/19/90

Bence-Albee Corrected Feldspar Phenocryst and Xenocryst Analyses of Sample: A1-1569

Point ID:	3	4	8
Element:			
SiO2	66.34	56.78	66.89
Al2O3	19.34	27.39	19.33
FeO*	B-0.06	0.11	B-0.05
MgO	B-0.02	B-0.00	B-0.00
CaO	0.18	8.60	0.13
Na2O	5.82	6.37	3.31
K2O	7.98	0.48	10.25
BaO	B-0.07	B-0.06	0.12
Total:	99.66	99.73	100.03
An	0.9	41.5	0.7
Ab	52.1	55.7	32.7
Or	47.0	2.8	66.6
Name:	Sanidine	Plag.	Sanidine

An, Ab, Or are molecular amounts of Ca, Na and K, calculated from the weight percents of CaO, Na2O and K2O and normalized to 100%.

* All Fe is reported as FeO. Amounts shown as "B-" are reported as analyzed, but are below detection limit and not included in totals.

YMP DRMS Data Set ID: 51/L04-4/19/90

Bence-Albee Corrected Matrix and Glass Fragment Analyses of Sample: A1-1569

Point ID:	G1	G2	G3	G4	G5	R1	R2	PU-3	X1	X2
Element:										
SiO2	65.42	69.05	79.63	72.74	72.84	55.54	69.22	66.53	59.17	66.47
Al2O3	13.19	10.86	5.38	9.10	8.05	13.29	12.85	11.83	10.73	14.18
FeO*	0.90	0.83	0.25	0.68	0.22	1.23	B-0.08	0.74	2.68	0.90
MgO	0.06	B-0.03	B-0.00	B-0.02	B-0.00	0.06	B-0.04	B-0.03	0.10	B-0.05
CaO	0.95	1.48	1.45	1.04	1.90	1.70	4.21	3.34	2.91	0.86
Na2O	0.75	0.75	0.67	0.58	0.96	0.55	1.09	1.11	0.74	0.77
K2O	7.01	5.20	1.20	4.00	2.58	5.89	3.25	2.79	2.62	7.43
MnO	B-0.01	B-0.07	B-0.05	B-0.04	B-0.06	B-0.00	B-0.07	B-0.05	B-0.09	B-0.06
TiO2	B-0.08	B-0.08	B-0.00	B-0.05	B-0.00	B-0.05	B-0.00	B-0.05	B-0.10	0.22
Total:	88.28	88.17	88.58	88.14	86.55	78.26	90.62	86.34	78.95	90.83
An	8.9	16.4	35.4	15.2	28.3	17.5	41.9	38.5	39.5	7.7
Ab	12.7	15.0	29.6	15.3	25.9	10.3	19.6	23.2	18.2	12.6
Or	78.3	68.6	34.9	69.5	45.8	72.2	38.5	38.3	42.3	79.7
Comment:	Zeolite & Glass(?)	Zeolite & Glass(?)	Glass with Zeolite	Glass with Zeolite	Glass with Zeolite	Zeolitized Pumice	Devit. Tuff	Zeolitized Perlite	Zeolite	Mostly Feldspar

An, Ab, Or are molecular amounts of Ca, Na and K, calculated from the weight percents of CaO, Na2O and K2O and normalized to 100%. These are calculated ONLY for comparison with feldspar data, and are not calculated if silica phases are dominant.

* All Fe is reported as FeO. Amounts shown as "B-" are reported as analyzed, but are below detection limit and not included in totals.

YMP DRMS Data Set ID: 51/L04-4/19/90

Bence-Albec Corrected Opaque Oxide Analyses of Sample: A1-1569

Point ID:	O1	O2	O3
Element:			
SiO2	1.98	0.45	0.64
TiO2	11.61	12.05	13.02
Al2O3	1.20	1.30	0.65
V2O5	0.10	B-0.04	B-0.07
Cr3O3	B-0.00	B-0.01	B-0.00
FeO*	74.88	78.30	77.01
MnO	0.50	0.37	1.60
MgO	0.09	0.04	0.05
CaO	0.10	B-0.02	B-0.00
Total:	90.46	92.51	92.97
Comment:	Titano-Magnetite	Titano-Magnetite	Titano-Magnetite

* All Fe is reported as FeO. Amounts shown as "B-" are reported as analyzed, but are below detection limit and not included in totals.

YMP DRMS Data Set ID: 51/L04-4/19/90

Bence-Albee Corrected Feldspar Phenocryst and Xenocryst Analyses of Sample: USW G-1 1617.0-A

Point ID:	FP1	FS2
Element:		
SiO2	64.47	66.08
Al2O3	23.92	19.09
FeO*	0.15	0.09
MnO	B-0.03	B-0.01
MgO	B-0.00	B-0.00
CaO	4.07	0.22
Na2O	8.40	3.44
K2O	1.77	10.77
Total:	102.78	99.69
An	19.0	1.1
Ab	71.1	32.3
Or	9.9	66.6
Name:	Plag.	Sanidine

An, Ab, Or are molecular amounts of Ca, Na and K, calculated from the weight percents of CaO, Na2O and K2O and normalized to 100%.

* All Fe is reported as FeO. Amounts shown as "B-" are reported as analyzed, but are below detection limit and not included in totals.

