INFORMATION ITEM 9

Copy of example entries from S. Wells' field notebook #1

RECORDS PACKAGE TRANSMITTAL

SECTION I. RECORD SOURCE

SELECT ONE ☐ INDIVIDUAL RECORD ☒ RECORDS PACKAGE

PRIMARY RECORD IDENTIFIER	SELECT ONE	WBS NUMBER (to the third decimal)
LA-EES-13-LV-05-94-028	☐ QA ☒ QA: N/A	1.2.3.2

TITLE/SUBJECT Record Package for S. Wells Field Notebook #1
(SCPB: 8.3.1.8.5.1.3)

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(Use Additional Pages as Necessary)

DATE	DOCUMENT NUMBER	TITLE/SUBJECT	PAGE COUNT
05/17/90	TWS-EES-13-LV-12-89-06	Field Notebook #1 - S. Wells, Field Geologic Studies, Activity 8.3.1.8.5.1.3	48

TOTAL NUMBER OF PAGES (Including this page and continuation sheets): 49

RECORD SOURCE

NAME (Print) Bruce M. Crowe

SIGNATURE Bruce M. Crowe DATE 5-26-94

SECTION II. RECORDS PROCESSING CENTER

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NAME (Print) _____

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Los Alamos
Yucca Mountain Site
Characterization Project

EXAMPLE

Name DR. STEPHEN G. WELLS

Address ~~4945 Simms Court SE~~
~~Albuquerque, NM 87108~~

Phone ~~505 255 5477, 217 4204~~

6-1-91
SGWells

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714 867 5803
OR
Department of Earth Sciences
Geology Bld - 036
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Riverside, CA 92521
714 - 787 - 4367

Projects

TWS-EES-13-LV-12-89-06

FIELD NOTE BOOK #1

STEPHEN G. WELLS, Consultant

Bruce Crowe, P.I.

ACTIVITY 8.3.1.8.5.1.3

FIELD GEOLOGIC STUDIES

All entries in this notebook are covered under:
TWS-EES-13-LV-DP 606, R1
S. Wells 11-6-90

Start Date: May 17, 1990

STUDY PLAN – Characterization of Volcanic Features 8.3.1.8.5.1
SGW 11/7/90

ELAN Publishing Co., Inc.
Meredith, N.H. 03253

Projects (continued) . . . . . .

May 17, 1990

Location: NORTHERN end of Soda/Silver Lake playas, Near Baker, California

ACTIVITY: FIELD GEOLOGIC STUDIES; EXAMINATION of pluvial lake beach ridge sediments & soils AS AN ANALOG for soils & radiocarbon dating of soil carbonates in scoria deposits of cinder cones.

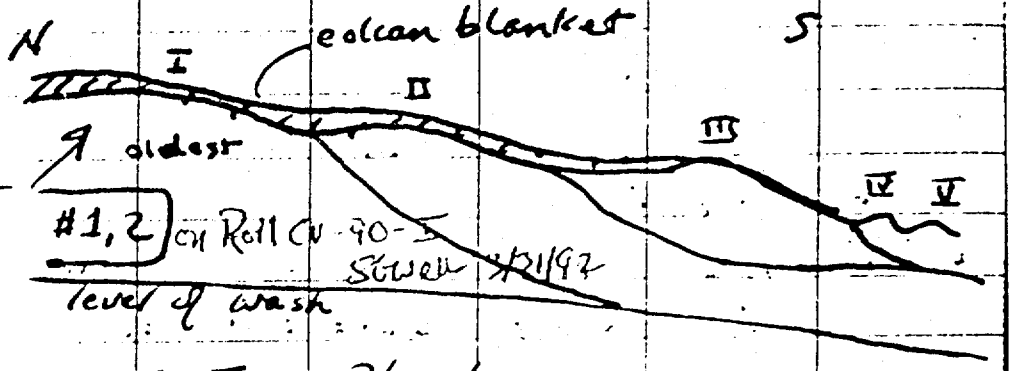
Accompanied by R. Amundsen (UC-Berkeley), Oliver Chadwick (JPL), & Leo McFadden (B&W Film Roll CV-90-I)

STOP 1: Examined Beach ridge sequence at Tidewater Basin on NORTHERN end of Silver Lake Playa; discussed relations between shoreline features & cones of Wells et al.

STOP 2: Examined five late Pleistocene and Holocene beach ridge sequence at El Capitan area northern end

(2)

of Silver Lake.
Discussed evidence for Pleistocene versus Holocene ages for beach ridge sequence; discussed relations between beach ridge sequence & eolian blanket over beach ridges:



Pho #1,2 on Roll CV-90-5 SSW 1/21/92

I, II, III = Pleistocene
IV & V = Holocene

Soil developed on eolian blanket & beach ridge with $CaCO_3$ (pedogenic) occurring as coatings on clasts & disseminated in eolian matrix.
SSW 1-27-92
Discussed types of clasts that should be sampled by Amundson & Chadwick.
Sampling (experimental) done by Amundson.

5/17/90 SSW 1-27-92

EXAMPLE

(8)

May 22, 1990

Location: Southern flank of "A" (Black Tank) cone, in SW part of Cima Volcanic field, California

Activity: Field Geologic Studies; Examination of geomorphic expression of stratigraphic units related to the eruptive sequence at the Black Tank cone. Accompanied by L. D. McFadden

Observations:

(a) Tephra unit with black cinder ± lapilli and ± bedded bombs coat old, eroded vent south of Black Tank cone. Old vent (A1) of Renault (1989) appears to be one of the most degraded cones in Quaternary part of Cima volc. field. Cinder/scoria has been partly excised across ± dikes have been exposed by erosion. Recommend that older vent be dated by K-Ar because date could exceed 1.0 Ma, which presently is oldest dated

EXAMPLE

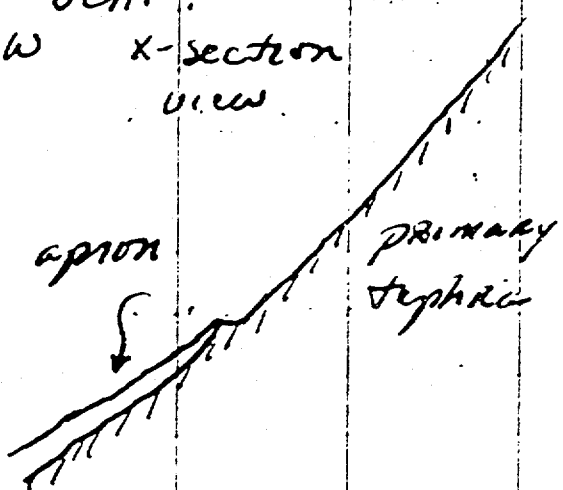
(4)

Quaternary flows.

(b) Black tephra unit is deeply degraded and occurs as cobbled patches over landscape (in places appears to have a base surge morphology)

(c) Red cinder unit overlies the black tephra and a third cone apron buries the black tephra unit. Apron forms "flat cons" on the west side of vent.

W X-section view E



Apron is only a few decimeters thick

(d) Black tephra can be traced laterally and appears to overlie the lava structure (older) at

EXAMPLE

The breach in Black Tank cone, indicating that the level structure formed prior to eruption of black tephra unit

(E) Examined alcoves in old vent for prehist (Neotoma) middens to investigate whether tephra could be incorporated in the midden. Observed interbedded midden and eolian silt layers, suggesting episodic wind transport of fines into area.

(F) Observed dark black flow unit along south side of Black Tank flow which appears to be anomalous to other types of flow morphology associated with Black Tank flow.

Recommendations.

Suggest several small stratigraphic sections across tephra & flow in order to establish stratigraphic relations. Then compile overall strat. relations.

5/22/80

EXAMPLE

(6)

May 23, 1990

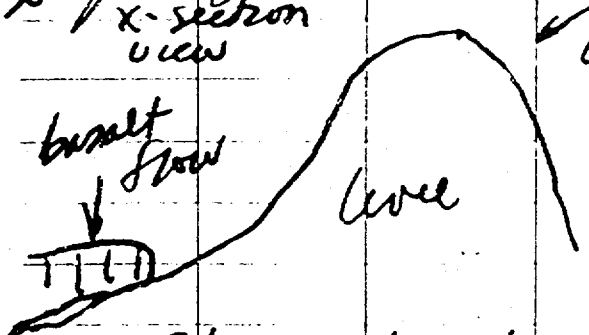
Location: North: south sides of Black Tank (A) cone, SW part of Cima Volc. field, California

Activity: Field Geologic Studies; continuation of activities from May 22, 1990.

Observations:

(a) Small fluid basalt flow within the levees (oldest) of Black Tank vent area appears to be sourced in a plug/vent with levees but outside of main scoria cone (A)

(b) Small fluid basalt flow ramps up onto levees indicating flow postdates and is stratigraphically younger than levee formation.



(c) Check for buried soil beneath lava flow in order to assess

EXAMPLE

for time difference between lava flow appearance of wide spread silt matrix in lava deposits and below the flow suggest hiatus with some duration of time.

(d) Black Tank flow buries older flow along north side of flow & parallel to Black Tank Wash. This ~~older~~ older flow forms upper dip falls 1-27-92 in Wash. I infer that this flow is the "60 ± 30 ka" flow which fills much of Black Tank Wash. The older flow dives south & west below Black Tank flow & may outcrop as an isolated black flow unit on south side of the Black Tank flow. Black Tank flow extruded over a degraded & buried older flow indicating a significant time break between 2 units.

Scott 5/23/90

(8)
May 24, 1990
Location: Black Tank cone, in SW part of Cima Volc. Field, California
Activity: Field Geologic Studies accompanied by B. Crowe (OWE ans 5/16/94) F. Perry; Photography of Black Tank Cone.
Photographs:

BW CV-90-I 3, 4: views of SE flank of Black Tank Cone: older degraded vent.

BW CV-90-I 5-9: various views of Cima volc. field from A & H cones

Observations: Conducted recon @ B. Crowe & F. Perry of A cone area. Noted that a previously unrecognized vent exists between very old A1 vent and very young A2 vent. The newly recognized vent consists of large bombs in saddle

SCW 6-27-91

EXAMPLE

between A1 and A2 vents. Examined stratigraphic relations between Tephra and flow units at A cone. Discussed mechanisms of tephra emplacement and subsequent erosion on south & SE Black Tank cone area. If tephra is true airfall then significant amounts of tephra have been eroded from slopes of older degraded A1 vent. USGS 5/16/94 VE

Observed Strat. relations at the H cone complex, including:

(1) lava lake dated by Turner et al at 0.17 Ma (7 01A 5/16/94) inside a well preserved tuff cone and associated base surge sequence;

(2) Blast craters which are younger stratigraphically than the tuff cone;

(3) Two flow units which vented on the western side, one a short viscous flow and the other a pahoehoe flow with a small lava lake near

(10)

The vast surface of pahoehoe is very degraded and looks relatively older than pahoehoe flow from G cone. Petrographically this flow has few olivine xtals exposed on fresh surfaces.
This flow has been dated by Turner et al at 0.18 Ma.

5 PER BRUCE CASWELL
ASB 5/6/94

S Wells 5/24/90

May 25, 1990

Location: G (Big Vulcan) cone in SW part of Lassen Volc field

Activity: Field Geology Studies and Descr of G cone.

Photographs: BW CV-90-5

Observations: G cone has 3 spatter cones with one being active presently. Oldest spatter is buried by present large cone and contains reworked class from older basalt lavas. That are presently not

EXAMP

exposed at surface of large cone.

ok 5/26/94

- Source for youngest tephra on SW part of Big Vulcan slope is small bomb area which stands topographically higher on top flank of cone. Bombs from vent appear to bury soil layer!
- Recon suggests 3 flows are sourced from G vent; source of 2 flows may be North side.
- Base surge deposits found around flank of G cone and are buried by oldest cone apron.

Crowe, Perry, Wells discussed and observed differences between the I & H flows. More olivine grains are in I flows. Petrography is supported by paleomag. in letter (plus enclosure) from Turrin & Champion.

SCW 1-27-91

SCW 1-27-92

B Wells 5/25/90

(2) May 29, 1990

Location: North side of (A) Black Tank cone & flow, SW part of Cima Volcanic Field, California

Activity: Geologic Field Studies:
(A) observations of stratigraphic relations of volcanic units associated with Black Tank cone & flow. (B) Geologic mapping of Black Tank cone & flows on enlarged aerial photo

GW 1-27-91

GMS 5/6/94

Observations:

1. Newly recognized flow unit found immediately N of Black Tank cone. Flow unit rests on older flows and channel gravels and is interbedded locally with bomb unit C?1. Flow unit is overlain by black & oxidized tephra from younger A2 cones. This flow unit may be youngest flow derived from the younger A2 cone
2. Cleared out gravels between newly recognized flow unit ca. and older to observe stratigraphic relations as clearly as possible.

EXAMPLE

(13)

Geologic Mapping: Conducted mapping of Black Tank cone/flow on enlarged air photograph (6-8-74, BLM - C - 11000 22-48 + SGW SGW 12-7-93

S Wells 5/29/90

May 30, 1990

Location: Black Tank (A) cone & flow complex, SW part of Lava Vole. Field, California

Activity: Geologic Field Studies; Geologic mapping of Black Tank cone/flow on enlarged air photo

Field Measurements:

Location	Feature	STRIKE	DIP	
A1 Vent	dike 1	N 78°E	Vertical	Towards Vent
A1 Vent	dike 1	N 65°E	80° NW	
A1 Vent	dike 2	N 72°W	Vertical	Towards Vent
A1 Vent	dike 2	N 60°E	Vertical	

SGW 1-27-92

WSS 5/6/94

5/30/90

S Wells Geologist

EXAMPLE

(14).

May 31, 1990

Location: Black Tank (A) core & flow complex, S.W. corner of Coso volcanic field, California

Activity: Geologic field studies; geologic mapping of Black Tank core / flow on enlarged air photo

NOTES: Met B. Turrin & D. Champion of U.S.G.S. in field and explained core & flow stratigraphy in order to facilitate sampling by Turrin & Champion.

S. Bell
6/2/90

BMC 11/1/90

Notebook reviewed on ~~11/1/90~~ 11/1/90, following QP 3.5. I found the notes to be readable and could follow the discussions of observations.

Two suggestions: ① Add the photo number of the enlarged aerial photograph of the Black Tank center on page 12, 13, & 14.

② DP-606 Field volcanism studies note that it is up to the option of the worker to decide if a field photograph

EXAMPLE

(5)

becomes a QA record. Steve Wells carefully numbers his photographs and this (THIS ONE 1-27-92) could appear to be a formal record. It might be useful to make a comment in the notebook about whether a photograph is, (OR IS NOT, 1-27-92) or might become a record.

Bruce Crowe
Nov 11, 1990

EXAMPLE

(16)

May 16, 1991

Location: Black Tank cone (A cone) and flow complex, SW corner of Cima Volcanic Field, CA.

Activity: Geologic field studies; sitting paleomagnetic & petrologic samples w/D.Z. F. Perry, L. Mosley and G. Geissman

Notes: Observed buried soil between older flow units from mid-Pleistocene?) A1 vent. Soil exposed in dry falls near edge of flows from A2 flows. Suggests idea of long periods of time between eruptions at older vent

May 17 ~~20~~, 1991 SGW 1-27-92 5-16-91

Attended Mojave Desert Quaternary Research Symposium; field trip. Presented information on Lathrop Wells Volc.

May 17, 91

EXAMPLE

(17)

May 22, 1991

Location: I cone & flow complex in The Cima Volcanic Field, CA

Activity: Geologic field studies, recon field sites for TL sampling of buried soils below I cone

Notes:

Located excellent site for TL samples in buried unit below I flow. Exposure where dry flows occurs on I flow near flank of I cone complex. Undercutting of basalt flow has exposed alluvial unit buried by I flow.

- should measure stratigraphic section at this location;
- hiked length of flow in this section, exposure at dry falls is best location

S. Wells 5-22-91

EXAMPLE

(18) May 23, 1991

Location: I flow complex near Frone, Cima Volcanic field, CA

Activity: Geologic field studies, recon for TL sampling

Notes: see I flow. STW 3/31/92

Observed two sites for strat. section measurements and TL sampling by S. Forman. North flank of Frone in exposure along Black Tank Wash. Observed buried pavement, accretionary mantle overlying F(?) flow, buried by tephra from Frone. Frone dated at ~ 500 ka, thus pavements and accretionary mantles existed in mid Pleistocene. Significant observation at this exposure

1-27-92 Examined sites on I flow STW from ~~cosmogenic~~ COSMOGENIC He sampling in future. Much of I flow is near stream level, must be careful that alluvium does not cover flow in places. STW 1-27-92

WD 55 STW 7-23-91

STW

EXAMPLE

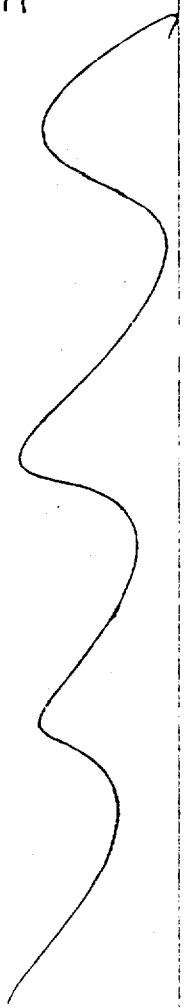
(19)

May 26, 1991

Location: Granite Mountain Reserve; Granite Mts, CA

Activity: Geologic field Studies; Practice with EDM/Total Station Survey in order to ascertain procedures for DP.

