

LOS ALAMOS NATIONAL LABORATORY  
YUCCA MOUNTAIN PROJECT  
CHANGE REQUEST

CHANGE REQUEST No. 067  
DATE 8/1/89

RECEIVED AUG 3 1989

PROCEDURE No. TWS-ESS-DP-114, RO SAMPLE COLLECTION PROCEDURE FOR ROCK  
VARNISH STUDIES

CHANGE REQUESTED:

Replace fifth complete sentence on page 3, which reads:

Sample identification will include the collector's three initials and a sequence number unique to that collector's NNWSI notebook.

with:

Sample identification for one sample collected from each surface or deposit will include the collector's initials and a sequence number, in addition to a lab identification number, unique to that collector's YMP field notebook. For all additional samples collected from the same surface or deposit, the sample identification number will consist of the unique sequential lab identification number.

REASON FOR CHANGE:

It is often impossible to write the entire longer number on each rock clast due to size restrictions.

SUPERSEDED

By TWS-ESS-DP-114,121 on 3/2/90

CHANGE REQUESTED BY Charles D Harrington DATE 8-1-89

REVIEWED BY Lane Korman DATE 8-1-89

QAPL APPROVAL Larry W. Masser (acting QAPL) DATE 8-1-89

TPO APPROVAL R. J. Hubel DATE 8/3/89

EFFECTIVE DATE 8/8/89

LOS ALAMOS NATIONAL LABORATORY  
NNWSI  
CHANGE REQUEST

Change Request No. 29  
Rev 0  
Date 4/27/88

Procedure No. TWS-ESS-DP-114, RO SAMPLE COLLECTION PROCEDURE FOR ROCK VARNISH STUDIES

Change Requested: Start typing text here

Insert the following as the first paragraph in Section 4.3:

Rock varnish samples shall be packed for shipment to Los Alamos in a manner so as to preclude destruction of the varnished rock surface during transport. Each varnished clast will be individually wrapped in paper or other protective material and placed in a cloth sample bag on which sample identification numbers will be marked by a permanent marking pen. Sample bags containing rock varnish samples will be hand carried to Los Alamos whenever possible. If sample bags containing rock varnish samples are shipped to Los Alamos, they shall be packed in heavy cardboard shipping containers sturdy enough to preclude crushing of samples during transport.

Reason for Change: Start typing text here

LATA Audit No. LANL-NNWSI-88-03, Finding No. 3 found that the above indicated procedure did not adequately address handling requirements for the collected samples.

**SUPERSEDED**

By TWS-DP-114, R1 on 3/2/90

|                     |                             |      |                       |
|---------------------|-----------------------------|------|-----------------------|
| Change Requested By | <u>Charles D Harrington</u> | Date | <u>April 28, 1988</u> |
| Reviewed By         | <u>Wayne A Morris</u>       | Date | <u>April 28, 1988</u> |
| QAPL Approval       | <u>[Signature]</u>          | Date | <u>5/3/88</u>         |
| TPO Approval        | <u>[Signature]</u>          | Date | <u>5/3/88</u>         |
| Effective Date      | <u>May 3, 1988</u>          | Date | <u>5/3/88</u>         |

SAMPLE COLLECTION PROCEDURE FOR ROCK VARNISH STUDIES

Effective Date MAY 1, 1987

Charles D. Harrington  
PREPARED BY

4-20-87  
DATE

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4-20-87  
DATE

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4-21-87  
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QUALITY ASSURANCE SUPPORT

4/20/87  
DATE

**SUPERSEDED**

By TWS-ESS-DP-114, R1 on 3/2/90

## SAMPLE COLLECTION PROCEDURE FOR ROCK VARNISH STUDIES

### 1. PURPOSE

This procedure describes the methods to be used in the collection of rock varnish samples from geomorphic surfaces and deposits, on Yucca Mountain, on and near the Nevada Test Site, or other selected localities within the southern Great Basin. Rock varnish data are utilized for four types of geologic determinations. These are: (1) obtaining chronometric ages of geologic surfaces or deposits; (2) obtaining additional calibration points for the Yucca Mountain rock varnish dating curve; (3) the study of rock varnish development through time on stable geomorphic surfaces; and, (4) studying rock varnish chemistry. Selection of sampling locations, sample collection and identification, and documentation are described.

### 2. SCOPE

This procedure applies to all rock varnish samples taken for the NNWSI project. Data acquired from the analysis of samples obtained using this procedure will be used in site characterization and the activity is therefore Quality Level 1.