YMP DRMS Data Set ID: 51/L04-4/19/90

Bence-Albee Corrected Feldspar Phenocryst and Xenocryst Analyses of Sample: A1-2000

Point ID:	1	2	3	4	5	6	7	8	9	10
Element:										
SiO2	66.37	66.03	66.26	66.54	66.93	66.50	65.99	66.96	58.45	61.93
Al2O3	21.95	22.22	19.05	21.53	19.07	19.41	19.43	21.40	26.58	24.92
FeO*	0.13	0.18	0.11	0.16	0.12	0.09	0.14	0.09	0.24	0.17
MgO	B-0.00	B-0.00	B-0.00	B-0.00	B-0.00	B-0.00	B-0.00	B-0.00	B-0.00	B-0.00
CaO	2.35	2.52	0.24	2.42	0.24	0.30	0.35	2.34	8.37	5.98
Na2O	9.33	9.21	4.99	9.05	5.14	5.14	5.13	9.14	6.60	7.89
K2O	1.84	1.71	9.06	1.75	9.18	8.92	9.06	1.80	0.40	0.60
BaO	B-0.00	B-0.04	B-0.08	B-0.06	B-0.13	B-0.13	0.27	B-0.00	B-0.07	B-0.10
Total:	101.97	101.87	99.71	101.45	100.68	100.36	100.37	101.73	100.64	101.49
An	11.0	11.9	1.2	11.6	1.2	1.5	1.7	11.1	40.3	28.5
Ab	78.8	78.5	45.0	78.4	45.4	46.0	45.5	78.7	57.4	68.1
Or	10.2	9.6	53.8	10.0	53.4	52.5	52.8	10.2	2.3	3.4
Name:	K-Rich Plag.	K-Rich Plag.	Sanidine	K-Rich Plag.	Sanidine	Sanidine	Sanidine	K-Rich Plag.	Plag.	Plag.

An, Ab, Or are molecular amounts of Ca, Na and K, calculated from the weight percents of CaO, Na2O and K2O and normalized to 100%.

* All Fe is reported as FeO. Amounts shown as "B-" are reported as analyzed, but are below detection limit and not included in totals.

YMP DRMS Data Set ID: 51/L04-4/19/90

Bence-Albee Corrected Feldspar Phenocryst and Xenocryst Analyses of Sample: A1-2000 (Continued)

Point ID:	12	13	14	15	16	18	19
Element:							
SiO2	55.49	65.80	60.56	66.06	66.40	65.96	66.43
Al2O3	27.56	21.87	25.90	22.16	19.34	19.44	19.23
FeO*	0.28	0.15	B-0.06	0.09	0.11	0.13	0.09
MgO	B-0.00	B-0.00	B-0.00	B-0.00	B-0.00	B-0.00	B-0.00
CaO	8.99	2.34	7.03	2.86	0.29	0.24	0.28
Na2O	6.37	9.38	7.35	9.22	4.92	5.20	5.14
K2O	0.35	1.84	0.53	1.45	9.02	8.85	9.10
BaO	B-0.00	B-0.03	B-0.05	B-0.00	0.25	0.14	0.14
Total:	99.04	101.38	101.37	101.84	100.33	99.96	100.41
An	42.9	10.9	33.5	13.4	1.5	1.2	1.4
Ab	55.1	78.9	63.5	78.4	44.7	46.6	45.6
Or	2.0	10.2	3.0	8.1	53.9	52.2	53.1
Name:	Plag.	K-Rich Plag.	Plag.	K-Rich Plag.	Sanidine	Sanidine	Sanidine

An, Ab, Or are molecular amounts of Ca, Na and K, calculated from the weight percents of CaO, Na2O and K2O and normalized to 100%.

* All Fe is reported as FeO. Amounts shown as "B-" are reported as analyzed, but are below detection limit and not included in totals.

YMP DRMS Data Set ID: 51/L04-4/19/90

Bence-Albee Corrected Matrix and Glass Fragment Analyses of Sample: A1-2000

Point ID:	D1	D2	D3	Pu/X1	X2	X3	X4	X5
Element:								
SiO2	82.96	83.70	87.15	52.17	55.88	51.51	59.10	51.36
Al2O3	9.60	8.94	8.06	14.28	14.85	13.99	15.35	13.66
FeO*	0.58	0.81	0.65	0.35	1.30	0.11	1.04	1.94
MgO	B-0.00	B-0.02	B-0.00	0.08	B-0.01	0.11	B-0.00	0.07
CaO	0.37	0.35	0.24	0.26	0.12	0.21	0.09	0.19
Na2O	3.57	3.21	3.01	2.70	2.30	2.24	2.49	2.81
K2O	2.49	1.91	1.85	6.88	8.59	7.68	9.50	6.29
MnO	B-0.00	B-0.04	B-0.06	B-0.05	B-0.09	B-0.00	B-0.02	B-0.00
TiO2	B-0.03	B-0.05	B-0.06	B-0.00	B-0.05	B-0.00	B-0.00	B-0.04
Total:	99.57	98.92	100.96	76.72	83.04	75.85	87.57	76.32
An	3.8	4.2	3.0	1.9	0.8	1.6	0.6	1.5
Ab	66.0	68.9	69.0	36.6	28.7	30.2	28.3	39.8
Or	30.3	27.0	27.9	61.4	70.5	68.2	71.1	58.7
Comment:	Devit. Shards	Devit. Shards	Devit. Shards	Devit. Pumice	Devit. Pumice	Devit. Pumice	Devit. Pumice	Devit. Pumice

An, Ab, Or are molecular amounts of Ca, Na and K, calculated from the weight percents of CaO, Na2O and K2O and normalized to 100%.

* All Fe is reported as FeO. Amounts shown as "B-" are reported as analyzed, but are below detection limit and not included in totals.

YMP DRMS Data Set ID: 51/L04-4/19/90

Bence-Albee Corrected Feldspar Phenocryst and Xenocryst Analyses of Sample: A1-2389

Point ID:	1	2	3	4	5	6	7	8-1	8-2	8-3
Element:										
SiO2	65.90	64.52	61.06	65.85	59.21	64.37	65.68	63.40	63.39	64.71
Al2O3	22.38	22.25	24.34	21.61	25.01	22.13	19.14	21.90	22.48	22.32
FeO*	0.12	0.13	0.10	0.14	0.11	0.17	B-0.05	0.16	0.09	0.11
MgO	B-0.00	B-0.00	B-0.00	B-0.00	B-0.00	B-0.00	B-0.00	B-0.00	B-0.00	B-0.00
CaO	3.50	3.34	6.21	2.80	7.04	3.16	0.20	3.19	3.57	3.50
Na2O	6.59	9.14	7.74	8.85	7.52	9.07	4.24	8.96	9.14	8.97
K2O	1.32	1.34	0.58	1.36	0.54	1.19	10.45	1.27	1.20	1.20
BaO	B-0.12	B-0.00	B-0.06	B-0.13	B-0.04	B-0.04	0.45	B-0.01	B-0.09	B-0.02
Total:	99.81	100.72	100.03	100.61	99.43	100.09	100.16	98.88	99.87	100.81
An	20.6	15.6	29.7	13.7	33.1	15.1	1.0	15.3	16.6	16.5
Ab	70.2	77.0	67.0	78.4	63.9	78.2	37.8	77.5	76.8	76.7
Or	9.2	7.4	3.3	7.9	3.0	6.8	61.2	7.2	6.6	6.8
Name:	Plag.	Plag.	Plag.	Plag.	Plag.	Plag.	Sanidine	Plag. Zoned	Plag. Zoned	Plag. Zoned

An, Ab, Or are molecular amounts of Ca, Na and K, calculated from the weight percents of CaO, Na2O and K2O and normalized to 100%.