S. Will 5-26-91



EXAMPLE

(20) December 17, 1991

Location: Lathrop Wells Volcanic Center, Nevada

Activities: Geologic Field Studies
Excavations for soil and stratigraphic studies, w/ Dr B. Crowe, F. Perry, L. McFadden and R. Morley

Notes: North side of Lathrop Wells volcano - main scoria cone.
Stratigraphic observation from trenching is that base of scoria cone is flanked by a sand ramp which thins out to the north has no visible sign of mass wasting or colluviation at the scale suggested by U.S.G.S. research. These observations support our original geology in the proposal.

S Forbes
12/17/91

EXAMPLE

(21)

March 16, 1992

Location: Lathrop Wells volcanic center, Nevada

Activities: Geologic field studies; excavations for soil & stratigraphic studies with B. Crowe, R. Morley, E. McDonald, J. Poths, F. Perry, L. McFadden

Notes: North & northwest sides of Lathrop Wells center; photographic base: 8-18-87 1:4000 #5 and #6 →

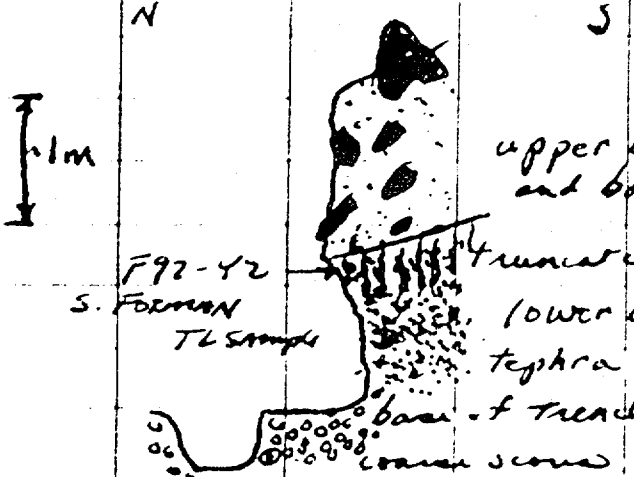
Excavation # SP-8a, photograph #5: general stratigraphy includes upper unit with sandy matrix & large basalt clasts angular in nature which increases in tephra concentration near base, clasts have weak discontinuous $CaCO_3$ coatings to many clasts without coatings. This upper unit overlies a basal unit that has reworked tephra (ash, scoria, lapilli) with moderate continuous to discontinuous $CaCO_3$ coatings on scoria clast bottoms and sides. Contact is transitional over ~15 cm, but is clearly seen by the lack of large basalt clasts in basal unit. Observations suggest buried soil in basal unit has

Lathrop Wells VC area 21-7-SSW
Stow 11/30/93

EXAMPLE

(22)

been truncated due to eolian sand ramp building and colluviation related to upper unit; transition from upper unit to lower unit at 1.10 m to 1.25 and 1.30 m at base of transition. Excavation depth at 2.5 m

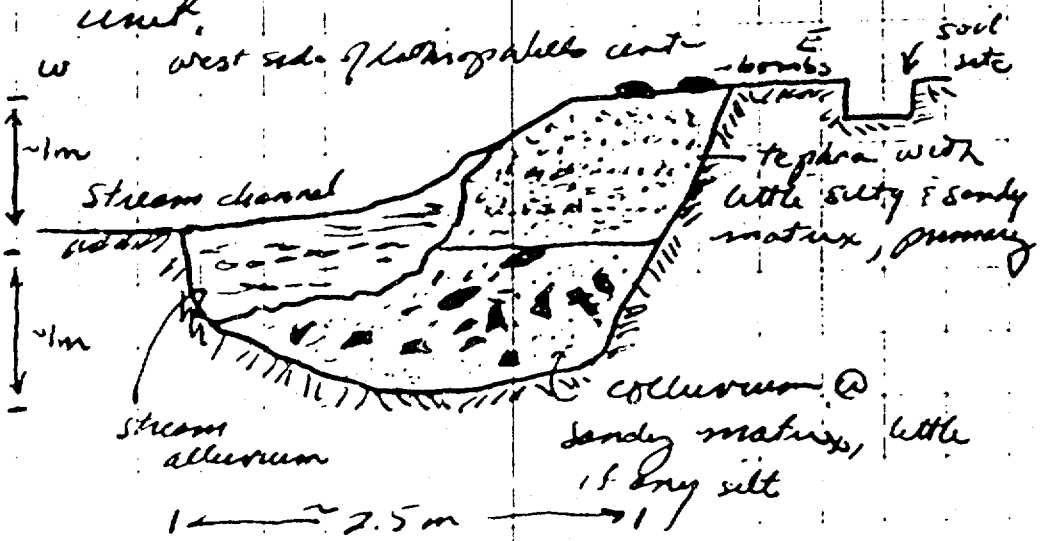


Basalt rubble derived from overlying unit Qly. Scoria in unit at base of trench is in matrix of reworked ash. Weak bedding in lower unit appears to slope away from Qly and in direction of modern surface. Below base of trench, scoria unit can be observed by digging down. Scoria increases in size, implying a vent may be nearby.

EXAMPLE

Excavation # SF-06, photograph #6:

Excavation shows relations between stream channel sediments, tephra & bombs (unit Qs5?), and underlying sandy matrix & angular debris flow unit.



tephra unit may correlate @ Qs5 given it topographic position & its distinct character which is different from cone; tephra unit rises toward NE on NW flank of Lathrop Wells main scoria cone, thus perhaps an older vent.

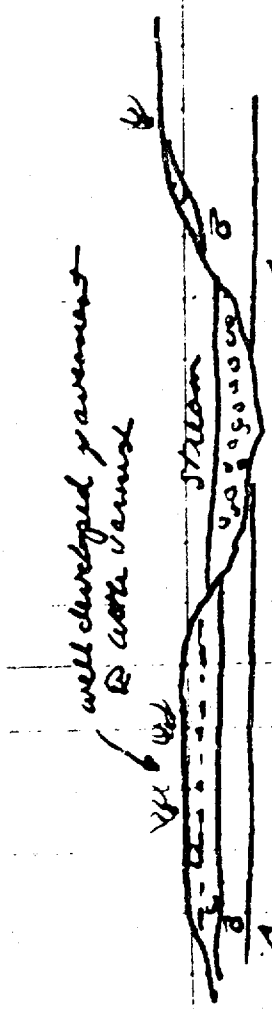
Soil site shows well developed soil (surface soil) indicating subaerially exposed for a long time.

EXAMPLE

(24)

General Stratigraphic / topographic relations on western side of Lathrop Wells volcano.

Eolian unit (O) overlies a truncated soil with strong $CaCO_3$ coatings on clasts in alluvium of unit C. Unit C is an alluvial fan unit that prograded over Tephra unit. Upper part of Tephra unit is reworked and it becomes primary outfall near base. Tephra rests unit A which is angular tuff in matrix of sand. Interpreted to be a colluvial unit with mixture of eolian sand. This unit may rest on a $CaCO_3$ cemented colluvial unit covering tuff bedrock.



Tephra unit could be one of the oldest from Lathrop Wells area.

SOWells 3-16-82

NE

SW

EXAMPLE

(75)

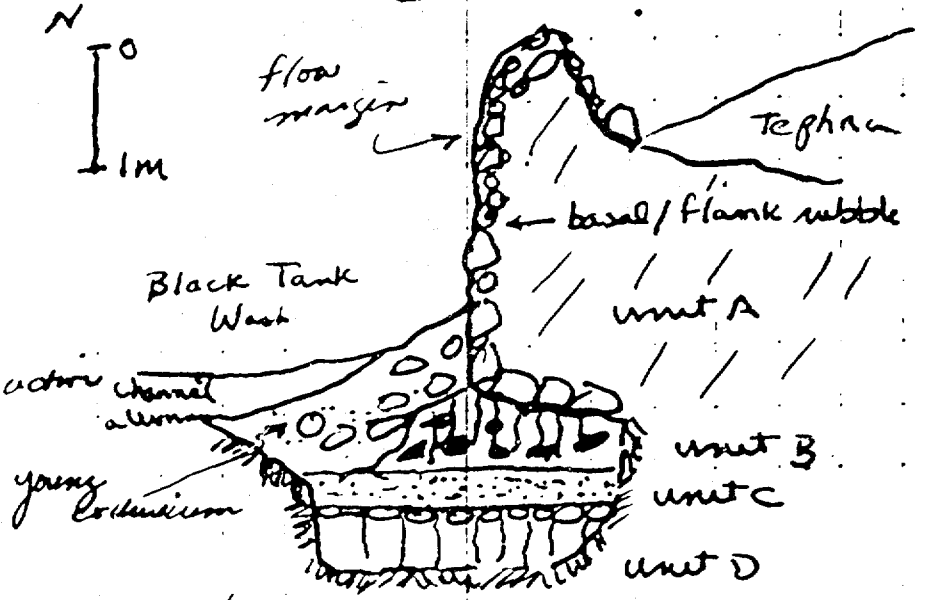
March 19, 1992

Location: Black Tank volcanic center, Cima volcanic field

Activities: Geologic field studies, pits for soil descriptions and volcanic stratigraphy with L. McFadden, E. McDonald, R. Morley, C. Sowell

Notes: North side of Black Tank volcanic center along south bank of Black Tank Wash

Excavation site # BTVC-T5-92.5



SGM 3/19/92

Unit A: 3.2 m thick, vertical flow margin of basal basalt flow coming from direction of main crater; basal and flank rubble exposed on vertical face of flow. Approx. 0.5 m below surface.

EXAMPLE

(26)

Unit B: Silt matrix infilling voids between angular blocks of basalt which are coated with $CaCO_3$; soil developed on this unit with thin vesicular A horizon and stage II $CaCO_3$ development. Unit could be rubble derived from nearby I flow. Unit is approximately 0.8 m thick.

Unit C: ~0.4 m thick; stratified unit of reworked tephra and clasts derived from granite (grus), ranges in size from coarse sand to fine gravel; indurated.

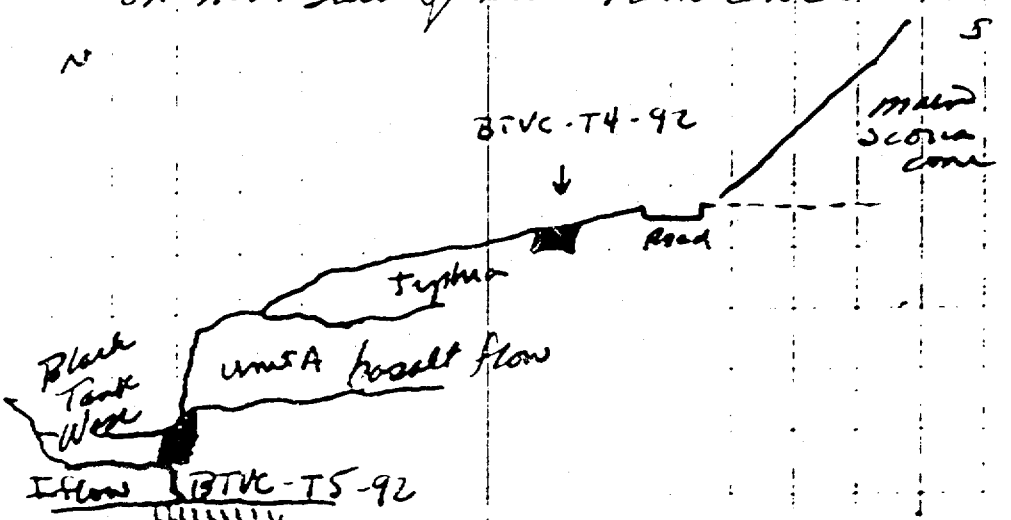
Unit D: Buried stone pavement with varnish resting on ~~decomposed~~ ash 5/24/94: ACCRETIONARY mantle @ soil developed in mantle. This may be same buried soil and pavement observed on the east side of center in the numerous trenches.

Unit B is a good unit for Steve Forman to sample for TL dating in that it should be reset by thermal source of unit A.

Observations: Trenching in this area has revealed that the buried soil

EXAMPLE

In the Black Tephra unit older was mapped by C. Renault is really a soil band that becomes discontinuous from the stream bank toward the interior. Thus no historic or Holocene activity is observed in this second unit. All the tephra overlying unit A flow may represent a single eruptive period, and unit A could represent just lava flow from the younger Black Tank vents. Sketched below is possible stratigraphic relations on North side of Black Tank center:



Trench # BTVC-T4-92 is site of R. Amundson's $CaCO_3$ study and sampling

EXAMPLE

(28)

for ^{14}C dating of pedogenic $CaCO_3$.

SWiles 3-19-92

3 SW 3-19-92

3-20-92

Activities: Continuation of Geologic Field studies at Black Tank volcanic center.

- Several soil pits have been opened, described and closed. These pits are located on my enlarged aerial photograph base (6-9-74, BLM-C-11000 22-48). These pits include:

SGW 1/7/93

BTVC-T1-92: 3.25 m of scoria and bombs forming black tephra blanket on N and E side of volcanic center. Thin eroded reworked tephra and grus layer over buried pavement and soil on significantly older flow. This scoria unit appears to correlate with black tephra blanket derived from vent located south of main scoria cone.

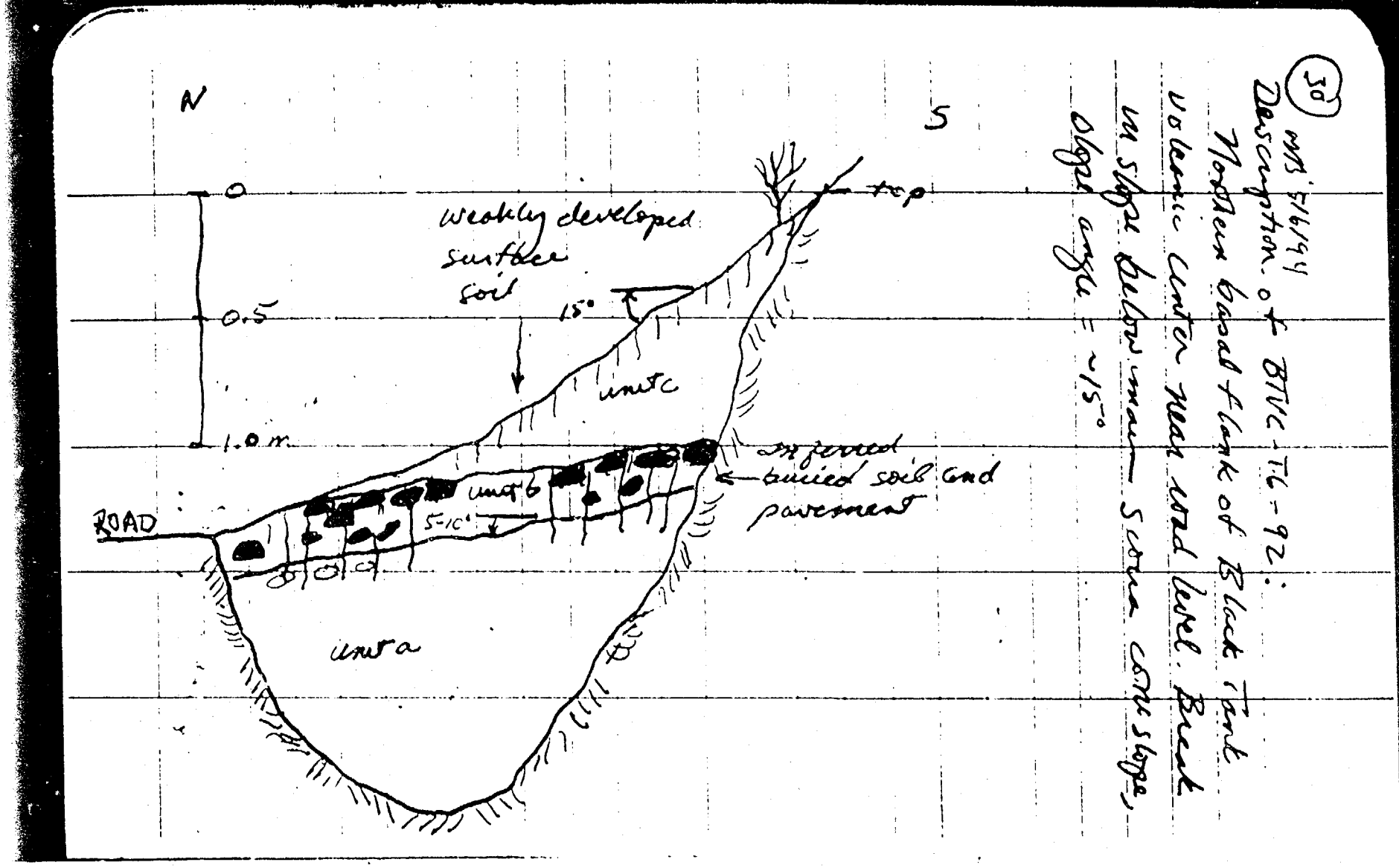
BTVC-T2-92: Trench depth to 1.5 m through dissected ridge plus another 0.3 m below channel floor for a total of 1.8 m. Base of tephra not

exposed in trench. However, channel cuts to the north show tephra blanket resting on reworked tephra / lava layer which in turn overlies buried pavement and soil on older basalt flow.

BTUC-T3-92: trench open in basal flank of main scoria cone near contact with dissected tephra blanket. No contact observed in trench between main scoria and tephra blanket. Primary tephra is overlain by ~ 1.0 m thick colluvium and reworked scoria.