### 3. PRINCIPLES

Rock varnish coatings on cobbles from geomorphic surfaces and from exposed deposits in arid environments can be used to date these surfaces or deposits over an age range of several thousand to more than a million years. The ratio of mobile to immobile cations  $[(K + Ca)/Ti]$  has been found to decrease with time and provide a relative-age indicator for rock varnish from a given region. Calibration curves, constructed by determining varnish cation ratios (VCR's) on surfaces previously dated by isotopic techniques are used for the calibrated time interval to estimate the VCR age of unknown-age deposits within the region. Because of variations in climate, rates of dust deposition, and differences in dust chemistry a separate VCR curve is created for each specific region of study. VCR's are determined by SEM chemical analyses of varnish on disks (about 2.5 cm in diameter) cored from rock varnish samples. The VCR for each geomorphic surface or deposit to be dated is the average of the VCR's determined for the varnish on each sampled cobble.

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Varnish characteristics and chemistry vary both across an individual rock surface and among a group of rocks taken from a single geomorphic surface. Therefore, collection of duplicate samples having identical chemistry is not possible. The SEM technique of rock varnish dating, however, analyzes in situ varnish on rock substrates. All collected rock samples and all varnish cores cut from these rock samples are neither modified nor destroyed during analysis. All rock specimens and disks made from varnish cores are retained at Los Alamos, and thus are available for verification and reanalysis. All rock material collected during rock varnish studies and all disks made from these rock varnish samples will be archived in the NNWSI Sample Management Facility at NTS following the completion of NNWSI rock varnish studies.

#### 4. PROCEDURE

##### 4.1 Site selection and identification

Sample sites are located on rock outcrops, on desert pavements formed on geomorphic surfaces, or on other stabilized geomorphic deposits. The type of rock varnish samples collected as well as the characteristics of the sampling site are determined by the nature of the geologic problem being studied. The location of the sampling site will be recorded on an appropriate topographic, geologic, highway, or other map. The site location and description will be recorded in the collector's controlled field notebook. Photograph(s) of the site may also be taken and these will be labeled and dated and retained with the collector's controlled notebook.

##### 4.2 Sample collection and identification

Rock varnish samples are selected at the site by qualified Los Alamos or U.S. Geological Survey staff geologists. Samples of rock varnish are either collected as whole varnish coated surface clasts or as chips of varnished rock broken from surface clasts or outcrops of rock. The number of samples acquired for a surface depends on the degree of complexity of the surface but generally equals or exceeds eight. Samples are not collected in close proximity to lichens and other vegetation; to varnish formed along cracks; or rock surfaces in contact with soil. Wind-abraded and spalled rock surfaces are also avoided. Photographs are taken to show the character of the surface

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from which the samples are taken and that portion of the surface from which samples are collected. Rational for sample collection is recorded in the investigator's notebook. Samples selected are those possessing the most mature varnish development on the geomorphic surface to be sampled. Each sample will be labeled with a sample identification number. Sample identification will be sufficient to trace a sample to its original field location and collector. Sample identification will include the collector's three initials and a sequence number unique to that collector's NNWSI sample notebook. The sample will be marked by a permanent marking pen either on the sample itself, or on tape wrapping the sample, or on the sample bag. The sample number, hand specimen description of the varnished surface and the underlying lithologic substrate, and a field description of the surface position of the sample are recorded for each sample. Notations may be made on photographs taken of sampled surfaces.

#### 4.3 Sample shipment

Rock varnish samples hand-carried to Los Alamos shall be recorded in the sample receiving/tracking logbook. Rock varnish samples shipped to Los Alamos from Mercury/NTS or from another locality shall be handled in accord with Handling, Storage, and Shipping Procedures defined in a LANL implementation procedure. Upon receipt, a copy of the shipping manifest or a memo verifying receipt shall be put in the ESS-1 resident file along with a list of samples. Each shipment entry in the sample tracking logbook will be signed and dated by the recipient.

## 5.0 QUALITY ASSURANCE

### 5.1 Personnel

This rock varnish sampling procedure shall be performed by qualified personnel with a geoscience degree or who can demonstrate an equivalent combination of education and experience. Evidence of qualification shall be documented according to the LANL Personnel Certification Procedure.

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5.2 Calibration

Not applicable.

6.0 RECORDS

6.1 Documentation and traceability of samples are addressed in Sections 4.1 and 4.2.

6.2 Records will be controlled in accordance with the LANL NNWSI Records Control Procedure.

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