* All Fe is reported as FeO. Amounts shown as "B-" are reported as analyzed, but are below detection limit and not included in totals.

YMP DRMS Data Set ID: 51/L04-4/19/90

Bence-Albee Corrected Feldspar Phenocryst and Xenocryst Analyses of Sample: A1-2389 (Continued)

Point ID:	9	10	11	12	13	14	15	16	20	21	22
Element:											
SiO2	64.20	64.33	63.84	62.74	62.83	63.04	63.96	63.84	62.48	63.96	64.55
Al2O3	19.17	21.97	18.86	22.36	22.86	22.79	22.22	22.81	22.35	22.22	22.13
FeO*	0.08	B-0.07	0.10	0.17	0.18	0.18	0.08	0.11	0.17	0.09	0.09
MgO	B-0.01	B-0.00	B-0.00	B-0.00	B-0.00	B-0.00	B-0.00	B-0.01	B-0.00	B-0.00	B-0.00
CaO	0.21	2.95	0.25	3.65	4.39	3.90	3.46	4.04	3.47	3.40	3.38
Na2O	4.35	9.25	4.25	8.94	8.57	8.69	8.97	8.90	8.94	9.34	9.25
K2O	10.01	1.40	10.20	1.08	0.83	1.02	1.28	1.12	1.07	1.23	1.26
BaO	0.50	B-0.08	0.67	B-0.08	B-0.12	B-0.00	B-0.11	B-0.00	0.15	B-0.09	B-0.00
Total:	98.02	99.90	98.17	98.94	99.66	99.62	99.97	100.82	98.63	100.24	100.66
An	1.0	13.8	1.2	17.3	21.0	18.7	16.3	18.8	16.6	15.6	15.6
Ab	39.4	78.4	38.3	76.6	74.2	75.5	76.5	75.0	77.3	77.7	77.4
Or	59.6	7.8	60.5	6.1	4.7	5.8	7.2	6.2	6.1	6.7	6.9
Name:	Sanidine	Plag.	Sanidine	Plag.	Plag.	Plag.	Plag.	Plag.	Plag.	Plag.	Plag.

An, Ab, Or are molecular amounts of Ca, Na and K, calculated from the weight percents of CaO, Na2O and K2O and normalized to 100%.

* All Fe is reported as FeO. Amounts shown as "B-" are reported as analyzed, but are below detection limit and not included in totals.

YMP DRMS Data Set ID: 51/L04-4/19/90

Bence-Albee Corrected Feldspar Phenocryst and Xenocryst Analyses of Sample: A1-2389 (Continued)

Point ID:	23	24	25	26
Element:				
SiO2	65.23	65.36	62.86	63.96
Al2O3	19.11	19.18	22.28	22.11
FeO*	B-0.08	B-0.07	0.15	0.13
MgO	B-0.00	B-0.00	B-0.00	B-0.00
CaO	0.23	0.25	3.43	3.19
Na2O	4.36	4.51	9.16	9.03
K2O	10.12	10.17	1.27	1.32
BaO	0.96	0.46	B-0.13	B-0.02
Total:	100.01	99.93	99.15	99.74
An	1.1	1.2	15.9	15.1
Ab	39.1	39.8	77.0	77.4
Or	59.7	59.0	7.0	7.4
Name:	Sanidine	Sanidine	Plag.	Plag.

An, Ab, Or are molecular amounts of Ca, Na and K, calculated from the weight percents of CaO, Na2O and K2O and normalized to 100%.

* All Fe is reported as FeO. Amounts shown as "B-" are reported as analyzed, but are below detection limit and not included in totals.

YMP DRMS Data Set ID: 51/L04-4/19/90

Bence-Albee Corrected Matrix and Glass Fragment Analyses of Sample: A1-2389

Point ID:	G1	G2	G3	D1	D2	D3	PU1	R1	R2	R3
Element:										
SiO2	50.10	89.08	82.55	99.84	99.52	58.97	98.99	59.28	87.96	65.66
Al2O3	13.59	7.46	9.17	0.51	1.41	14.40	2.08	16.41	6.69	20.95
FeO*	0.12	B-0.09	0.32	B-0.02	B-0.00	B-0.08	B-0.04	0.16	0.13	0.17
MgO	B-0.03	B-0.00	B-0.00	B-0.03	B-0.00	B-0.00	B-0.00	B-0.03	B-0.03	B-0.00
CaO	0.14	0.22	0.20	B-0.02	B-0.00	0.61	B-0.00	0.74	0.20	2.65
Na2O	2.08	2.52	2.38	0.12	0.28	5.42	0.32	4.71	1.77	8.60
K2O	7.72	2.42	3.98	0.14	0.81	3.35	1.08	5.91	3.05	1.56
MnO	B-0.01	B-0.00	B-0.00	B-0.00	B-0.00	B-0.02	B-0.01	B-0.03	0.21	B-0.00
TiO2	B-0.00	B-0.02	B-0.00	B-0.00	B-0.04	B-0.08	B-0.00	B-0.02	B-0.10	B-0.00
Total:	73.75	101.70	98.60	100.61	102.02	82.75	102.47	87.21	100.01	99.59
An	1.1	2.9	2.2			4.2	0.0	4.5	2.8	13.2
Ab	28.7	59.5	46.6			68.1	31.0	52.3	45.5	77.5
Or	70.2	37.6	51.3			27.7	69.0	43.2	51.6	9.3
Comment:	Devit. Matrix	Devit. Matrix	Devit. Matrix	Devit. Tridymite?	Devit. Tridymite?	Devit. Matrix	Devit. Silica	Devit. Matrix	Devit. Matrix	Devit. Matrix

An, Ab, Or are molecular amounts of Ca, Na and K, calculated from the weight percents of CaO, Na2O and K2O and normalized to 100%. These are calculated ONLY for comparison with feldspar data, and are not calculated if silica phases are dominant.