BTUC-T4-92. ~ 2.0 m thick scoria without base of unit exposed below stone pavement surface. Shows varnished dense bombs and bomb fragments. This unit rests stratigraphically over flow exposed at BTUC-T5-92 along Black Tank Wash. Surface is dissected with broad flat pavement interfluves. This is trench that R. Amundson has sampled for ^{14}C dating of pedogenic $CaCO_3$. SOU 5-10-92

DATING
ltr 5/16/94

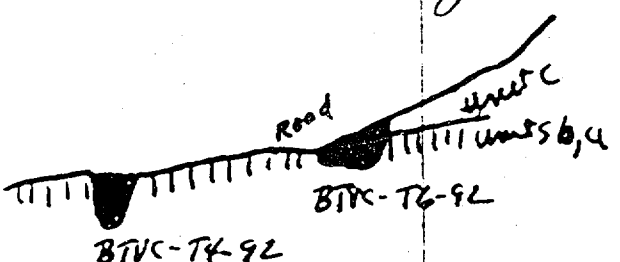

(30)
mms 5/6/94
Description of BTVC-TC-92:
Modern gabal flank of Black Tank
volcanic center near wadi level. Break
in slope below main scarp comes slope
angle ~15°
N
S
0
0.5
1.0 m
weakly developed
surface
soil
15°
unit c
top
unit b
5-10°
unit a
ROAD
exposed
buried soil and
pavement

EXAMPLE

SOW 2-25-92

unit a: ~ 1.5 m of scoria and bombs with weak bedding or stratification that is less than 10° dip. Bombs are scoriaceous with altered tops and $CaCO_3$ coatings on bottoms. Bombs are not dense but light. Over 1.5 m below top the ashen matrix decreases.

unit b: a 0.3 m thick layer of dense bombs with ashen sandy silt matrix. Contact at base of this unit is ~ 8° slope away from cone with variations from 5-10° in slope. This is a close match to dense bomb covered pavement at BTVC-T4-92. A buried soil and pavement exists in this unit and soil development extends into unit a below. Overlying that buried soil becomes surface soil which is not overlain by unit c north of road.



EXAMPLE

(32)

Presence of varnish coatings on dense bomb clasts and burned soil (massive structure) with divergence of slope as compared to main scoria cone slope is highly suggestive of a hiatus in eruption activity between units a and b and main scoria cone. Five samples taken from dense bombs in this unit:
BTVC-T6-92 SA, SB, SC, SD, SE

SEW 6-21-92 Unit c: accretionary apron with scoria derived from main scoria cone and colian fines in matrix and voids. Weakly developed soil with single grain structure and color changes. This will need to be re-opened for soil description by L. McFadden. Surface slope SEW 3-20-92 is 2-12° with variations 1 1/2 between 10°-15°. This unit 5/24/94 appears consistently around flank of main scoria cone and appears to be proto-cone apron that is not related to gully/arroyo debris flows. SEWell 3-20-92

EXAMPLE

373

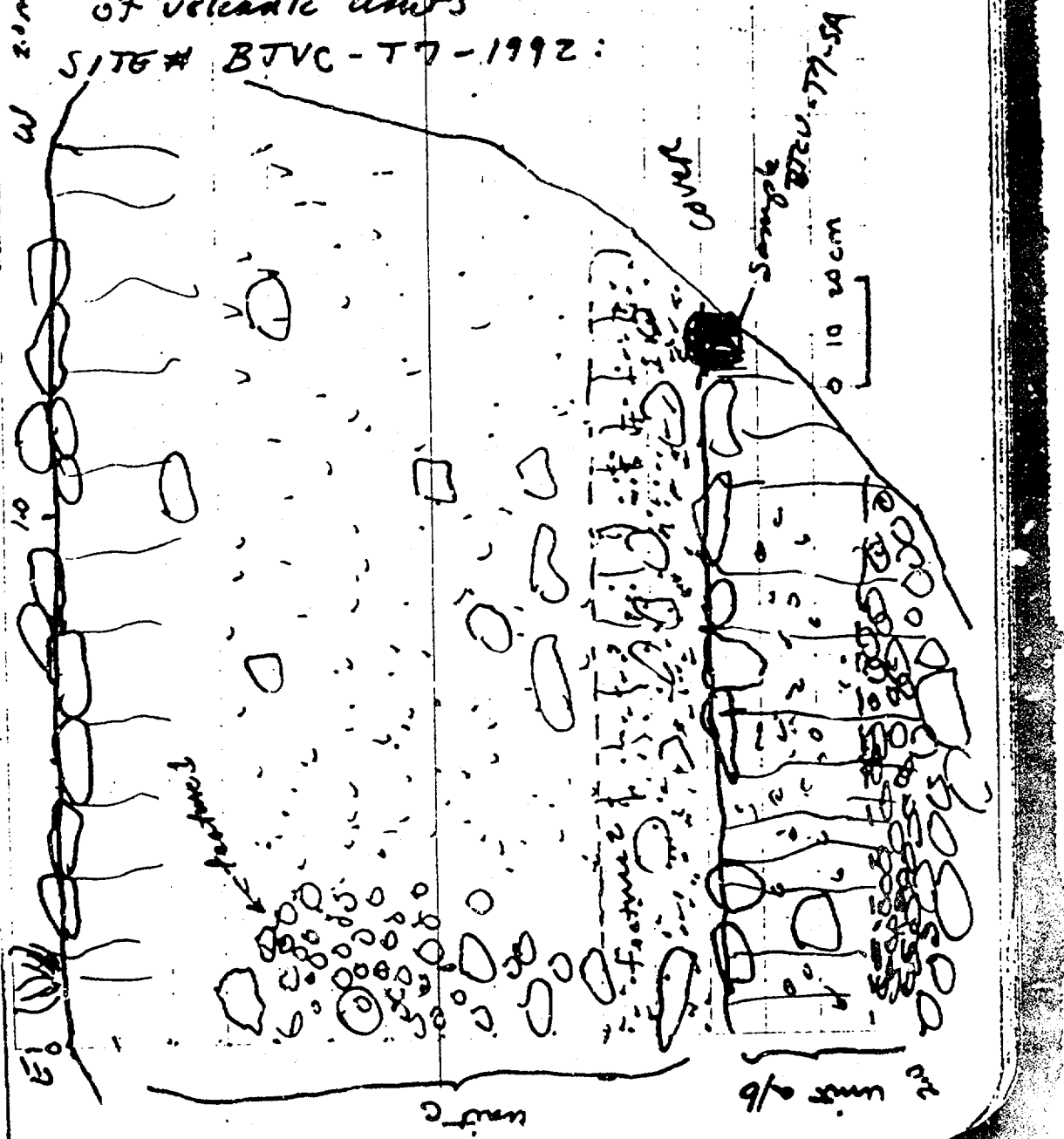
5/24/94

June 24, 1992

Location: NORTH side of Black Tank ("A") cone, Cima volcanic field, California

Activity: Geologic field studies; training; geomorphic and stratigraphic studies of volcanic units of Black Tank cone.

SITE # BJVC-TT-1992:



(34)

Units a/b in BTVC-T7-92 is equivalent to units a and b of trench BTVC-TC-92 and unit c in BTVC-T7-92 equals BTVC-TC-92.

Unit c: colluvium derived from main scoria cone of Black Tank intermixed with sandy silt. Surface of this unit is characterized by garlands with lapilli backed upslope from layers of larger bombs. Head of trench is near buried in shape here garlands occur. Weak buried soil near surface (?). Feature 1 is either a zone of bioturbation filled with scoria or a channel. Massive poorly defined sediment features; ~1.2 m thick as of 5/6/94

Unit a/b: > 1.0 m of weakly stratified bombs & scoria with altered (oxidized) tops and $CaCO_3$ coated bottoms on clasts. Eolian fines increase to form matrix dominated unit at top in which buried soil has developed. Dense bombs

EXAMPLE

found in top 30 cm ?
unit but pavement characteristics
are not as visible as on
found BTVC-T6-92. Buried soil
is predominate feature that separates
this unit from the overlying
unit C

Feature 1: Two appears to be
buried channel filled with scoria
or burrow/bioturbation filled with
scoria

Feature 2: Appears to be
weakly developed soil on
tephra (?) infilled with eolian
fines. Interpreted to be part
of main scoria cone ejecta

General Comments:
Buried pavement and underlying
tephra appears to correlate with
pavement at BTVC-T4-92 site
and perhaps black tephra
to east of main scoria cone

Sample BTCV-T7-3A 60m NW

EXAMPLE

(36)

$CaCO_3$ veins and wk. fmd xenoliths

SOW 6-24-92

June 25, 1992

Location: East side of Black Tank volcanic center at base of main scoria cone; Cima volcanic field, CA

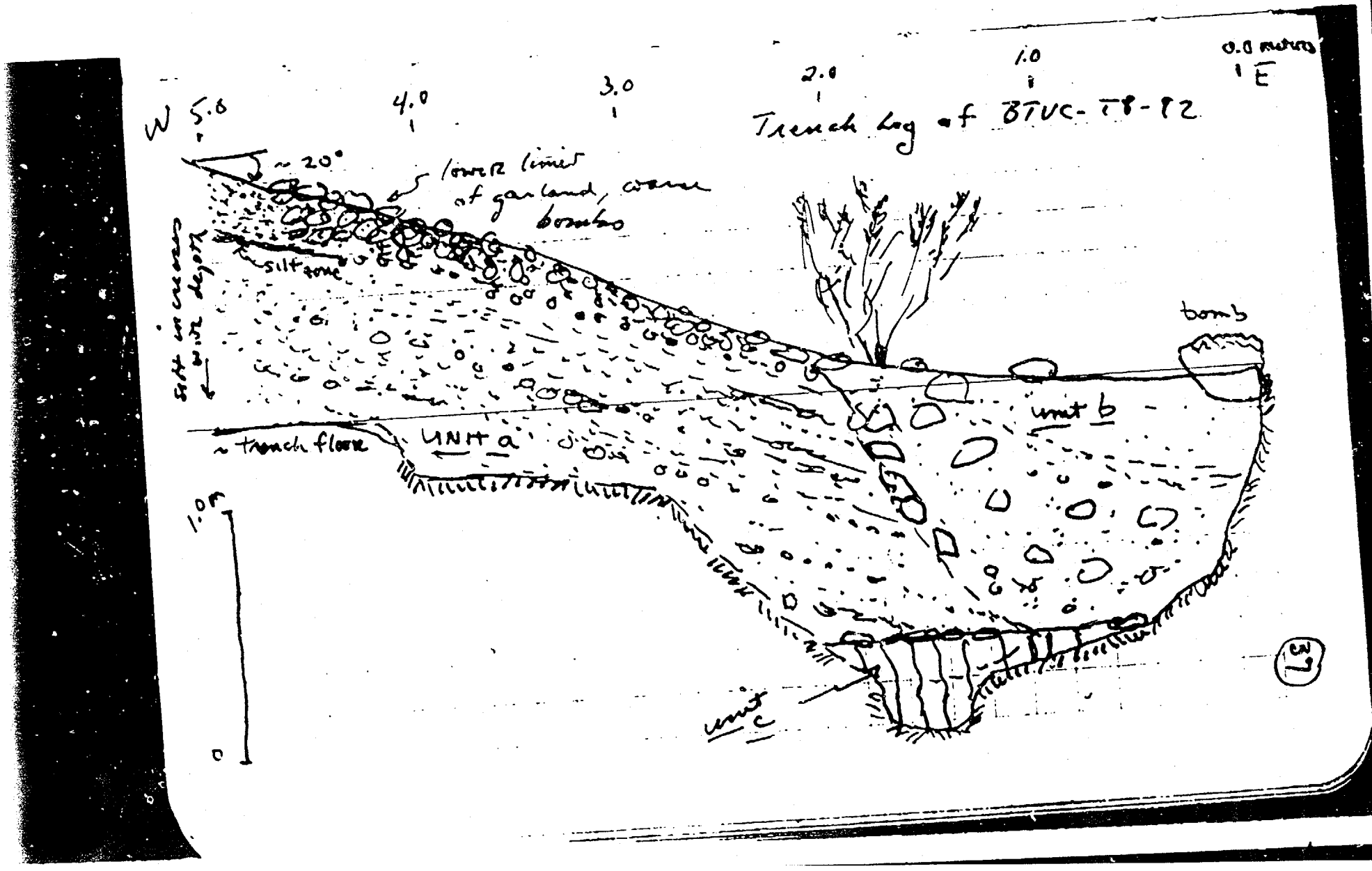
Activities: Continuation of geologic fmd studies of Black Tank volcanic center; Stratigraphy of trenches @ L. McFadden

SITE: BTVC-T8-92

unit a: Eastward dipping layers of scoria and lapilli w/ occasional bombs w/ some open framework, majority of void space filled with or contain clast and sand; sand and silt increases with depth below tree/silt zone, minimal soil formation; Thickness is >1.5 m Thick near base and rests directly on buried soil; unit a is tephra from main scoria cone.

EXAMPL

EXAMPLE


W
5.0
4.0
3.0
2.0
1.0
0.0 meters
E
Trench Log of BTVC-TP-P2
~ 20°
lower limit of garland coarse bombs
silt in cracks
silt zone
bomb
unit b
~ trench floor
UNIT a
1.0 m
0
unit c

(38)

unit b: ~1.2 m thick alluvial unit
with reworked tephra and sandy
silt derived primarily from "older"
black tephra unit south and west
of main cone.

unit c: buried soil on ash-fan
(a) engulfed Av and stone pavement,
basal part of unit c is coarse
rubble zone; this unit is inferred
to be buried flow and accretionary
mantle deposit to trenches to NE

NOTES:

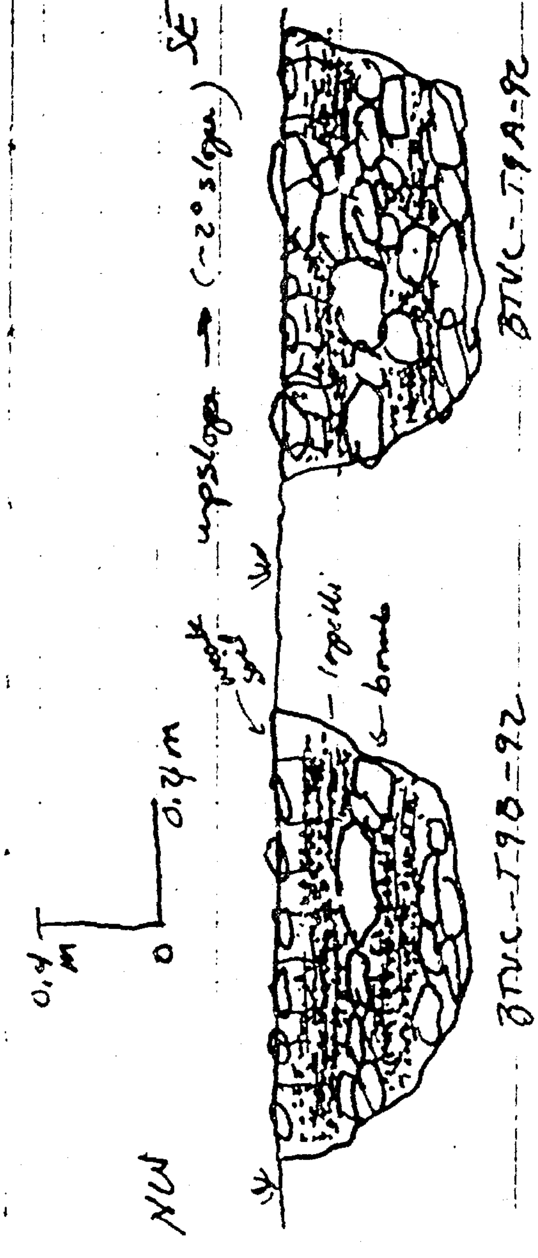
Contact between unit b and a is
not very clear but marked by
loss of stratification in unit a
and zone of bombs along
channel (?) wall. Unit a has
several layers that appear to
be eruptive surges and is capped
with silt free garlands/bombs.
Large bombs in unit b
appear to have rolled down
main scoria slope and are
incorporated into alluvium.
Some bombs are fragile and both
as though they could not have
rolled down slope

EXAMPLE

A, B DW 12/7/93 (39)

SITE BTVC - T9~~A,B~~-92:

2 small trench east of site BTVC-T8-92 in flank of low scoria mound capped with large bombs. Trend of trenchs N45°W



Both trenches show alternating ~~beds~~ sow 6-25-96 bombs and lapilli beds, scoriaceous and black with slight dip in bedding away from mound top and toward NW. Increase in bomb concentration and size toward mound top suggests vent at this location.

(40)

This unit has soil that is weakly developed and less developed than buried soil at site BJVC-76-92; mound mass and grades into black tephra sheet which appears sourced from vent SW of main scoria cones. Stratigraphic context of this unit is unclear.