* All Fe is reported as FeO. Amounts shown as "B-" are reported as analyzed, but are below detection limit and not included in totals.

YMP DRMS Data Set ID: 51/L04-4/19/90

Bence-Albee Corrected Opaque Oxide Analyses of Sample: A1-2389

Point ID:	O2	O3
Element:		
SiO2	0.08	0.31
TiO2	15.46	10.78
Al2O3	0.61	1.02
V2O5	B-0.00	0.18
Cr3O3	B-0.10	B-0.06
FeO*	79.50	79.28
MnO	0.67	0.63
MgO	B-0.01	B-0.00
CaO	0.05	B-0.04
Total:	96.37	92.20
Comment:	Titano-Magnetite	Titano-Magnetite

* All Fe is reported as FeO. Amounts shown as "B-" are reported as analyzed, but are below detection limit and not included in totals.

YMP DBMS Data Set ID: 51/L04-4/19/90

Bence-Albee Corrected Feldspar Phenocryst and Xenocryst Analyses of Sample: A1-2429

Point ID:	1	2	3	4	5	6	7	8	10	11
Element:										
SiO2	66.60	64.36	64.55	63.89	64.84	65.08	63.28	66.02	66.31	66.14
Al2O3	18.72	19.24	18.93	22.46	18.65	18.61	22.42	18.56	18.52	21.77
FeO*	0.12	B-0.07	0.13	0.08	0.12	0.11	0.10	0.11	0.11	0.17
MgO	B-0.00	B-0.00	B-0.00	B-0.00	B-0.00	B-0.00	B-0.00	B-0.00	B-0.00	B-0.00
CaO	0.23	0.22	0.26	3.57	0.26	0.16	3.64	0.24	0.21	3.22
Na2O	4.22	4.20	4.25	9.31	4.16	4.17	9.10	4.16	4.16	9.12
K2O	9.85	10.11	9.37	1.30	10.14	9.83	1.21	10.17	10.20	1.08
BaO	0.69	0.53	0.61	B-0.09	0.76	0.46	B-0.04	0.58	0.35	B-0.03
Total:	100.43	98.68	98.10	100.61	98.93	98.42	99.75	99.84	99.86	101.50
An	1.2	1.1	1.4	16.3	1.3	0.8	16.9	1.2	1.1	15.3
Ab	39.0	38.3	40.3	76.7	37.9	38.9	76.4	37.9	37.9	78.6
Or	59.9	60.6	58.4	7.0	60.8	60.3	6.7	60.9	61.1	6.1
Name:	Sanidine	Sanidine	Sanidine	Plag.	Sanidine	Sanidine	Plag.	Sanidine	Sanidine	Plag.

An, Ab, Or are molecular amounts of Ca, Na and K, calculated from the weight percents of CaO, Na2O and K2O and normalized to 100%.

* All Fe is reported as FeO. Amounts shown as "B-" are reported as analyzed, but are below detection limit and not included in totals.

YMP DRMS Data Set ID: 51/L04-4/19/90

Bence-Albee Corrected Feldspar Phenocryst and Xenocryst Analyses of Sample: A1-2429 (Continued)

Point ID:	12	13	15	16	17
Element:					
SiO2	63.27	65.59	64.68	65.34	64.51
Al2O3	22.92	21.82	18.79	22.29	22.31
FeO*	0.18	0.19	0.12	0.19	0.10
MgO	B-0.00	B-0.00	B-0.00	B-0.00	B-0.00
CaO	4.28	3.09	0.21	3.95	3.29
Na2O	8.39	8.87	4.12	8.72	9.37
K2O	0.88	1.29	9.97	1.03	1.38
BaO	B-0.12	B-0.06	0.62	B-0.06	B-0.03
Total:	99.92	100.85	98.51	101.52	100.96
An	20.9	14.9	1.1	18.8	15.0
Ab	74.0	77.6	38.2	75.3	77.5
Or	5.1	7.4	60.8	5.9	7.5
Name:	Plag.	Plag.	Sanidine	Plag.	Plag.

An, Ab, Or are molecular amounts of Ca, Na and K, calculated from the weight percents of CaO, Na2O and K2O and normalized to 100%.

* All Fe is reported as FeO. Amounts shown as "B-" are reported as analyzed, but are below detection limit and not included in totals.

YMP DRMS Data Set ID: 51/L04-4/19/90

Bence-Albee Corrected Matrix and Glass Fragment Analyses of Sample: A1-2429

Point ID:	G1	G2	G3	D1	D2	R1	R2
Element:							
SiO2	95.40	61.00	64.16	63.49	65.61	100.57	64.26
Al2O3	2.83	16.74	15.84	18.68	18.94	0.35	20.61
FeO*	B-0.07	0.12	0.23	0.12	0.28	0.70	0.39
MgO	B-0.00	B-0.00	B-0.01	B-0.04	0.09	0.15	0.21
CaO	B-0.06	0.58	0.32	0.88	0.19	B-0.01	1.90
Na2O	0.77	3.48	2.54	6.54	2.46	0.11	7.13
K2O	0.75	7.88	9.11	4.55	10.86	0.17	2.89
MnO	B-0.05	B-0.07	B-0.01	B-0.00	B-0.04	B-0.04	B-0.00
TiO2	B-0.03	B-0.02	B-0.05	B-0.00	B-0.00	B-0.05	B-0.00
Total:	99.75	89.80	92.20	94.26	98.43	102.05	97.39
An		3.6	2.0	4.9	1.1		10.4
Ab		38.7	29.2	65.3	25.3		70.7
Or		57.7	68.8	29.9	73.6		18.9
Comment:	Silica Dominant	Sanidine Dominant	Sanidine Dominant	Rock Frag. Na-K Feldsp.	Rock Frag. Sanidine	Rock Frag. Quartz	Rock Frag. Na-K Feldsp.

An, Ab, Or are molecular amounts of Ca, Na and K, calculated from the weight percents of CaO, Na2O and K2O and normalized to 100%. These are calculated ONLY for comparison with feldspar data, and are not calculated if silica phases are dominant.

* All Fe is reported as FeO. Amounts shown as "B-" are reported as analyzed, but are below detection limit and not included in totals.

YMP DRMS Data Set ID: 51/L04-4/19/90

Bence-Albee Corrected Opaque Oxide Analyses of Sample: A1-2429

Point ID:	O1	O2
Element:		
SiO2	0.11	0.14
TiO2	10.90	10.51
Al2O3	0.60	0.56
V2O5	0.10	0.13
Cr3O3	B-0.01	B-0.00
FeO*	79.68	79.29
MnO	1.12	1.04
MgO	0.18	0.06
CaO	0.05	B-0.03
Total:	92.74	91.73
Comment:	Titano-Magnetite	Titano-Magnetite

* All Fe is reported as FeO. Amounts shown as "B-" are reported as analyzed, but are below detection limit and not included in totals.

YMP DRMS Data Set ID: 51/L04-4/19/90

Bence-Albee Corrected Feldspar Phenocryst and Xenocryst Analyses of Sample: A1-2499

Point ID:	2	3	4	5P	6	8	9	11	12	13
Element:										
SiO2	65.78	65.33	65.54	63.26	64.83	66.95	64.13	66.59	64.70	65.19
Al2O3	19.27	19.16	22.39	22.6	23.02	19.50	23.30	19.36	19.23	19.37
FeO*	0.12	0.11	0.15	0.09	0.17	0.12	0.19	0.11	0.10	0.13
MgO	B-0.00	B-0.00	B-0.00	B-0.00	B-0.00	B-0.00	B-0.00	B-0.00	B-0.00	B-0.00
CaO	0.24	0.24	3.30	3.63	3.58	0.22	3.77	0.17	0.21	0.23
Na2O	4.25	4.25	8.85	9.04	8.92	4.09	8.83	4.27	4.29	4.22
K2O	10.57	10.24	1.26	1.16	1.08	10.32	1.12	10.47	10.08	9.61
BaO	B-0.12	0.34	B-0.05	B-0.00	B-0.08	0.42	B-0.04	0.27	0.23	0.74
Total:	100.23	99.67	101.49	99.78	101.60	101.62	101.34	101.24	98.84	99.49
An	1.2	1.2	15.9	17.0	17.0	1.1	17.9	0.8	1.1	1.2
Ab	37.5	38.2	76.9	76.5	76.8	37.2	75.8	37.9	38.9	39.5
Or	61.3	60.6	7.2	6.5	6.1	61.7	6.3	61.2	60.1	59.3
Name:	Sanidine	Sanidine	Plag.	Plag.	Plag.	Sanidine	Plag.	Sanidine	Sanidine	Sanidine

An, Ab, Or are molecular amounts of Ca, Na and K, calculated from the weight percents of CaO, Na2O and K2O and normalized to 100%.

* All Fe is reported as FeO. Amounts shown as "B-" are reported as analyzed, but are below detection limit and not included in totals.

YMP DRMS Data Set ID: 51/L04-4/19/90

Bence-Albee Corrected Feldspar Phenocryst and Xenocryst Analyses of Sample: A1-2499 (Continued)

Point ID:	14P	15	16
Element:			
SiO2	64.36	63.40	66.13
Al2O3	22.32	22.76	22.43
FeO*	0.08	0.16	0.16
MgO	B-0.00	B-0.00	B-0.00
CaO	3.40	3.57	2.74
Na2O	9.20	8.92	8.97
K2O	1.18	1.10	1.41
BaO	B-0.00	B-0.04	B-0.06
Total:	100.54	99.91	101.84
An	15.8	17.0	13.3
Ab	77.6	76.8	78.6
Or	6.5	6.2	8.1
Name:	Plag.	Plag.	Plag.

An, Ab, Or are molecular amounts of Ca, Na and K, calculated from the weight percents of CaO, Na2O and K2O and normalized to 100%.

* All Fe is reported as FeO. Amounts shown as "B-" are reported as analyzed, but are below detection limit and not included in totals.

YMP DRMS Data Set ID: 51/L04-4/19/90

Bence-Albee Corrected Matrix and Glass Fragment Analyses of Sample: A1-2499

Point ID:	(D&G)1	(D&G)2	(D&G)3	(D&G)4	D5	D6	D7
Element:							
SiO2	100.68	46.76	99.37	90.89	95.77	91.87	83.45
Al2O3	0.29	18.19	1.68	4.37	4.19	4.16	7.38
FeO*	B-0.03	0.20	B-0.05	B-0.04	B-0.06	B-0.03	B-0.02
MgO	B-0.00	0.51	0.12	B-0.03	B-0.00	B-0.00	B-0.00
CaO	B-0.00	0.48	0.12	0.18	0.08	B-0.00	0.14
Na2O	B-0.06	1.18	B-0.05	0.91	0.43	0.72	1.62
K2O	0.05	5.63	0.12	1.24	1.62	3.31	3.29
MnO	B-0.00	B-0.00	B-0.00	B-0.03	B-0.04	B-0.00	B-0.00
TiO2	B-0.01	B-0.00	B-0.00	B-0.00	B-0.00	B-0.05	B-0.01
Total:	101.02	72.95	101.41	97.59	102.09	100.06	95.88
An		5.2		5.4	2.9	0.0	2.0
Ab		22.9		49.9	27.9	24.8	41.9
Or		71.9		44.7	69.2	75.2	56.1
Comment:	Quartz & Tridymite?	Feldspar Porous	Quartz & Tridymite?	Quartz + Feldspar	Quartz + Feldspar	Quartz + K-Feldspar	Quartz + Feldspar

An, Ab, Or are molecular amounts of Ca, Na and K, calculated from the weight percents of CaO, Na2O and K2O and normalized to 100%. These are calculated ONLY for comparison with feldspar data, and are not calculated if silica phases are dominant.