Hooten 6/27/92

June 26, 1992

Location: Black Tank volcanic center, Cima volcanic field, CA

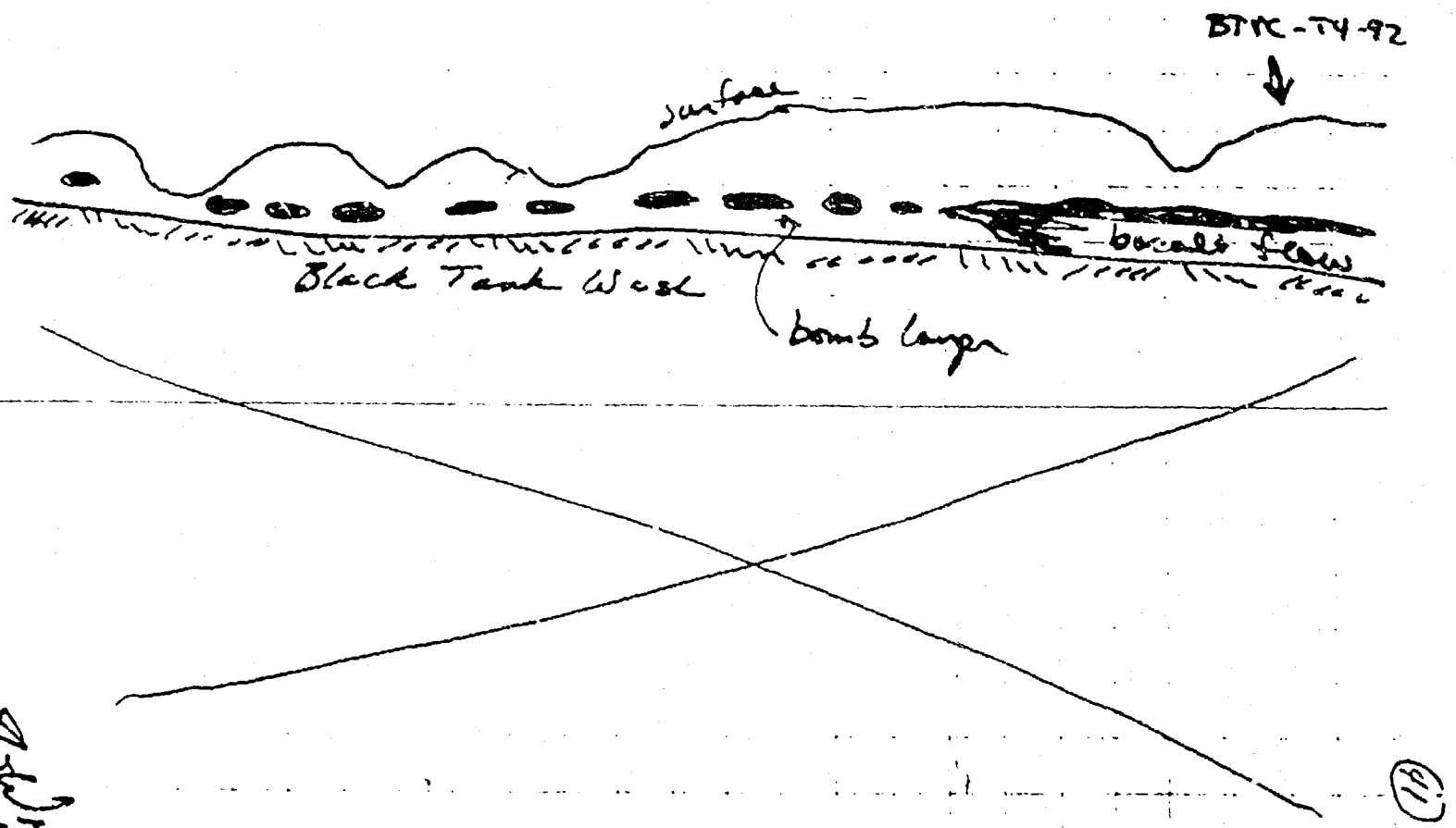
Activities: Continuation of geologic field studies, Black Tank volcanic center

Observations:

The relationship between black scoriaceous tephra mounds and blankets with the "older" cooling volcanic unit with pavement is observable along southern edge of Black Tank Wash and appears as sketch:

EXAMPLE

EXAMPLE



(42)

I have reviewed this notebook and determined it to be legible, interpretable, and appropriately organized and prepared

Leslie B. McFadden 2/19/93

LES REVIEWED PAGES i-41 IN ACCORDANCE WITH QP 3.5, Rl.
THIS WAS VERIFIED BY A RADIO CONVERSATION WITH ME 6/29/93

[signature] 6/29/93

EXAMPLE

(43)

I conducted a QA review on pages i-42 of this notebook. This review was done in accordance with QP-03.5, R1.

Page i, Add "Study Plan Characterization of Volcanic Features 8.3.1.8.5.1".

Page 13 and 28, Add the "-SGW" suffix to the photograph identifier.

Page 21, Add a statement to clarify that photos 5 and 6 are from the "Lathrop Wells VC Area 25" series. Also include the appropriate suffix.

Page 23, Indicate what the excavation # and photograph # is.

Page 39, At the top of the page line out the write over, insert "A, B", initial, and date.

Page 44, Add a statement indicating that the BTVC trenches 1-9b are marked on air photo 7-9-74 BLM-C-M000 22-48-SGW.

Page 44, Add a statement that the ground photos taken in 1990 are non-records and do not need to be submitted with this notebook.

Page 45, Sign and date the index.

10/6/93

EXAMPLE

(44)

WSM 5/6/94

Comment: BVC trenches 1-96 are marked on an photograph 7-9-74 BLM-C-MOOC 22-48-SGW

Comment: Ground photographs taken in 1990 are monikinds and do not need to be submitted with this notebook

Brian Crowe
for Steve Weller
May 6, 1994

QA REVIEW COMMENTS FROM PAGE 42 HAVE BEEN SATISFACTORILY ADDRESSED. PAGES 1 - 45 ARE ACCEPTABLE

5/6/94

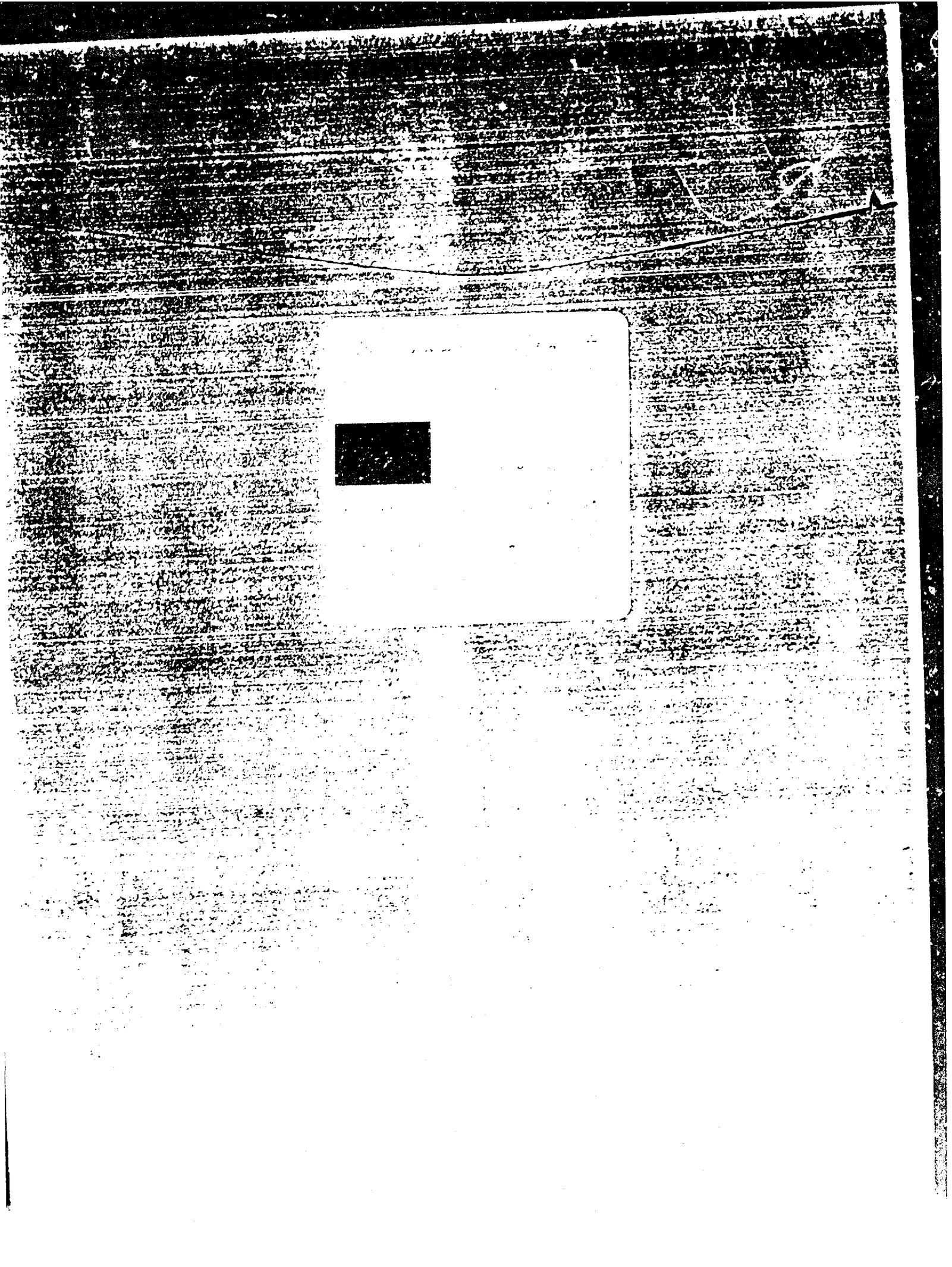
EXAMPLE

(45)

INDEX

12-7-93

EXAMPLE



INFORMATION ITEM 8

[redacted] Copy of M. Heizlers' report and data for 40Ar/39Ar dating at Lathrop Wells volcanic center.

New Mexico Bureau of Mines & Mineral Resources
Socorro, NM 87801

A DIVISION OF
NEW MEXICO INSTITUTE OF MINING & TECHNOLOGY

ormation 505/835-5420
locations 505/835-5490
AX 505/835-6333

July 27, 1994

Dr. Frank Perry
Los Alamos National Laboratory
EES-13, MS J521
Los Alamos, NM 87545

Dear Frank,

Enclosed find the data and figures for the $^{40}Ar/^{39}Ar$ dating at Lathrop Wells Volcanic Center, Yucca Mountains. These data represent completion of purchase order 26[illegible]M0014-2R and an invoice is being sent to Accounts Payable for $9999.00. This amount covers the cost of 25 samples @ 400.00/sample.

Sincerely,

Dr. Matthew Heizler
Geochronologist

General Sample Preparation

Xenoliths were first cut in half with a rock saw. One half was saved for thin section preparation and the other crushed with a standard jaw crusher and Bico grinder. Crushing devices were thoroughly cleaned between each sample with a combination of compressed air and wire brushing.

Samples were size to 14-60 mesh, washed and dried. Magnetite was removed with a hand magnet. The sample wash ultrasonically cleaned with 15% HF acid for 15 minutes and then thoroughly ultrasonically washed with distilled water. Sanidines were concentrated with a combination of heavy liquid, Franz magnetic and hand-picking techniques. Sample purity was determined to nearly 100% by microscopic inspection under immersion oils.

Sanidines were packaged in Sn foil and sealed in evacuated quartz vials along with the standard Fish Canyon sanidine (27.84 Ma). The samples were irradiated for 0.5 to 1 hour in the L-67 position at the Ford Reactor, University of Michigan. Neutron flux gradients were determined to 0.25% by quadruplet analysis of argon evolved by laser fusion of the standard.

Sanidine was step-heated (10 minutes each step) in a double vacuum Mo furnace following a 30 minute degas step at 350 °C to remove atmospheric contamination caused by the Sn foil. Simultaneous with heating, the sample gas was gettered with an AP-10 SAES getter operated at 0.5 A and additionally getter for 5 minutes with a SAES GP-50 operated at 2.0 A. Argon isotopic compositions were measured with a MAP 215-50 mass spectrometer operated in electron multiplier collection mode. Following each sample, ~100 mg of Hawaii basalt was dropped into the furnace at 1650 °C for a minimum of 3 hours in order to degas the pervious sample prior to beginning the next. Extraction systems blanks were run repeatedly throughout the course of the analyses as were air argons to monitor mass discrimination and mass spectrometer calibration.

For the experiments which were designed to better understand argon systematics of sanidine, samples of whole rock and mineral separates were heated in atmosphere in a muffle furnace. A whole rock of LW-142-1101 was heated at 1100 °C for 12 hours prior to mineral separation of sanidine. Also, Fish Canyon and LW-142 sanidine were degassed in a muffle furnace at 850 °C and 1100 °C for 20 hours.

Samples FC-1 with and without HF represent first degassing at 850 °C for 20 hours and then treating one aliquot with 15% HF acid for 30 minutes prior to irradiation whereas the other was not acid etched.

Sample breakdown:

I. Standard age spectrum analysis of sanidine from xenoliths

No.	Sample	Location	isochron steps	Age & error (ka)	$^{40}Ar/^{36}Ari$	comments
1	LW-138	QL-1 Flow				laser run indicates high air
2	LW-140	Conduit QL-1	g k	79±2 ka	296±3	pristine
3	LW-139-J	QS-3 Cone	ae	158±5	297±2	pristine
4	LW-139-P	QS-3 Cone				HF acid removed youngest ages highly melted
5	LW-139-D	QS-3 Cone				material HF acid
6	LW-139-G	QS-3 Cone				removed youngest ages
7	LW-143-A	QL-2 Flow	a k	77±2	303±1	pristine
8	LW-143-O	QL-2 Flow	a l	62±6	298±1	pristine
9	LW-143-P	QL-2 Flow	a f	103±4	295±1	pristine highly melted
10	LW-143-G	QL-2 Flow				material
11	LW-145	Little Cone	a g	908±11	300±4	pristine

II. Laser analyses of sanidine from xenoliths (all two step analyses).

LW-138	QL-1 flow	3 crystals
LW-139-G	QS-3 cone	5 crystals
LW-139-B	QS-3 cone	5 crystals
LW-139-J	QS-3 cone	5 crystals
LW-140	QL-1 conduit	6 crystals
LW-143-A	QL-2 flow	5 crystals
LW-143-O	QL-2 flow	5 crystals
LW-143-P	QL-2 flow	5 crystals
LW-143-G	QL-2 flow	5 crystals
LW-145	Little cone	5 crystals

III. Single crystal laser dating of local ash flow tuffs

LW-141	10 crystals	12.70 ± 0.07 Ma
LW-142	9 crystals	11.51 ± 0.02 Ma

IV. Experimental studies.

LW-142-HOT

Rock sample of LW-142 ash flow tuff heated in muffle furnace at 1050 °C for 12 hours. Sanidine was separated just as the xenolith samples. Age spectrum does not yield zero ages due to HF acid treatment.

LW-142: Sanidine from ash flow tuff heated in muffle furnace at 850 °C 20 hours.

Age spectrum analysis on bulk sanidine to measure argon kinetics and produce zero ages.

LW-142: Sanidine from ash flow tuff.

Age spectrum analysis on single crystal to measure argon kinetics.

LW-142: Sanidine from ash flow tuff heated in muffle furnace at 850 °C 20 hours.

Laser age spectrum analysis on single crystal to measure argon distribution in unbroken sample.

LW-142: Sanidine from ash flow tuff heated in muffle furnace at 850 °C [illegible] hours.

Laser age spectrum analysis on broken single crystal to measure effect on the argon distribution in broken sample (1st half).

LW-142: Sanidine from ash flow tuff heated in muffle furnace at 850 °C 20 hours.

Laser age spectrum analysis on broken single crystal to measure effect on the argon distribution in broken sample (2nd half).

FC-1: Fish Canyon tuff sanidine.

Furnace age spectrum analysis of a single crystal to measure argon kinetics.

FC-1: Fish Canyon tuff sanidine heated in muffle furnace at 850 °C 20 hours.

Experiment to test the effect of HF acid etching on sanidine with a non uniform argon distribution. Standard age spectrum analysis on bulk samples, one not treated with HF (no HF) and the other with 15% HF for 30 minutes (with HF). Experiment confirmed that a portion of the age spectrum can be removed by acid treatment and explains the results from QS-3 cone xenoliths LW-139 G and P and LW-142-HOT.

FC-1: Fish Canyon tuff sanidine heated in muffle furnace at 1100 °C 20 hours.

Standard age spectrum anaysis on bulk sample. Intent was to partially melt the sanidine and observe any effects on the argon systematics.

FC-1 Fish Canyon tuff sanidine heated in muffle furnace at 850 °C 20 hours.

20 Single crystal laser fusion to investigate the relationship between grain-size and apparent age. This experiment confirmed that the large the crystal the less argon loss during heat-treatment which suggests the crystal size is proportional to the diffusion dimension.

LW-147 Little Cone whole rock basalt.

Aborted this analysis after 4 heating steps as it severly contaminated the argon extraction system.

L#	Power	40Ar/39Ar	37Ar/39Ar	36Ar/39Ar	39ArK moles	K/Ca	Cl/K	%40Ar*	%39Ar	Age (Ma)	± Err (Ma)
QL-1 CONDUIT XENOLITH:Y3:NM-10:LWFVP-140, SINGLE CRYSTAL SANIDINE, J=0.0000800											
805-01A	0.55	5.251	0.0157	0.0152	1.0E-16	32.55	-3.1E-04	14.1	44.57	0.107	0.034
805-01B	2.07	4.150	0.0151	0.0047	1.3E-16	33.88	-6.5E-04	65.8	100.00	0.394	0.029
total gas age					**2.3E-16**				n=2	0.266	0.031
805-02A	0.51	59.699	1.9337	0.6676	2.9E-19	0.26	2.1E-01	%-230.2	2.47	-19.973	11.443
805-02B	2.04	5.756	0.0485	0.0159	1.2E-17	10.52	5.8E-03	17.9	100.00	0.149	0.239
total gas age					**1.2E-17**				**n=2**	**-0.348**	**0.516**
805-03A	0.51	5.510	0.0117	0.0210	5.7E-17	43.70	-8.8E-04	-13.0	39.61	-0.104	0.053
805-03B	2.04	2.521	0.0114	0.0071	8.7E-17	44.75	-4.1E-04	15.8	100.00	0.058	0.0
total gas age					**1.4E-16**				**n=2**	**-0.006**	**0.041**
805-04A	0.50	3.208	0.0115	0.0106	1.4E-16	44.32	-4.9E-04	1.6	47.92	0.007	0.022
805-04B	2.02	0.954	0.0129	0.0032	1.5E-16	39.70	4.5E-05	-2.5	100.00	-0.003	0.016
total gas age					**2.9E-16**				**n=2**	**0.002**	**0.019**
805-05A	0.50	6.770	0.0143	0.0155	4.40E-17	36.00	5.80E-04	31.9	41.45	0.311	0.057
805-05B	2.09	2.130	0.0132	0.0036	6.40E-17	39.00	4.50E-04	49.4	100	0.152	0.038
total gas age					**1.12E-16**				**n=2**	**0.218**	**0.046**
805-06A	0.49	16.943	0.0146	0.0551	5.3E-17	34.48	3.4E-04	3.7	41.86	0.090	0.061
805-06B	2.02	7.359	0.0176	0.0230	7.4E-17	28.93	5.2E-04	7.4	100.00	0.078	0.051
total gas age					**1.3E-16**				**n=2**	**0.083**	**0.055**
ASH FLOW TUFF:Y27:NM-10:LWFVP-142 LAB DEGASSED 1050 C 12 HRS, SINGLE CRYSTAL SANIDINE, J=0.0000805											
806-01A	0.49	95.995	0.0335	0.2943	1.6E-17	15.21	-3.4E-03	9.4	0.31	1.309	0.575
806-01B	2.08	55.706	0.0185	0.0278	4.8E-16	27.57	1.8E-04	85.2	100.00	6.881	0.023
total gas age					**5.1E-16**				n=2	**6.864**	**0.012**
806-02A	0.56	30.025	0.0198	0.0119	1.6E-16	25.74	-1.9E-04	88.3	42.59	3.844	0.035
806-02B	2.07	45.686	0.0217	0.0069	2.1E-16	23.56	2.2E-04	95.5	100.00	6.323	0.026

EXAMPLE

6A

COMPLETE ...SER TABLE

L=	Power	40Ar/39Ar	37Ar/39Ar	36Ar/39Ar	39ArK moles	K/Ca	Cl/K	%40Ar*	%39Ar	Age (Ma)	± Err (Ma)
total gas age					**3.7E-16**				n=2	**5.267**	**0.030**
806-03A	0.56	26.653	0.0211	0.0409	3.1E-17	24.22	2.7E-04	54.6	7.81	2.113	0.125
806-03B	2.08	65.702	0.0195	0.0705	3.7E-16	26.12	-7.5E-05	68.3	100.00	6.503	0.036
total gas age					**4.0E-16**				n=2	**6.160**	**0.043**
806-04A	0.56	38.123	0.0132	0.0074	3.6E-17	38.65	-1.1E-03	94.2	17.88	5.208	0.082
806-04B	2.08	59.389	0.0185	0.0016	1.7E-16	27.60	-1.7E-04	99.1	100.00	8.531	0.032
total gas age					**2.0E-16**				n=2	**7.937**	**0.041**
806-05A	0.56	46.182	0.0211	0.0148	1.1E-16	24.22	-2.2E-08	90.5	48.93	6.059	0.052
806-05B	2.08	62.226	0.0172	0.0048	1.2E-16	29.68	3.5E-04	97.7	100.00	8.805	0.059
total gas age					**2.3E-16**				n=2	**7.461**	**0.055**
QS-3 CONE XENOLITH:Y6:NM-10:LWFVP-139-G, SINGLE CRYSTAL SANIDINE, J=0.0000801											
809-01A	0.55	89.485	0.0089	0.1000	1.9E-16	57.23	2.1E-04	67.0	21.70	8.639	0.053
809-01B	2.07	95.707	0.0079	0.0008	6.9E-16	64.49	8.5E-05	99.7	100.00	13.740	0.032
total gas age					**5.1E-16**				**n=2**	**12.631**	**0.036**
809-02A	0.57	98.342	0.0000	0.1827	3.0E-18	0.00	2.5E-03	45.1	0.38	6.394	0.819
809-02B	2.09	93.114	0.0072	0.0009	8.0E-16	71.14	1.2E-04	99.7	100.00	13.363	0.031
total gas age					**8.0E-16**				**n=2**	**13.336**	**0.034**
809-03A	0.56	125.355	0.0170	0.3242	1.5E-17	30.02	3.2E-03	23.6	2.12	4.262	0.380
809-03B	2.07	87.936	0.0091	0.0028	6.9E-16	56.36	1.6E-04	99.0	100.00	12.541	0.031
total gas age					**7.1E-16**				**n=2**	**12.365**	**0.038**
809-04A	0.55	87.857	0.0080	0.0479	2.3E-16	63.42	2.2E-04	83.8	60.73	10.614	0.042
809-04B	2.07	87.535	0.0095	0.0024	1.5E-16	53.53	-1.3E-04	99.2	100.00	12.500	0.037
total gas age					**3.8E-16**				**n=2**	**11.355**	**0.040**
809-05A	0.54	74.768	0.0086	0.0027	1.6E-16	59.47	1.5E-04	98.9	23.38	10.655	0.039

EXAMPLE

7A

_=	Power	40Ar/39Ar	37Ar/39Ar	36Ar/39Ar	39ArK moles	K/Ca	Cl/K	%40Ar*	%39Ar	Age (Ma)	± Err (Ma)
309-05B	2.06	100.085	0.0083	0.0011	5.3E-16	61.15	1.6E-04	99.6	100.00	14.354	0.037
total gas age					6.9E-16				n=2	13.489	0.038
QI-2 FLOW XENOLITH:Y15:NM-10:LWFVP-143-A, SINGLE CRYSTAL SANIDINE, J=0.0000798											
310-01A	0.55	2.469	0.0069	0.0073	2.6E-16	73.99	3.1E-04	11.6	50.70	0.041	0.014
310-01B	2.08	1.081	0.0079	0.0013	2.5E-16	64.42	8.9E-05	62.0	100.00	0.097	0.010
total gas age					5.1E-16				n=2	0.069	0.012
310-02B	2.10	2.732	0.0214	0.0000	4.7E-18	23.87	-4.1E-03	99.8	100.00	0.393	0.460
total gas age					4.7E-18				n=1	0.393	0.460
310-03A	0.57	3.503	0.0064	0.0093	3.2E-16	80.05	-2.1E-04	20.9	45.84	0.106	0.009
310-03B	2.09	4.164	0.0053	0.0032	3.8E-16	96.49	2.4E-06	76.9	100.00	0.462	0.008
total gas age					7.1E-16				n=2	0.299	0.009
310-04A	0.57	4.439	0.0064	0.0103	2.6E-16	79.30	-6.2E-05	31.1	45.09	0.199	0.015
310-04B	2.10	4.403	0.0074	0.0077	3.2E-16	69.14	5.0E-05	48.0	100.00	0.305	0.011
total gas age					5.8E-16				n=2	0.257	0.013
310-05A	0.57	2.728	0.0081	0.0076	2.8E-16	63.36	1.9E-04	16.4	56.53	0.065	0.010
310-05B	2.10	16.456	0.0061	0.0546	2.1E-16	83.2[illegible]	-8.0E-05	1.8	100.00	0.043	0.036
total gas age					4.9E-16				n=2	0.055	0.022
QS-3 CONE XENOLITH:Y4:NM-10:LWFVP-139-B, SINGLE CRYSTAL SANIDINE, J=0.0000786											
311-01A	0.55	78.783	0.0104	0.0015	1.4E-16	49.20	2.1E-05	99.4	36.16	10.876	0.036
311-01B	2.07	99.090	0.0091	0.0011	2.5E-16	56.23	-1.2E-04	99.7	100.00	13.948	0.044
total gas age					3.9E-16				n=2	12.837	0.041

EXAMPLE

A8

COMPLETE ...SER TABLE

...e	...ower	40Ar/39Ar	37Ar/39Ar	36Ar/39Ar	39ArK moles	K/Ca	Cl/K	%40Ar*	%39Ar	Age (Ma)	± Err (Ma)
...11-02A	...57	67.110	0.0093	0.0026	1.6E-16	54.86	5.5E-04	98.8	32.50	9.381	0.032
...11-02B	2.10	87.358	...0084	0.0009	3.3E-16	60.56	-3.1E-04	99.7	100.00	12.305	0.037
...total gas age					**4.9E-16**				**n=2**	**11.355**	**0.035**
...11-03A	0.57	71.186	0.0102	0.0...71	1.1E-16	50.06	5.7E-04	80.4	34.88	8.099	0.065
...11-03B	2.09	80.866	0.0089	0.002...	2.0E-16	57.58	1.7E-04	99.2	100.00	11.337	0.029
...total gas age					**3.1E-16**				**n=2**	**10.208**	**0.041**
...11-04A	0.57	67.971	0.0162	0.0018	9.4E-17	31.49	-6.6E-04	99.2	40.27	9.533	0.047
...11-04B	2.09	69.259	0.0124	0.0011	1.4E-16	41.10	-4.9E-05	99.5	100.00	9.743	0.051
...total gas age					**2.3E-16**				**n=2**	**9.659**	**0.049**
...11-05A	0.57	88.781	0.0107	0.0013	8.4E-17	47.53	8.2E-04	99.5	49.04	12.486	0.070
...11-05B	2.09	103.009	0.0115	0.0010	8.8E-17	44.36	1.0E-03	99.7	100.00	14.501	0.068
...total gas age					**1.7E-16**				**n=2**	**13.513**	**0.069**
QS-3 CC ... XENOLITH:Y8:NM-10:LWFVP-139-J, SINGLE CRYSTAL SANIDINE, J=0.0000788											
312-01A	0.55	36.972	0.0212	0.0834	5.3E-16	24.11	4.4E-04	33.3	59.56	1.751	0.027
312-01B	2.08	24.086	0.0069	0.0176	3.6E-16	73.50	2.5E-04	78.4	100.00	2.681	0.016
total gas age					**8.8E-16**				**n=2**	**2.127**	**0.023**
312-02A	0.52	12.210	0.1153	-0.0283	1.8E-18	4.42	-1.7E-02	168.5	2.06	2.922	1.444
312-02B	1.79	15.698	0.0086	0.0205	8.7E-17	59.56	1.5E-04	61.3	100.00	1.367	0.043
total gas age					**8.9E-17**				**n=2**	**1.399**	**0.072**
312-03A	0.51	23.332	0.0077	0.0603	1.0E-16	66.06	3.7E-04	23.5	37.70	0.780	0.056
312-03B	1.79	15.896	0.0060	0.0236	1.7E-16	85.65	2.9E-04	56.0	100.00	1.265	0.030

9A

COMPLETE SER TABLE

_=	Power	40Ar/39Ar	37Ar/39Ar	36Ar/39Ar	39ArK moles	K/Ca	Cl/K	%40Ar*	%39Ar	Age (Ma)	± Err (Ma)
total gas age					**2.7E-16**				**n=2**	**1.082**	**0.040**
812-04A	0.51	36.837	0.0426	0.1290	2.4E-17	11.97	-1.5E-03	-3.6	12.46	-0.186	0.140
812-04B	1.79	13.206	0.0081	0.0259	1.7E-16	63.09	1.0E-04	42.0	100.00	0.788	0.026
total gas age					**1.9E-16**				**n=2**	**0.667**	**0.040**
812-05A	0.51	27.775	0.0281	0.0855	3.6E-17	18.17	-4.6E-04	8.9	17.64	0.352	0.114
812-05B	1.79	23.035	0.0[illegible]60	0.0466	1.7E-16	85.05	9.7E-05	40.1	100.00	1.312	0.038
total gas age					**2.0E-16**				**n=2**	**1.143**	**0.052**
QL-2 FLOW XENOLITH:Y13:NM-10:LWFVP-143-O, SINGLE CRYSTAL SANIDINE, J=0.0000793											
813-01A	0.56	103.653	0.0145	0.3120	5.4E-16	35.10	7.2E-04	11.0	68.05	1.634	0.083
813-01B	2.08	27.099	0.0083	0.0697	2.6E-16	61.47	-4.3E-05	23.9	100.00	0.927	0.027
total gas age					**8.0E-16**				**n=2**	**1.408**	**0.065**
813-02A	0.51	85.868	0.0825	0.3026	3.8E-18	6.18	1.5E-02	-4.2	2.19	-0.511	0.784
813-02B	1.79	35.252	0.0108	0.1201	1.7E-16	47.20	-3.9E-04	-0.7	100.00	-0.037	0.058
total gas age					**1.8E-16**				**n=2**	**-0.047**	**0.074**
813-03A	0.51	24.700	0.0000	0.0855	7.0E-18	#DIV/0!	-6.9E-03	-2.3	3.00	-0.083	0.408
813-03B	1.79	19.153	0.0097	0.0306	2.3E-16	52.86	7.0E-04	52.7	100.00	1.444	0.023
total gas age					**2.3E-16**				**n=2**	**1.398**	**0.035**
813-04A	0.51	609.634	0.0262	2.1886	4.9E-18	19.45	-2.1E-03	-6.1	3.41	-5.320	3.059
813-04B	1.79	13.427	0.0121	0.0433	1.4E-16	42.09	-1.8E-04	4.5	100.00	0.087	0.033
total gas age					**1.4E-16**				**n=2**	**-0.097**	**0.136**

EXAMPLE

10A

COMPLETE ER TABLE

_#	Power	40Ar/39Ar	37Ar/39Ar	36Ar/39Ar	39ArK moles	K/Ca	Cl/K	%40Ar*	%39Ar	Age (Ma)	± Err (Ma)
813-05A	0.51	310.029	0.0000	1.0806	7.4E-18	#DIV/0!	-1.3E-02	-3.0	3.22	-1.332	1.416
813-05B	1.78	25.651	0.0103	0.0833	2.2E-16	49.70	-1.1E-04	4.0	100.00	0.146	0.036
total gas age					**2.3E-16**				**n=2**	**0.099**	**0.081**
QL-2 FLOW XENOLITH:Y19:NM-10:LWFVP-143-P, SINGLE CRYSTAL SANIDINE, J=0.0000797											
814-01A	0.56	8.112	0.0066	0.0125	2.1E-16	77.74	2.4E-04	54.2	53.27	0.632	0.018
814-01B	2.06	4.515	0.0064	0.0017	1.8E-16	80.23	3.6E-05	88.3	100.00	0.573	0.015
total gas age					**3.9E-16**				**n=2**	**0.604**	**0.017**
814-02A	0.50	379.183	0.2077	1.3949	2.1E-18	2.46	-4.8E-03	-8.7	0.68	-4.754	3.703
814-02B	1.77	33.026	0.0103	0.1010	3.1E-16	49.33	-8.8E-05	9.6	100.00	0.455	0.034
total gas age					**3.1E-16**				**n=2**	**0.420**	**0.059**
814-03A	0.50	10.308	0.0081	0.0344	5.4E-17	63.10	1.4E-04	1.2	17.75	0.018	0.071
814-03B	1.77	4.759	0.0090	0.0042	2.5E-16	56.64	1.7E-04	73.6	100.00	0.503	0.013
total gas age					**3.0E-16**				**n=2**	**0.417**	**0.023**
814-04A	0.50	2 361	0.0088	0.0059	4.1E-17	58.29	-5.8E-05	24.8	16.22	0.084	0.064
814-04B	1.77	48.430	0.0077	0.0790	2.1E-16	65.97	1.1E-04	51.8	100.00	3.601	0.037
total gas age					**2.5E-16**				**n=2**	**3.030**	**0.041**
814-05A	0.50	34.244	0.0000	0.0436	8.9E-19	#DIV/0!	3.1E-03	62.3	100.00	3.066	2.983
total gas age					**8.9E-19**				**n=1**	**3.066**	**2.983**
LITTLE CONE XENOLITH:Y24:NM-10:LWFVP-145, SINGLE CRYSTAL SANIDINE, J=0.0000798											
815-01A	0.38	50.931	0.0527	0.0176	6.3E-17	9.67	9.9E-05	89.8	24.53	6.014	0.070
815-01B	1.57	59.072	0.0419	0.0061	1.9E-16	12.17	4.3E-04	96.9	100.00	7.377	0.039

EXAMPLE

11A

COMPLETE ...SER TABLE

_=	Power	40Ar/39Ar	37Ar/39Ar	36Ar/39Ar	39ArK moles	K/Ca	Cl/K	%40Ar*	%39Ar	Age (Ma)	± Err (Ma)
total gas age					2.6E-16				n=2	/.043	0.046
815-02A	0.57	69.020	0.1760	0.3006	3.3E-19	2.90	8.7E-03	%-114.3	1.76	-13.847	11.163
815-02B	2.09	58.256	0.0640	0.0204	1.9E-17	7.98	6.2E-04	89.6	100.00	6.786	0.117
total gas age					1.9E-17				n=2	6.423	0.311
815-04	0.56	46.051	0.0252	0.0414	6.1E-17	20.28	-5.0E-05	73.4	35.14	4.547	000.1
815-04B	2.09	33.029	0.0244	0.0143	1.1E-16	20.91	-3.1E-04	87.2	100.00	3.909	000.0
total gas age					1.7E-16				n=2	4.134	0.042
815-05A	0.57	56.422	0.0473	0.0319	8.0E-17	10.79	2.9E-04	83.3	60.96	6.167	000.1
815-05B	2.09	53.848	0.0432	0.0084	5.1E-17	11.80	-4.4E-04	95.3	100.00	6.685	000.1
total gas age					1.3E-16				n=2	006.4	0.057
815-06A	0.56	15.570	0.0306	0.0319	6.1E-17	16.67	-4.7E-04	39.3	58.40	0.870	000.0
815-06B	2.08	12.493	0.0301	0.0256	4.4E-17	16.93	9.5E-05	39.2	100.00	0.699	000.1
total gas age					1.0E-16				n=2	0.799	0.054
815-07A	0.57	39.013	0.0192	0.1151	1.9E-16	26.52	3.2E-04	12.8	91.04	0.712	000.1
815-07B	2.09	19.012	0.0244	0.0448	1.9E-17	20.89	-1.7E-03	30.2	100.00	0.818	000.1
total gas age					2.1E-16				n=2	0.721	0.059
QL-1 FLOW XENOLITH:Y12:LWFVP-138, MELTED FELSIC FRACTION, J=0.0000797											
823-01	1.58	2016.623	3.9610	6.8049	8.4E-17	0.13	4.7E-02	0.3	100.00	0.876	2.651
total gas age					8.4E-17				n=1	0.876	2.651
					0.0E+00						
823-02A	0.50	11023.020	1.0926	37.0970	3.2E-17	0.47	8.0E-02	0.6	21.20	...7	35.436