* All Fe is reported as FeO. Amounts shown as "B-" are reported as analyzed, but are below detection limit and not included in totals.

YMP DRMS Data Set ID: 51/L04-4/19/90

Bence-Albee Corrected Opaque Oxide Analyses of Sample: A1-2499

Point ID:	O1	O2	O3	O4
Element:				
SiO2	0.22	0.13	0.14	0.35
TiO2	7.05	42.14	8.98	11.80
Al2O3	0.43	0.33	0.72	1.45
V2O5	B-0.07	0.14	B-0.00	B-0.07
Cr3O3	B-0.00	B-0.01	B-0.00	B-0.01
FeO*	78.50	59.51	83.35	71.62
MnO	3.48	2.89	2.11	4.26
MgO	0.14	0.09	0.12	0.32
CaO	B-0.02	B-0.02	B-0.03	B-0.03
Total:	89.82	105.23	95.42	89.80
Comment:	Titano-Magnetite	Ilmenite	Titano-Magnetite	Titano-Magnetite

(Note: All analyses show relatively high MnO content.)

* All Fe is reported as FeO. Amounts shown as "B-" are reported as analyzed, but are below detection limit and not included in totals.

YMP DRMS Data Set ID: 51/L04-4/19/90

Bence-Albee Corrected Feldspar Phenocryst and Xenocryst Analyses of Sample: USW G-1 2928.6

Point ID:	1S	2S	3P	5P	6P	7S	8S	9P-Z1	10P-Z2	11P-Z1
Element:										
SiO2	65.51	64.12	63.19	63.17	62.22	64.46	66.49	57.14	63.72	62.98
Al2O3	19.12	18.98	23.28	23.02	23.32	19.35	18.91	26.38	23.45	23.26
FeO*	B-0.07	B-0.05	0.12	0.11	0.10	B-0.08	B-0.06	0.15	0.11	0.12
MgO	B-0.00	B-0.00	B-0.00	B-0.00	B-0.01	B-0.00	B-0.00	B-0.00	B-0.00	B-0.00
CaO	0.20	0.19	4.46	4.59	4.63	0.31	0.18	8.30	4.80	4.44
Na2O	3.62	3.70	8.48	8.61	8.74	3.74	3.61	6.77	8.53	8.55
K2O	11.29	10.98	1.13	0.94	0.90	10.80	11.45	0.51	1.04	1.06
BaO	B-0.13	0.33	B-0.00	B-0.02	B-0.00	0.55	B-0.15	B-0.14	B-0.04	B-0.00
Total:	99.74	98.30	100.66	100.44	99.91	99.21	100.64	99.25	101.65	100.41
An	1.0	1.0	21.1	21.6	21.5	1.6	0.9	39.2	22.4	21.0
Ab	32.4	33.5	72.6	73.2	73.5	33.9	32.1	57.9	71.9	73.1
Or	66.6	65.5	6.4	5.3	5.0	64.5	67.0	2.9	5.8	6.0
Name:	Sanidine	Sanidine	Plag.	Plag.	Plag.	Sanidine	Sanidine	Plag. Zoned Core	Plag. Zoned Rim	Plag. Zoned Core

An, Ab, Or are molecular amounts of Ca, Na and K, calculated from the weight percents of CaO, Na2O and K2O and normalized to 100%.

* All Fe is reported as FeO. Amounts shown as "B-" are reported as analyzed, but are below detection limit and not included in totals.

YMP DRMS Data Set ID: 51/L04-4/19/90

Bence-Albee Corrected Feldspar Phenocryst and Xenocryst Analyses of Sample: USW G-1 2928.6 (Continued)

Point ID:	11P-Z2	13P-Z1	14P-Z2	15P-Z1	16P-Z2	18P-Z1	19P-Z2	20P-Z1	21P-Z2
Element:									
SiO2	63.38	61.26	64.07	60.97	58.80	59.73	62.20	63.30	57.80
Al2O3	22.57	23.69	22.97	23.76	25.25	24.64	22.67	23.01	26.22
FeO*	0.09	0.13	0.11	0.12	0.09	0.13	0.11	0.10	0.11
MgO	B-0.00	B-0.00	B-0.00	B-0.01	B-0.00	B-0.00	B-0.00	B-0.00	B-0.00
CaO	4.06	5.47	4.21	5.51	7.13	6.18	4.07	4.29	8.09
Na2O	9.06	8.17	8.70	8.20	7.36	7.88	8.78	9.14	7.05
K2O	1.08	0.84	1.18	0.81	0.61	0.74	1.13	0.77	0.51
BaO	B-0.00	B-0.05	B-0.01	B-0.02	B-0.10	B-0.11	B-0.01	B-0.05	B-0.13
Total:	100.24	99.56	101.24	99.37	99.24	99.30	98.96	100.61	99.78
An	18.7	25.7	19.7	25.9	33.7	29.0	19.1	19.7	37.7
Ab	75.4	69.6	73.7	69.6	62.9	66.9	74.6	76.1	59.5
Or	5.9	4.7	6.6	4.5	3.4	4.1	6.3	4.2	2.8
Name:	Plag. Zoned Rim	Plag. Zoned Core	Plag. Zoned Rim	Plag. Zoned Core	Plag. Zoned Rim	Plag. Zoned Core	Plag. Zoned Rim	Plag. Zoned Core	Plag. Zoned Rim

An, Ab, Or are molecular amounts of Ca, Na and K, calculated from the weight percents of CaO, Na2O and K2O and normalized to 100%.

* All Fe is reported as FeO. Amounts shown as "B-" are reported as analyzed, but are below detection limit and not included in totals.