EXAMPLE

12 A

L#	Power	40Ar/39Ar	37Ar/39Ar	36Ar/39Ar	39ArK moles	K/Ca	Cl/K	%40Ar*	%39Ar	Age (Ma)	± Err (Ma)
823-02B	1.58	1374.178	1.8602	4.6350	1.2E-16	0.27	2.2E-02	0.3	100.00	0.673	1.906
total gas age					**1.5E-16**				**n=2**	**2.391**	**9.013**
823-03A	0.51	5343.662	0.8472	18.1418	4.7E-17	0.60	6.5E-02	-0.3	26.99	-2.485	20.654
823-03B	1.58	472.412	1.6750	1.5809	1.3E-16	0.30	3.8E-03	1.1	100.00	0.775	0.470
total gas age					**1.7E-16**				**n=2**	**-0.105**	**5.919**
QL-2 FLOW XENOLITH:Y17:LWFVP-143-g, MELTED FELSIC FRACITON, J=0.0000795											
824-01A	0.51	65.748	0.0523	0.2101	2.7E-17	9.76	-4.2E-03	5.5	24.44	0.526	0.218
824-01B	1.58	-0.268	0.0669	-0.0052	8.3E-17	7.63	-1.8E-03	%-472.8	100.00	0.183	0.035
total gas age					**1.1E-16**				**n=2**	**0.267**	**0.080**
824-02A	0.51	56.965	0.0469	0.2259	4.0E-18	10.87	-2.1E-03	-17.2	9.54	-1.418	0.668
824-02B	1.78	164.661	0.0866	0.5656	3.8E-17	5.89	2.6E-03	-1.5	100.00	-0.360	0.393
total gas age					**4.2E-17**				**n=2**	**-0.461**	**0.419**
824-03A	0.51	9.596	0.2128	0.0665	4.[illegible]E-18	2.40	-3.5E-03	%-104.8	11.89	-1.452	0.557
824-03B	1.78	8.511	0.1621	0.0329	3.0E-17	3.15	-1.2E-04	-14.3	100.00	-0.176	0.085
total gas age					**3.4E-17**				**n=2**	**-0.328**	**0.141**
824-04A	0.51	1595.808	0.0935	5.3656	1.0E-17	5.46	2.0E-02	0.6	15.67	1.479	7.765
824-04B	1.78	4.312	0.1259	0.0148	5.5E-17	4.05	1.7E-03	-1.[illegible]	100.00	-0.009	0.046
total gas age					6.6E-17				n=2	**0.224**	**1.255**
824-05A	0.51	33.112	0.0404	0.1098	7.7E-18	12.63	1.2E-02	2.0	15.11	0.094	0.358
824-05B	1.78	37.534	0.0957	0.1430	4.3E-17	5.33	-1.5E-04	-12.6	100.00	-0.683	0.119
total gas age					5.1E-17				n=2	**-0.566**	**0.155**

EXAMPLE

13A

COMPLETE ...SER TABLE

L#	Power	40Ar/39Ar	37Ar/39Ar	36Ar/39Ar	39ArK moles	K/Ca	Cl/K	%40Ar*	%39Ar	Age (Ma)	± Err (Ma)
ASH FLOW TUFF:y2:NM-13: , LW-142 850 C 20 HRS SINGLE CRYSTAL SANIDINE, J=0.000684											
1272-02A	0.26	145.129	0.1436	0.4329	6.8E-17	3.55	6.4E-02	11.8	0.01	21.102	50.389
1272-02B	0.49	10.230	0.2813	0.0385	4.0E-16	1.81	7.8E-03	-11.1	0.09	-1.408	5.115
1272-02C	0.61	1.812	0.0625	-0.0055	9.9E-16	8.16	-7.2E-05	189.0	0.27	4.225	2.308
1272-02D	0.71	0.726	0.0350	-0.0015	1.8E-15	14.58	5.8E-04	156.9	0.61	1.406	1.158
1272-02E	0.82	0.627	0.0138	0.0022	1.0E-14	36.96	7.9E-04	-7.6	2.47	-0.059	0.243
1272-02F	0.93	1.527	0.0153	0.0002	1.3E-14	33.42	7.9E-04	95.4	4.95	1.797	0.154
1272-02G	1.03	3.136	0.0116	0.0009	1.5E-14	44.12	-1.9E-04	90.9	7.66	3.515	0.154
1272-02H	1.14	5.700	0.0127	-0.0001	3.4E-14	40.32	2.3E-04	100.3	14.03	7.044	0.081
1272-02I	1.25	8.251	0.0159	0.0003	2.7E-13	32.14	2.4E-05	98.8	63.89	10.040	0.019
1272-02J	1.35	8.654	0.0166	0.0008	1.5E-13	30.69	1.5E-04	96.9	92.14	10.318	0.032
1272-02K	1.46	7.966	0.0067	0.0004	1.2E-14	75.97	-3.4E-05	98.4	94.37	9.652	0.242
1272-02L	1.56	8.876	0.0145	-0.0009	1.8E-14	35.14	1.7E-04	102.6	97.64	11.211	0.140
1272-02N	1.56	8.187	0.0332	0.0040	5.1E-15	15.35	1.5E-04	85.4	98.59	8.613	0.392
1272-02P	2.07	8.432	0.0159	0.0035	7.6E-15	32.17	4.2E-04	87.4	100.00	9.076	0.263
total gas age					**5.4E-13**				**n=14**	**9.314**	**0.072**
ASH FLOW TUFF:y2:NM-13: LW-142 850 C 20 HRS SINGLE BROKEN CRYSTAL SANIDINE, J=0.0006843											
1286-01A	0.27	9.330	0.0185	0.0303	1.9E-15	27.51	4.3E-03	3.7	0.67	0.423	1.225
1286-01B	0.50	1.985	0.0280	0.0020	2.1E-14	18.23	9.1E-04	69.2	7.98	1.696	0.096
1286-01C	0.61	4.305	0.0215	0.0014	4.3E-14	23.75	2.2E-04	90.1	23.25	4.783	0.063
1286-01D	0.71	8.239	0.0187	0.0071	3.3E-14	27.28	3.4E-04	74.2	34.88	7.534	0.104
1286-01E	0.82	8.151	0.0187	0.0011	7.8E-14	27.31	3.9E-05	95.7	62.31	9.602	0.039
1286-01F	0.93	8.537	0.0229	0.0003	3.5E-14	22.31	2.3E-04	98.7	74.45	10.375	0.079
1286-01G	1.03	9.009	0.0188	0.0007	4.8E-14	27.21	5.9E-05	97.4	91.31	10.803	0.056
1286-01H	1.14	8.595	0.0152	-0.0007	1.0E-14	33.57	2.1E-04	102.3	94.87	10.825	0.250
1286-01I	1.20	8.490	0.0077	0.0042	6.1E-15	66.22	4.6E-04	85.0	97.01	8.883	0.314
1286-01K	1.31	8.521	0.0143	0.0031	8.5E-15	35.70	7.8E-04	89.1	100.00	9.347	0.223
total gas age					**2.8E-13**				**n=10**	**8.303**	**0.089**
ASH FLOW TUFF:y2:NM-13: , LW-142 850 C 20 HRS SINGLE BROKEN CRYSTAL SANIDINE, J=0.0006843											

EXAMPLE

14A

COMPLETE ...SER TABLE

L#	Power	40Ar/39Ar	37Ar/39Ar	36Ar/39Ar	39ArK moles	K/Ca	Cl/K	%40Ar*	%39Ar	Age (Ma)	± Err (Ma)
1375-01A	0.24	8.292	0.0416	0.0269	6.1E-17	12.25	2.6E-04	3.9	1.47	0.400	0.562
1375-01B	0.36	2.528	0.0197	0.0039	4.2E-16	25.85	9.9E-05	53.0	11.64	1.655	0.084
1375-01C	0.59	13.853	0.0223	0.0262	1.7E-15	22.90	1.3E-04	44.0	52.63	7.507	0.086
1375-01D	0.80	8.512	0.0263	0.0018	5.6E-16	19.42	2.3E-04	93.5	66.33	9.794	0.088
1375-01E	0.91	7.767	0.0262	0.0010	3.6E-16	19.45	-1.5E-04	96.0	75.19	9.184	0.120
1375-01F	1.03	7.491	0.0214	0.0021	7.3E-16	23.90	-1.5E-04	91.6	92.83	8.448	0.059
1375-01G	1.12	6.928	0.0168	-0.0007	5.7E-17	30.38	-1.9E-03	102.6	94.21	8.755	0.458
1375-01H	1.24	7.777	0.0316	0.0009	1.8E-16	16.16	6.9E-05	96.3	98.64	9.226	0.253
1375-01K	1.55	7.988	0.0700	0.0021	5.6E-17	7.29	6.8E-04	92.0	100.00	9.049	0.418
total gas age					**4.1E-15**				**n=9**	**7.550**	**0.109**

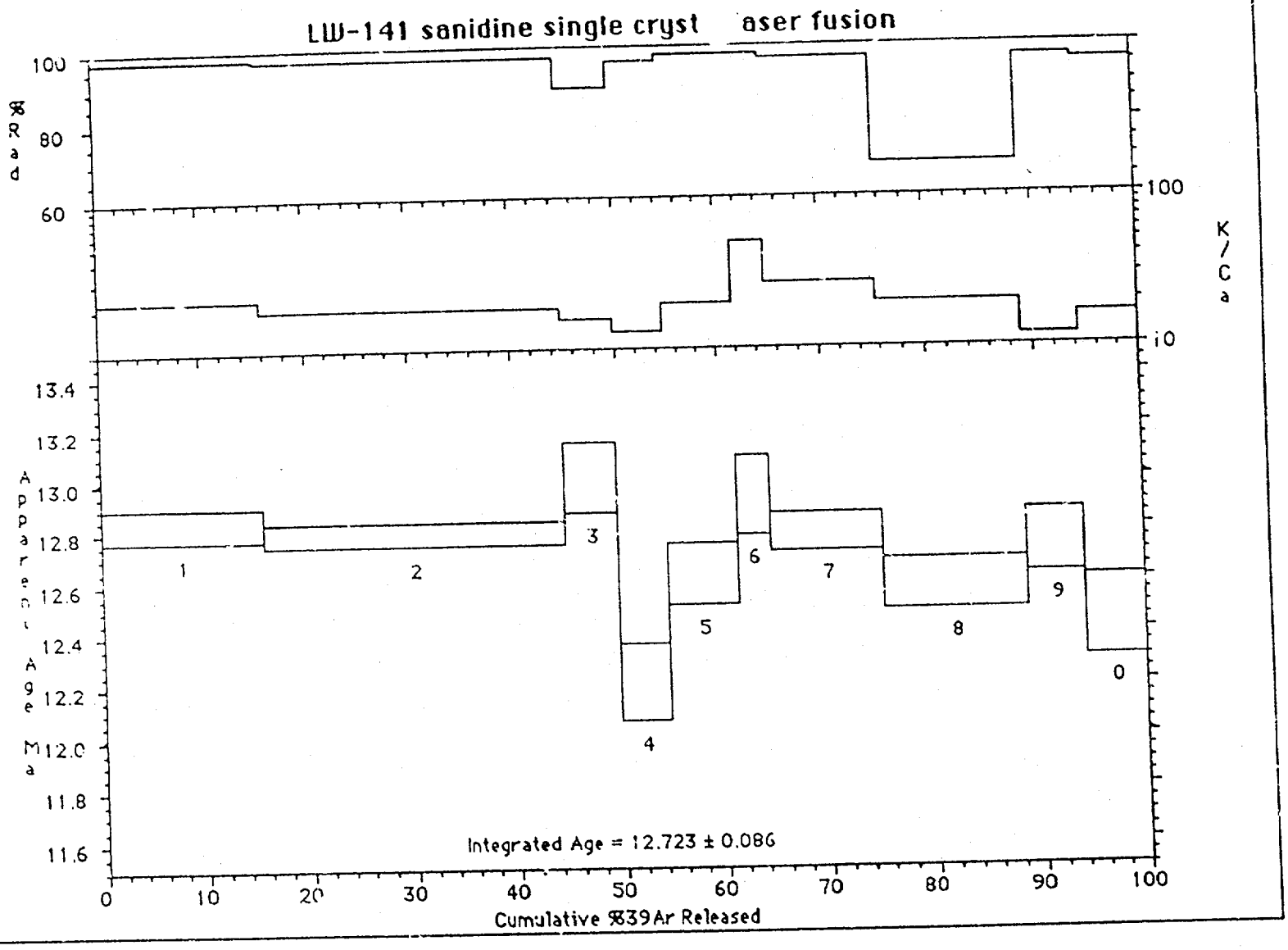
EXAMPLE

15A

L#	40Ar/39Ar	37Ar/39Ar	36Ar/39Ar	39ArK moles	K/Ca	%40Ar*	Age	± Err	SEM
Ash flow tuff, LW-142 single crystal fusion, Y27, J=0.0000806									
807-08	32.79	1.81E-02	1.29E-02	1.3E-17	28.2	95.4	11.444	0.026	
807-05	79.74	1.91E-02	2.47E-03	9.0E-18	26.7	99.1	11.450	0.029	
807-09	84.45	1.98E-02	1.80E-02	6.2E-18	25.8	93.7	11.467	0.039	
807-03	80.17	1.82E-02	3.18E-03	1.3E-17	28.0	98.8	11.481	0.025	
807-02	93.10	1.83E-02	4.69E-02	1.4E-17	27.9	85.1	11.483	0.033	
807-06	91.30	1.93E-02	4.03E-02	1.0E-17	26.4	86.9	11.505	0.038	
807-07	81.06	1.92E-02	4.73E-03	6.8E-18	26.6	98.2	11.544	0.034	
807-04	86.62	2.04E-02	2.24E-02	9.4E-18	25.0	92.3	11.592	0.036	
807-10	81.37	1.96E-02	4.59E-03	7.7E-18	26.0	98.3	11.594	0.035	
					mean	n=9	11.507	0.057	0.019
Ash flow tuff, LW-141 single crystal fusion, Y31, J=0.0000796									
808-04	89.15	3.92E-02	1.28E-02	8.4E-19	13.0	95.7	12.214	0.151	
808-10	91.21	3.08E-02	1.42E-02	1.0E-18	16.6	95.4	12.451	0.156	
808-08	128.34	2.57E-02	1.37E-01	2.3E-18	19.9	68.5	12.583	0.096	
808-05	90.29	2.53E-02	6.88E-03	1.2E-18	20.2	97.7	12.627	0.121	
808-09	92.29	4.26E-02	1.08E-02	9.4E-19	12.0	96.5	12.746	0.124	
808-07	92.31	1.90E-02	1.00E-02	1.9E-18	26.8	96.8	12.782	0.073	
808-02	91.86	2.72E-02	8.37E-03	5.1E-18	18.8	97.3	12.789	0.042	
808-01	91.63	2.31E-02	6.46E-03	2.8E-18	22.1	97.9	12.836	0.064	
808-06	92.41	1.03E-02	6.76E-03	5.8E-19	19.5	97.8	12.935	0.154	
808-03	102.13	3.19E-02	3.81E-02	8.7E-19	16.0	89.0	13.001	0.138	
					mean	n=10	12.696	0.235	0.074