YMP DRMS Data Set ID: 51/L04-4/19/90

Bence-Albee Corrected Matrix and Glass Fragment Analyses of Sample: USW G-1 2928.6

Point ID:	(D&G)1	(D&G)2	(D&G)3	Pu/X-1	Pu/X-2	X4	X5	X6
Element:								
SiO2	91.84	79.31	79.80	51.73	80.19	54.19	64.64	101.18
Al2O3	5.71	11.71	11.72	15.00	13.65	15.00	17.48	1.07
FeO*	B-0.03	0.21	0.18	0.19	0.30	0.25	0.17	B-0.05
MgO	B-0.00	0.01	B-0.01	0.13	B-0.00	0.09	B-0.02	B-0.02
CaO	B-0.06	0.12	0.83	0.47	1.03	0.24	B-0.00	B-0.01
Na2O	0.90	2.01	3.85	3.20	4.30	2.06	1.92	0.13
K2O	2.96	6.95	2.99	5.84	3.34	7.80	11.93	0.53
MnO	B-0.07	B-0.04	B-0.09	B-0.02	B-0.05	B-0.03	B-0.00	B-0.00
TiO2	B-0.00	B-0.05	B-0.08	B-0.02	B-0.05	B-0.01	B-0.00	B-0.00
Total:	101.41	100.32	99.37	76.56	102.81	79.63	96.14	102.91
An	0.0	1.0	7.3	3.6	8.1	1.8	0.0	
Ab	31.6	30.2	61.3	43.8	60.8	28.1	19.7	
Or	68.4	68.8	31.3	52.6	31.1	70.1	80.3	
Comment:	Devit. Qtz Feldspar	Devit. Qtz Feldspar	Devit. Qtz Feldspar	Qtz-Feldsp (Porous)	Quartz Feldspar	Qtz-Feldsp (Porous)	Devit. Feldspar	Quartz Dominant

An, Ab, Or are molecular amounts of Ca, Na and K, calculated from the weight percents of CaO, Na2O and K2O and normalized to 100%. These are calculated ONLY for comparison with feldspar data, and are not calculated if silica phases are dominant.

* All Fe is reported as FeO. Amounts shown as "B-" are reported as analyzed, but are below detection limit and not included in totals.

YMP DRMS Data Set ID: 51/L04-4/19/90

Bence-Albee Corrected Opaque Oxide Analyses of Sample: USW G-1 2928.6

Point ID:	O1
Element:	
SiO2	0.49
TiO2	8.98
Al2O3	0.96
V2O5	0.10
Cr3O3	B-0.00
FeO*	82.20
MnO	2.20
MgO	0.05
CaO	0.08
Total:	95.06
Comment:	Titano-Magnetite

* All Fe is reported as FeO. Amounts shown as "B-" are reported as analyzed, but are below detection limit and not included in totals.

YMP DRMS Data Set ID: 51/L04-4/19/90

Bence-Albee Corrected Feldspar Phenocryst and Xenocryst Analyses of Sample: USW G-1 2939.3

Point ID:	1	2-Z1	3-Z2	4-Z3	5	6	7	8-Z1	9-Z2	10-Z3
Element:										
SiO2	66.09	57.03	58.93	59.30	65.64	65.96	65.93	63.34	59.37	63.53
Al2O3	19.17	27.72	26.42	26.03	19.25	19.06	18.97	23.18	26.36	22.72
FeO*	B-0.06	0.17	0.14	0.15	B-0.05	B-0.05	0.06	B-0.08	0.16	0.12
MgO	B-0.00	B-0.00	B-0.00	B-0.00	B-0.00	B-0.00	B-0.00	B-0.00	B-0.00	B-0.00
CaO	0.14	8.81	7.74	7.40	0.19	0.18	0.14	3.80	7.36	3.60
Na2O	3.56	6.01	6.59	6.71	3.49	3.48	3.76	8.77	6.96	8.52
K2O	11.43	0.47	0.65	0.72	10.34	10.17	10.71	1.23	0.45	1.11
BaO	0.27	B-0.00	B-0.03	B-0.03	0.26	0.21	0.20	B-0.00	B-0.06	B-0.01
Total:	100.66	100.21	100.47	100.31	99.17	99.06	99.77	100.32	100.66	99.60
An	0.7	43.5	37.9	36.3	1.0	1.0	0.7	18.0	35.9	17.7
Ab	31.9	53.7	58.3	59.5	33.6	33.9	34.5	75.1	61.5	75.8
Or	67.4	2.8	3.8	4.2	65.4	65.2	64.7	6.9	2.6	6.5
Name:	Sanidine	Plag. Core	Plag. Intermed.	Plag. Rim	Sanidine	Sanidine	Sanidine	Plag. Core	Plag. Intermed.	Plag. Rim

An, Ab, Or are molecular amounts of Ca, Na and K, calculated from the weight percents of CaO, Na2O and K2O and normalized to 100%.

* All Fe is reported as FeO. Amounts shown as "B-" are reported as analyzed, but are below detection limit and not included in totals.

YMP DRMS Data Set ID: 51/L04-4/19/90

Bence-Albee Corrected Feldspar Phenocryst and Xenocryst Analyses of Sample: USW G-1 2939.3 (Continued)