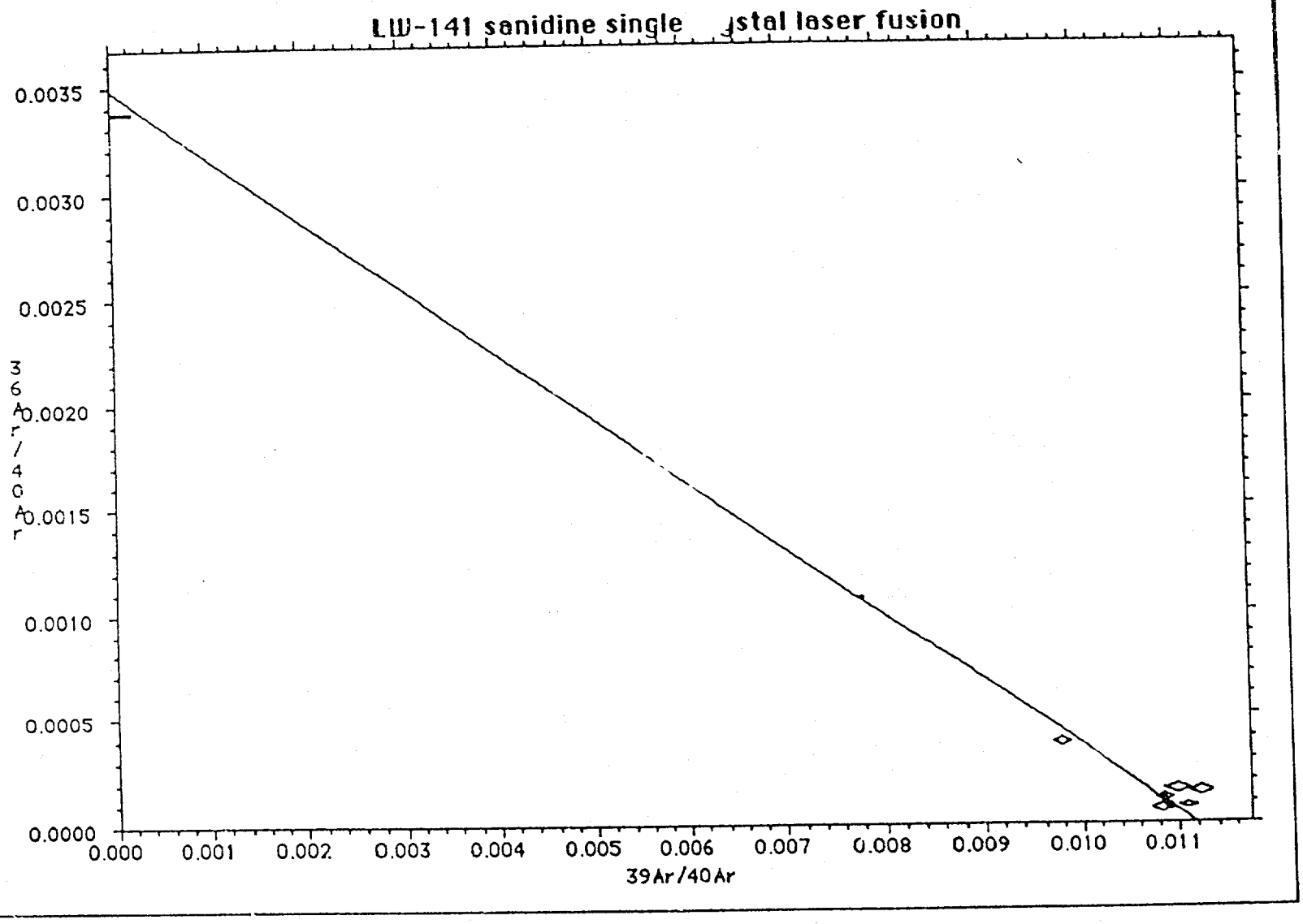
EXAMPLE

164


LW-141 sanidine single cryst aser fusion
100
80
60
% Rad
100
i0
K/Ca
13.4
13.2
13.0
12.8
12.6
12.4
12.2
12.0
11.8
11.6
Apparent Age Ma
1
2
3
4
5
6
7
8
9
0
Integrated Age = 12.723 ± 0.086
0
10
20
30
40
50
60
70
80
90
100
Cumulative %39Ar Released

EXAMPLE

17 A


LW-141 sanidine single ystal laser fusion
0.0035
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
36Ar/40Ar
0.000
0.001
0.002
0.003
0.004
0.005
0.006
0.007
0.008
0.009
0.010
0.011
39Ar/40Ar

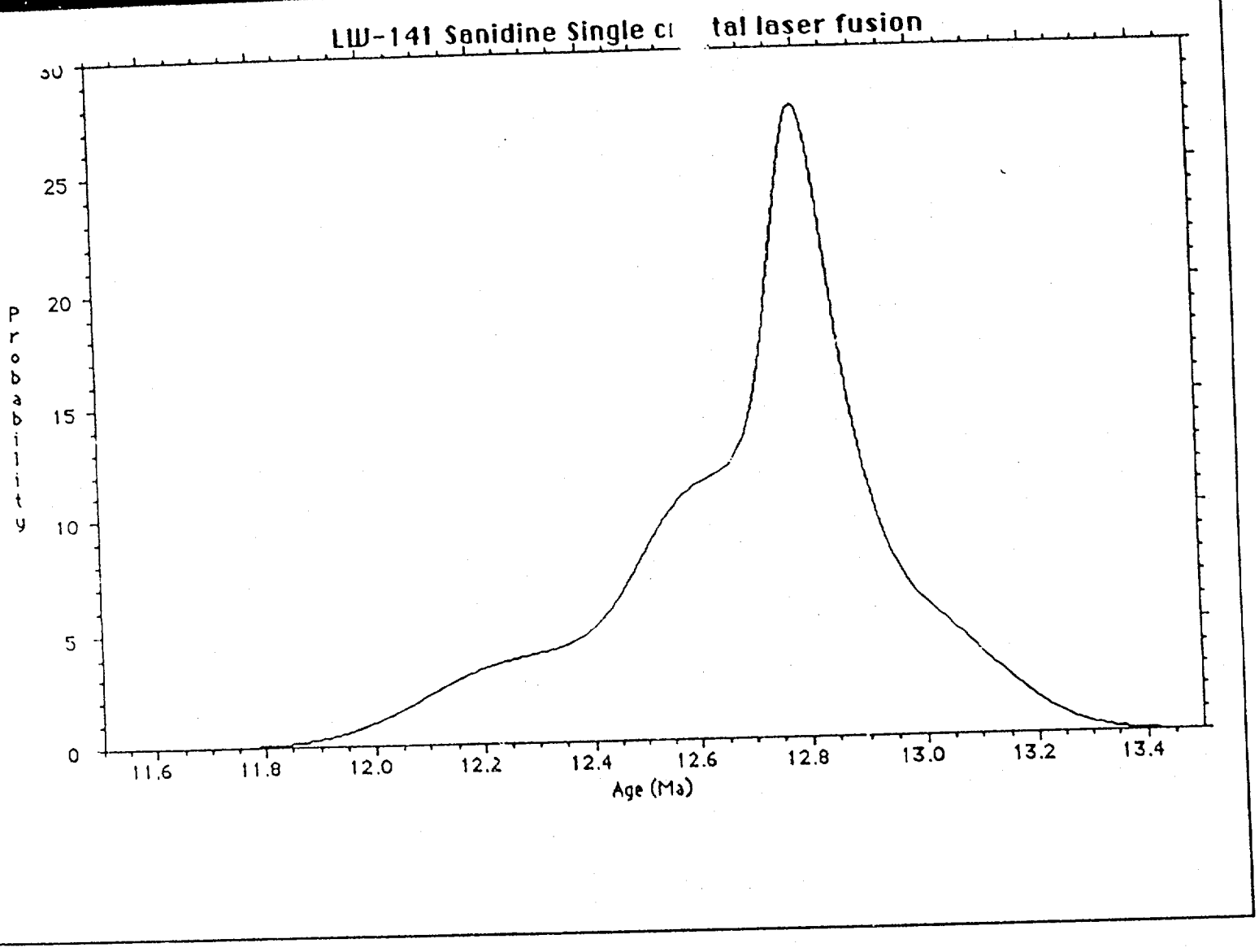
EXAMPLE

LW-141 Idine single crystal laser fusion

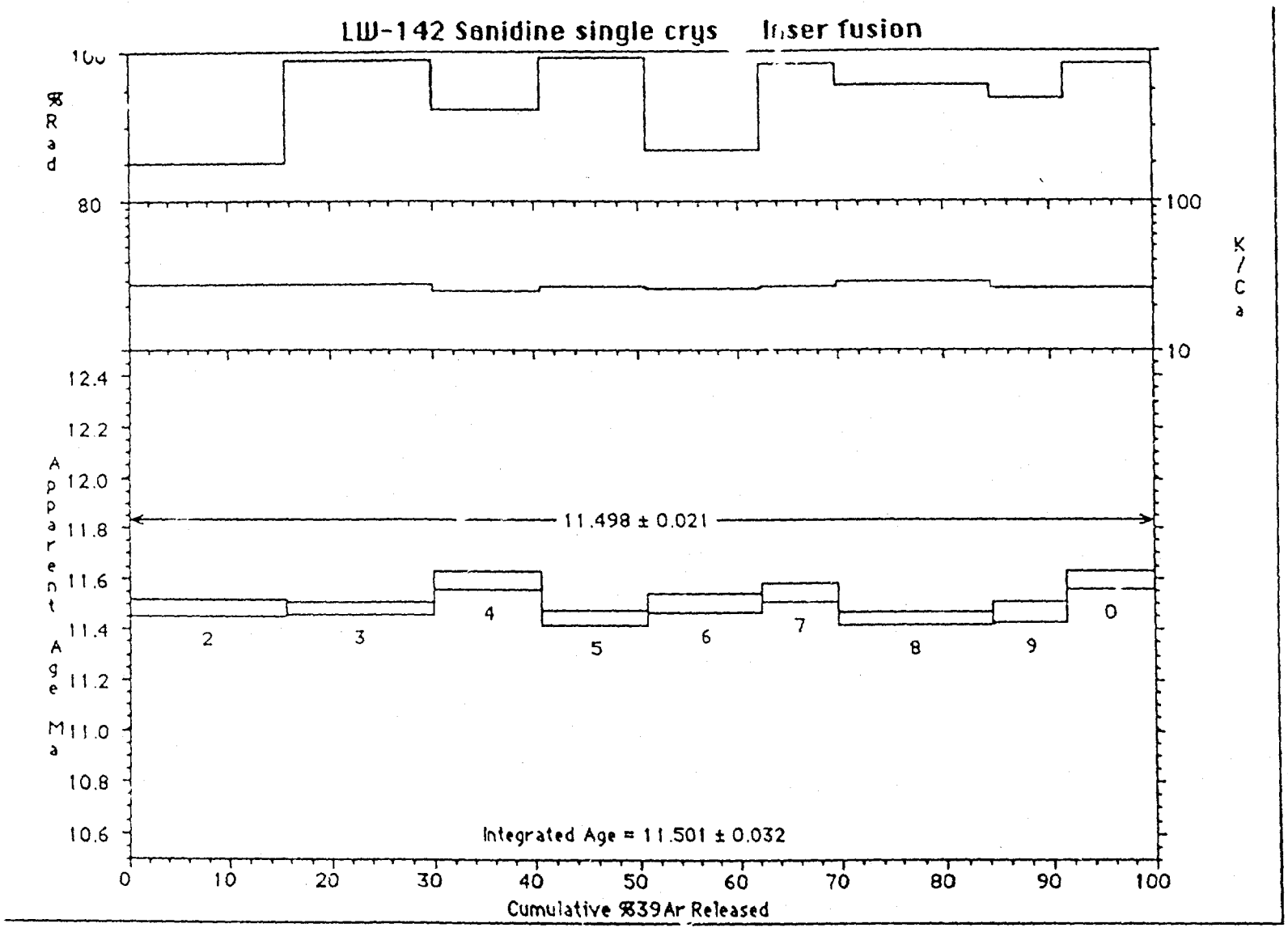
J	=	.0000796	± .0000002					
Conv. Criterion	=	.0001						
No. Iterations	=	5						
No. Points	=	10						
MSWD	=	3.182663			Prob= 1.297946E-03			
Slope (36tr/39K)	=	-3.121E-01	±SE	5.728E-03	(1.8%),	±MSE	1.022E-02	(3.3%)
Intcpt (36/40)tr	=	3.494E-03	±SE	5.978E-05	(1.7%),	±MSE	1.066E-04	(3.1%)
Intcpt (39K/40*)	=	1.119E-02	±SE	2.556E-05	(0.2%),	±MSE	4.561E-05	(0.4%)
Intcpt (40*/39K)	=	8.935E+01	±SE	2.041E-01	(0.2%),	±MSE	4.561E-05	(0.4%)
Intcpt (40/36)tr	=	286.2	±SE	4.9	(1.7%),	±MSE	8.7	(3.1%)
Age (Ma)	=	12.7850	±SE	0.0433	(0.3%),	±MSE	0.0610	(0.5%)
Age (w/o J Er)	=	12.7850	±SE	0.0291	(0.2%),	±MSE	0.0519	(0.4%)

EXAMPLE

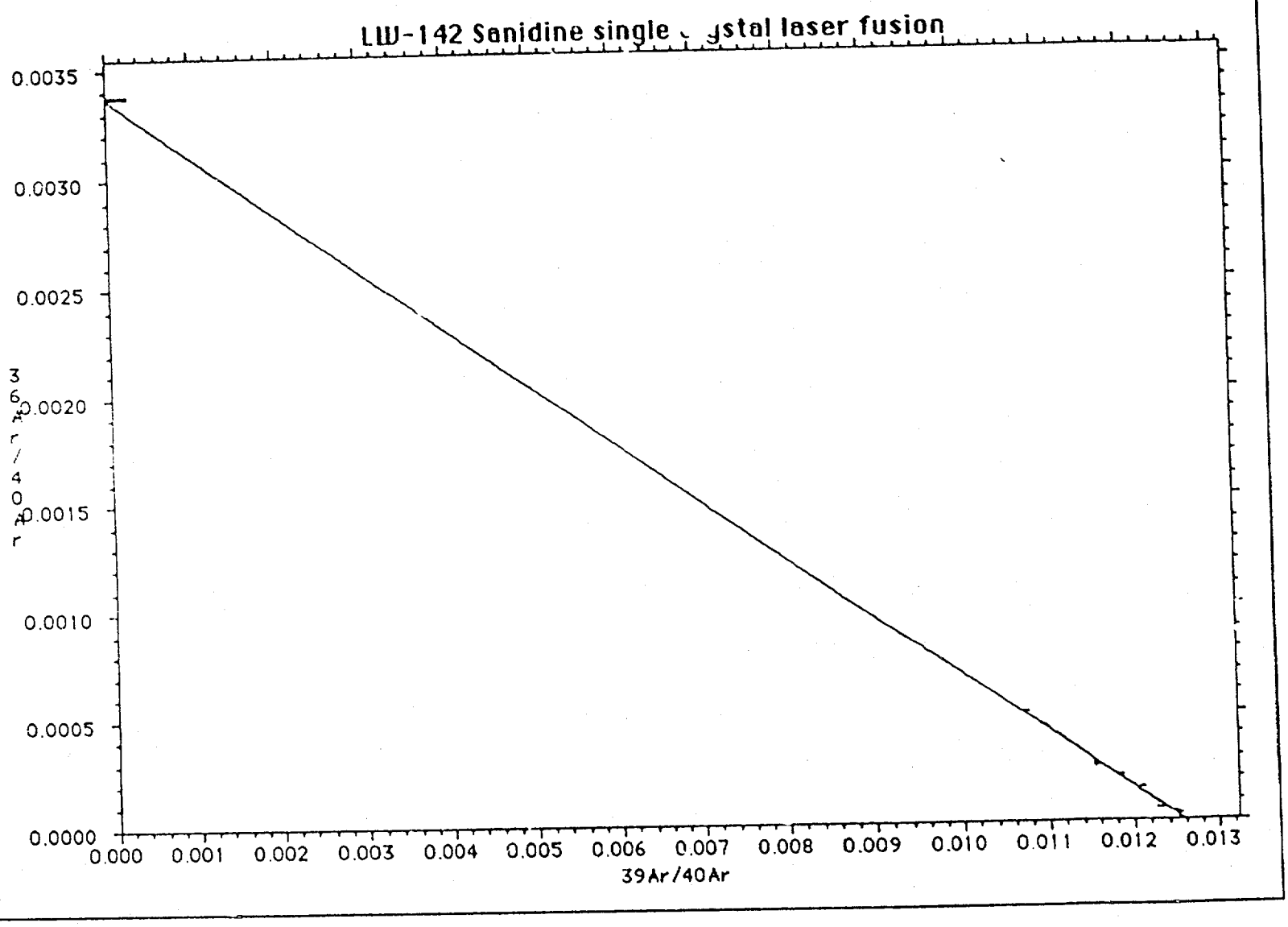
V61


LW-141 Sanidine Single c
tal laser fusion
30
25
20
15
10
5
0
Probability
11.6
11.8
12.0
12.2
12.4
12.6
12.8
13.0
13.2
13.4
Age (Ma)

EXAMPLE


LW-142 Sanidine single crys Laser fusion
%Rad
100
80
100
10
K/Ca
Apparent Age Ma
12.4
12.2
12.0
11.8
11.6
11.4
11.2
11.0
10.8
10.6
11.498 ± 0.021
2
3
4
5
6
7
8
9
0
Integrated Age = 11.501 ± 0.032
0
10
20
30
40
50
60
70
80
90
100
Cumulative %39Ar Released