Point ID:	11	12	13	15	16	17	20	22-Z1	23-Z2	24-Z1	25-Z2
Element:											
SiO2	61.89	60.62	65.33	63.84	66.45	65.82	66.19	64.07	60.60	59.19	63.47
Al2O3	23.09	23.96	18.92	23.23	19.01	19.01	19.23	23.28	25.14	26.22	23.40
FeO*	0.10	B-0.07	B-0.05	0.11	B-0.06	B-0.07	B-0.07	0.09	0.10	0.11	B-0.08
MgO	B-0.00	B-0.00	B-0.00	B-0.00	B-0.00	B-0.00	B-0.00	B-0.00	B-0.00	B-0.00	B-0.00
CaO	3.69	4.76	0.13	4.03	0.14	0.13	0.19	3.97	6.22	6.87	4.09
Na2O	8.54	8.25	3.39	8.36	3.52	3.55	3.58	8.67	7.35	6.94	8.36
K2O	1.19	0.77	10.91	1.04	11.88	11.94	10.88	0.70	0.61	0.56	0.98
BaO	B-0.03	B-0.00	0.87	B-0.10	B-0.10	B-0.05	0.12	B-0.04	B-0.09	B-0.04	B-0.00
Total:	98.50	98.36	99.55	100.61	101.00	100.45	100.19	100.78	100.02	99.89	100.30
An	17.9	23.1	0.7	19.8	0.7	0.6	1.0	19.4	30.7	34.2	20.1
Ab	75.2	72.5	31.9	74.2	30.8	30.9	33.0	76.6	65.7	62.5	74.2
Or	6.9	4.4	67.5	6.1	68.5	68.4	66.0	4.1	3.6	3.3	5.7
Name:	Plag.	Plag.	Sanidine	Plag.	Sanidine	Sanidine	Sanidine	Plag. Core	Plag. Rim	Plag. Core	Plag. Rim

An, Ab, Or are molecular amounts of Ca, Na and K, calculated from the weight percents of CaO, Na2O and K2O and normalized to 100%.

* All Fe is reported as FeO. Amounts shown as "B-" are reported as analyzed, but are below detection limit and not included in totals.

YMP DRMS Data Set ID: 51/L04-4/19/90

Bence-Albee Corrected Feldspar Phenocryst and Xenocryst Analyses of Sample: USW G-1 2939.3 (Continued)

Point ID:	26-Z1	27-Z2	29-Z1	30-Z2	33-Z1	34-Z2
Element:						
SiO2	60.03	62.61	55.94	62.65	63.40	60.12
Al2O3	25.36	23.41	28.38	22.86	23.31	25.07
FeO*	0.09	B-0.07	B-0.05	B-0.08	0.11	0.11
MgO	B-0.00	B-0.00	B-0.00	B-0.00	B-0.00	B-0.00
CaO	5.99	3.93	9.44	3.56	3.92	5.81
Na2O	7.53	8.24	5.65	8.75	8.57	7.51
K2O	0.58	1.08	0.46	1.27	0.78	0.82
BaO	B-0.00	B-0.08	B-0.01	B-0.00	B-0.00	0.23
Total:	99.58	99.27	99.87	99.09	100.09	99.67
An	29.5	19.5	46.7	17.0	19.3	28.5
Ab	67.1	74.1	50.6	75.7	76.2	66.7
Or	3.4	6.4	2.7	7.2	4.6	4.8
Name:	Plag. Core	Plag. Rim	Plag. Core	Plag. Rim	Plag. Core	Plag. Rim

An, Ab, Or are molecular amounts of Ca, Na and K, calculated from the weight percents of CaO, Na2O and K2O and normalized to 100%.

* All Fe is reported as FeO. Amounts shown as "B-" are reported as analyzed, but are below detection limit and not included in totals.

YMP DRMS Data Set ID: 51/L04-4/19/90

Bence-Albee Corrected Matrix and Glass Fragment Analyses of Sample: USW G-1 2939.3

Point ID:	(G&D)1	(G&D)2	(G&D)3	D4	D5	X1	X2	X3
Element:								
SiO2	82.40	85.89	85.16	93.12	86.33	45.48	56.83	51.29
Al2O3	10.49	8.79	10.21	6.19	9.20	13.09	15.65	14.19
FeO*	1.49	0.24	0.93	0.14	0.21	0.44	0.43	0.62
MgO	0.09	0.02	0.15	B-0.02	B-0.05	0.11	0.14	0.23
CaO	0.65	0.69	0.82	0.36	0.78	0.22	0.18	0.32
Na2O	3.96	3.43	4.13	2.19	3.78	1.53	2.22	1.50
K2O	2.28	1.18	1.20	1.26	1.17	7.18	9.67	7.17
MnO	0.04	B-0.00	B-0.09	B-0.03	B-0.03	B-0.00	B-0.00	B-0.01
TiO2	0.17	B-0.00	B-0.10	B-0.00	B-0.00	B-0.00	B-0.01	B-0.06
Total:	101.57	100.24	102.60	103.26	101.47	68.05	85.12	75.32
An	6.2	8.3	8.4	6.2	8.7	1.9	1.1	2.8
Ab	68.0	74.8	76.9	68.1	75.9	24.0	25.6	23.5
Or	25.8	16.9	14.7	25.8	15.5	74.1	73.3	73.8
Comment:	Quartz & Feldspar	Quartz & Feldspar	Quartz & Feldspar	Devit. Shard	Devit. Shard	Porous Clay-rich?	Porous Clay-rich?	Porous Clay-rich?

An, Ab, Or are molecular amounts of Ca, Na and K, calculated from the weight percents of CaO, Na2O and K2O and normalized to 100%. These are calculated ONLY for comparison with feldspar data, and are not calculated if silica phases are dominant.

* All Fe is reported as FeO. Amounts shown as "B-" are reported as analyzed, but are below detection limit and not included in totals.

YMP DRMS Data Set ID: 51/L04-4/19/90

Bence-Albee Corrected Opaque Oxide Analyses of Sample: USW G-1 2939.3

Point ID:	O1	O2
Element:		
SiO2	0.51	0.50
TiO2	8.73	0.28
Al2O3	0.93	0.79
V2O5	0.18	B-0.06
Cr3O3	0.10	B-0.06
FeO*	82.06	85.25
MnO	2.16	2.70
MgO	0.13	0.08
CaO	0.08	0.17
Total:	94.88	89.77
Comment:	Titano-Magnetite	Hematite in Lithic

* All Fe is reported as FeO. Amounts shown as "B-" are reported as analyzed, but are below detection limit and not included in totals.

YMP DRMS Data Set ID: 51/L04-4/19/90

APPENDIX E

APPLICABILITY TO REFERENCE INFORMATION BASE AND SITE AND ENGINEERING PROPERTIES DATA BASE

All data presented on the data compilation forms in Appendix B are intended for entry in the Site and Engineering Properties Data Base (SEPDB).

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