EXAMPLE

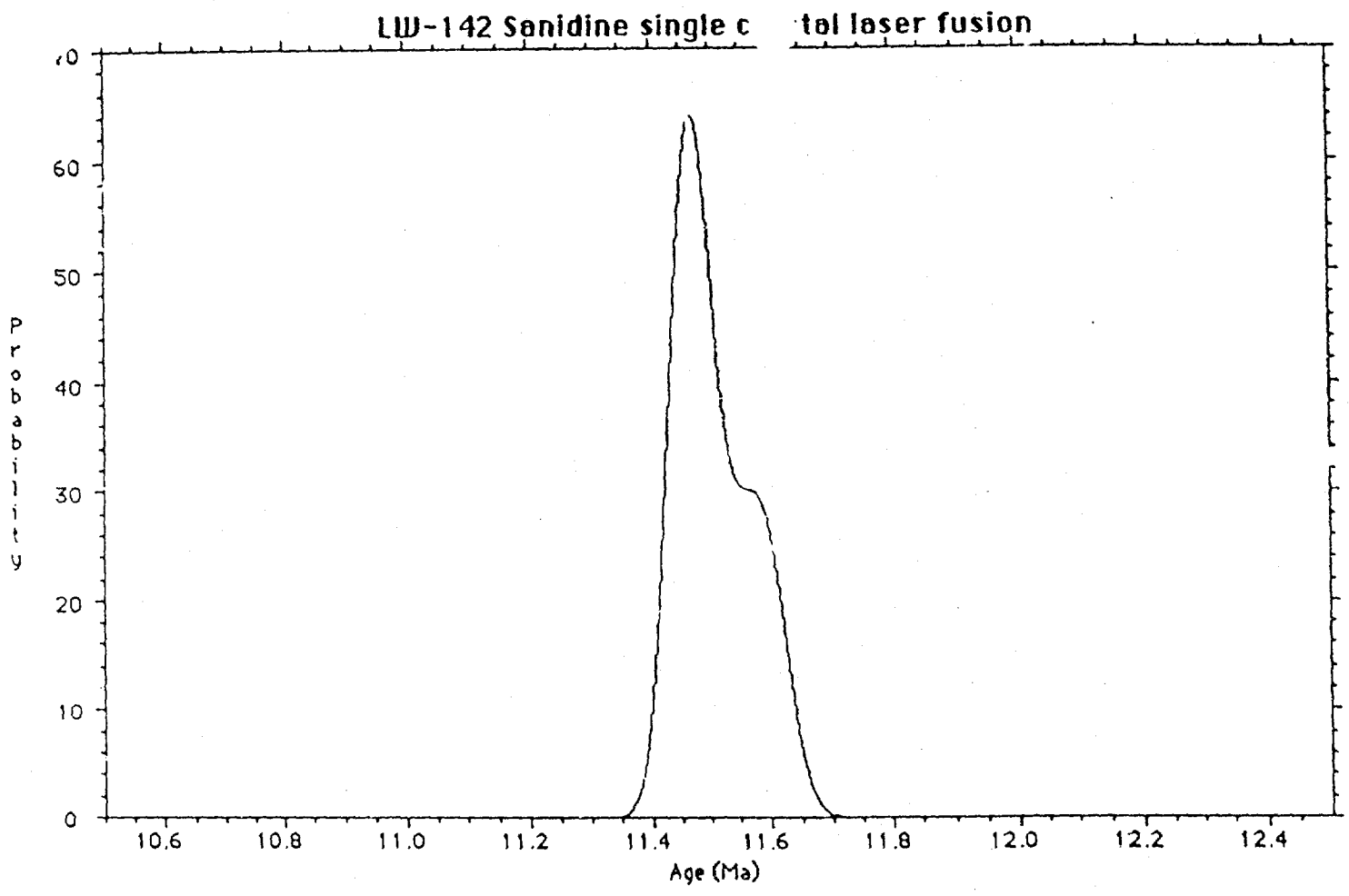

LW-142 Sanidine single ... ystal laser fusion
0.0035
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
36Ar/40Ar
0.000
0.001
0.002
0.003
0.004
0.005
0.006
0.007
0.008
0.009
0.010
0.011
0.012
0.013
39Ar/40Ar

EXAMPLE

CW-142 Idine single crystal laser fusion

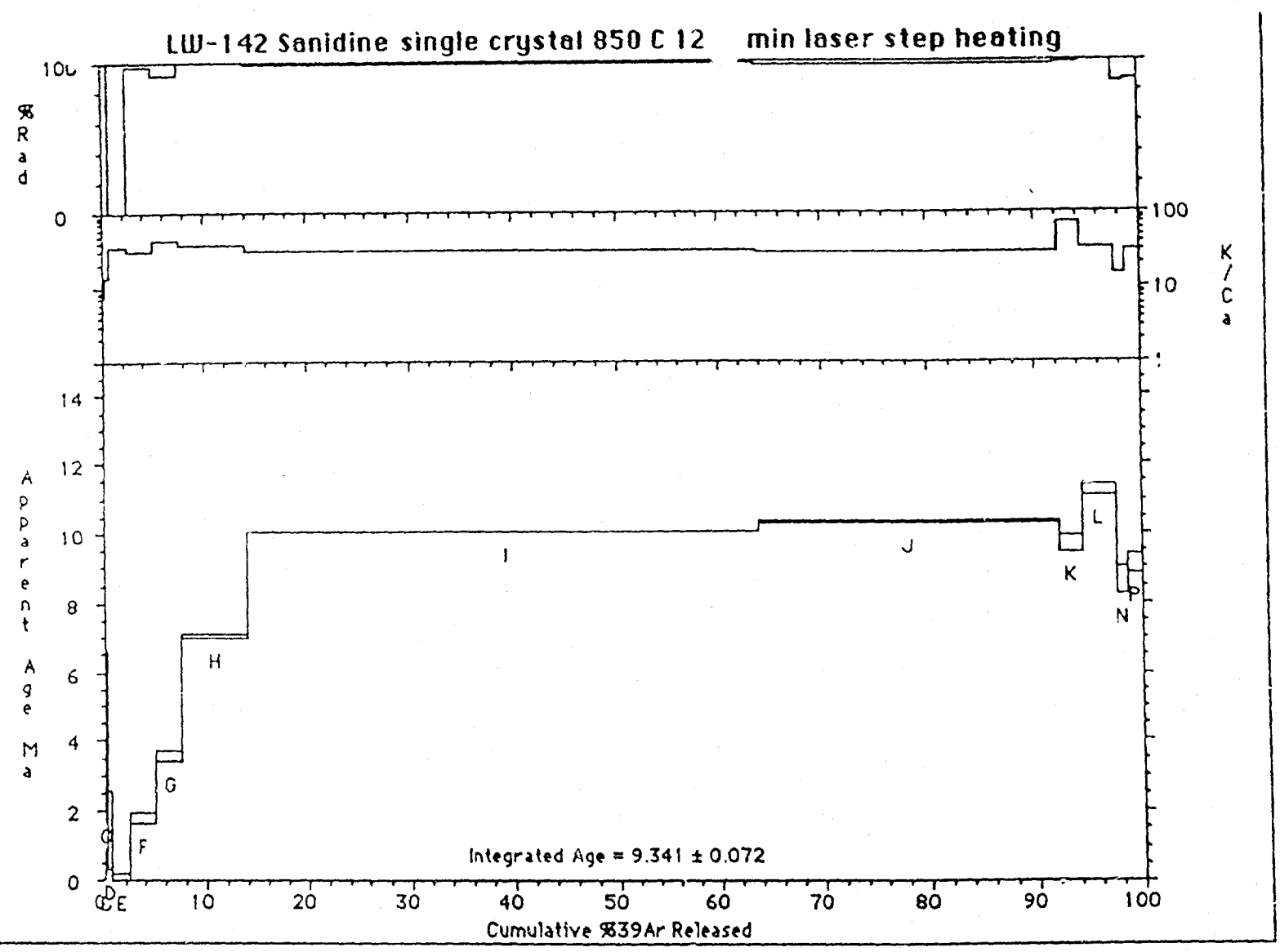
J	=	.0000806	±	.0000002				
Conv. Criterion	=	.0001						
No. Iterations	=	4						
No. Points	=	9						
MSWD	=	4.034158			Prob=	1.990266E-04		
Slope (36tr/39K)	=	-2.679E-01	±SE	4.237E-03	(1.6%),	±MSE	8.510E-03	(3.2%)
Intcpt (36/40)tr	=	3.377E-03	±SE	5.040E-05	(1.5%),	±MSE	1.012E-04	(3.0%)
Intcpt (39K/40*)	=	1.261E-02	±SE	1.542E-05	(0.1%),	±MSE	3.096E-05	(0.2%)
Intcpt (40*/39K)	=	7.931E+01	±SE	9.697E-02	(0.1%),	±MSE	3.096E-05	(0.2%)
Intcpt (40/36)tr	=	296.1	±SE	4.4	(1.5%),	±MSE	8.9	(3.0%)
Age (Ma)	=	11.4962	±SE	0.0317	(0.3%),	±MSE	0.0400	(0.3%)
Age (w/o J Er)	=	11.4962	±SE	0.0140	(0.1%),	±MSE	0.0281	(0.2%)

EXAMPLE

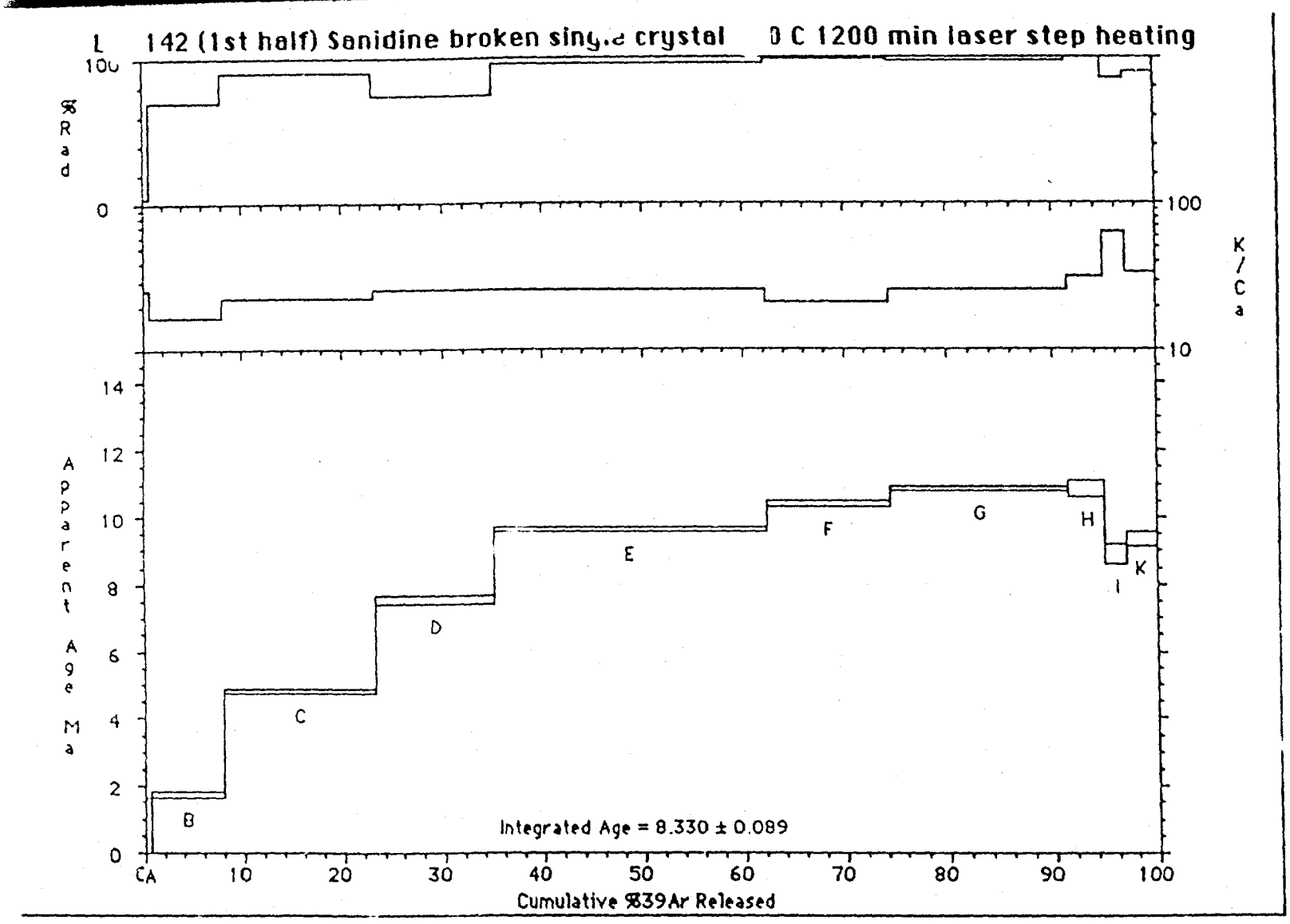

LW-142 Sanidine single c tal laser fusion
Probability
0
10
20
30
40
50
60
10.6
10.8
11.0
11.2
11.4
11.6
11.8
12.0
12.2
12.4
Age (Ma)

EXAMPLE

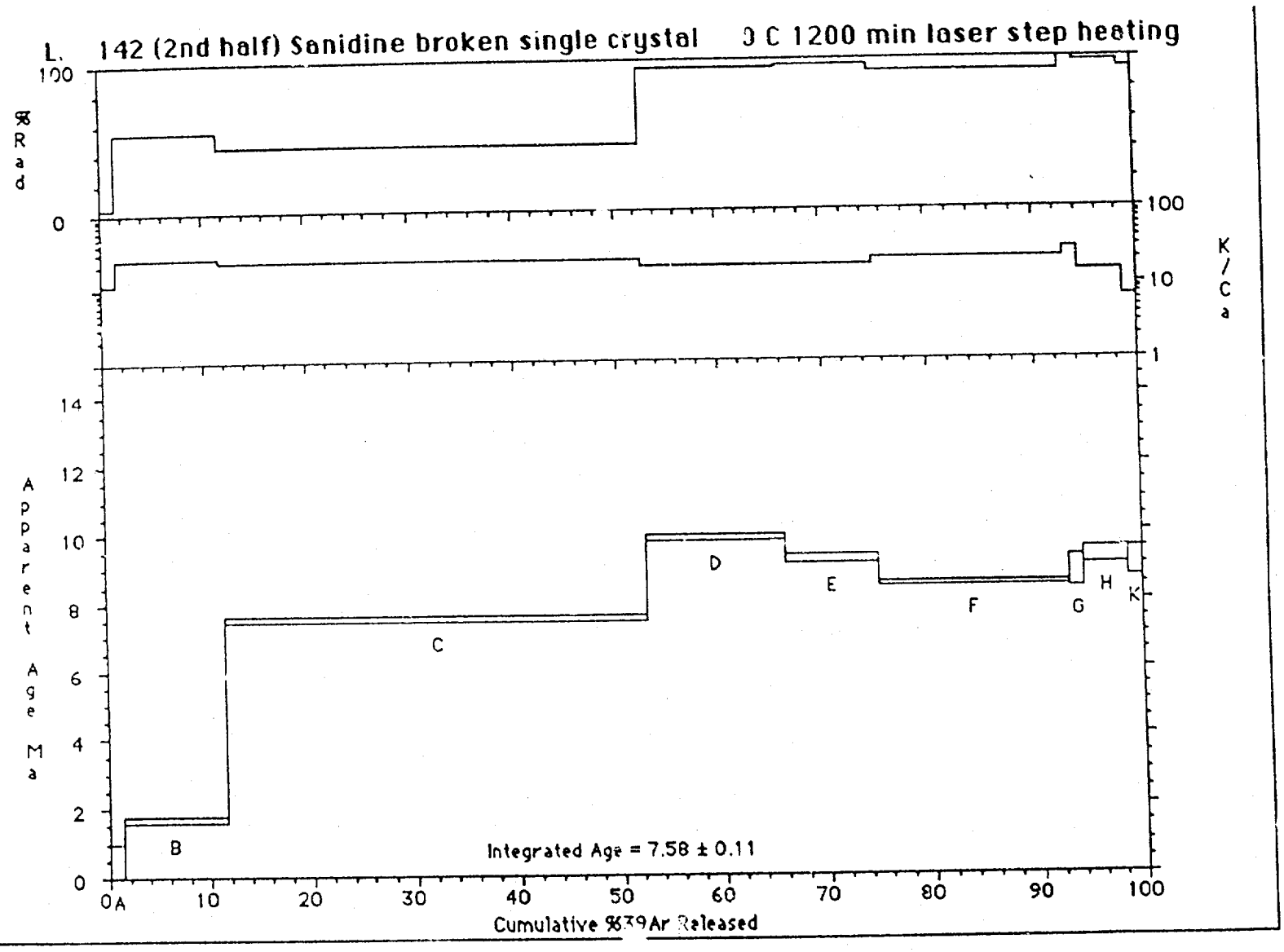
24A


LW-142 Sanidine single crystal 850 C 12 min laser step heating
100
%Rad
0
100
10
1
K/Ca
14
12
10
8
6
4
2
0
Apparent Age Ma
A
B
C
D
E
F
G
H
I
J
K
L
N
Integrated Age = 9.341 ± 0.072
10
20
30
40
50
60
70
80
90
100
Cumulative %39Ar Released

EXAMPLE


L 142 (1st half) Sanidine broken single crystal 0 C 1200 min laser step heating
100
%Rad
0
100
K/Ca
10
14
12
10
8
6
4
2
0
Apparent Age Ma
B
C
D
E
F
G
H
I
K
Integrated Age = 8.330 ± 0.089
CA
10
20
30
40
50
60
70
80
90
100
Cumulative %39Ar Released

EXAMPLE


L. 142 (2nd half) Sanidine broken single crystal 3 C 1200 min laser step heating
100
%Rad
0
100
10
1
K/Ca
14
12
10
8
6
4
2
0
Apparent Age Ma
A
B
C
D
E
F
G
H
K
Integrated Age = 7.58 ± 0.11
0A
10
20
30
40
50
60
70
80
90
100
Cumulative %39Ar Released

EXAMPLE

COMPLETE F IACE TABLE

L#	Temp	40/39	37/39	36/39	39K moles	K/Ca	Cl/K	%40*	%39Ar	Age	± Err
Y1:LWFVP-140, SANIDINE 122.2 MG, J=0.0000798±0.0000002											
818-01A	500	2.64E+02	1.09E-02	9.03E-01	3.9E-18	4.7E+01	2.4E-03	-0.9	0.32	-0.355	0.290
818-01B	600	7.98E+02	2.38E-02	2.66E+00	7.5E-19	2.1E+01	1.6E-02	1.6	0.39	1.849	1.606
818-01C	700	5.65E+01	2.05E-02	1.89E-01	2.5E-18	2.5E+01	3.9E-03	1.3	0.59	0.105	0.091
818-01D	800	1.45E+01	2.15E-02	4.69E-02	9.4E-18	2.4E+01	6.4E-04	4.6	1.37	0.096	0.021
818-01E	447	3.47E+00	1.80E-02	9.17E-03	3.0E-17	2.8E+01	-9.6E-05	21.2	3.86	0.106	0.006
818-01F	846	1.41E+00	1.63E-02	2.18E-03	2.5E-17	3.1E+01	7.3E-05	52.7	5.95	0.107	0.004
818-01G	834	1.24E+00	1.56E-02	2.23E-03	6.3E-17	3.3E+01	-4.1E-05	45.4	11.19	0.081	0.002
818-01H	1023	1.02E+00	1.54E-02	1.54E-03	3.8E-17	3.3E+01	-1.8E-04	53.4	14.34	0.078	0.003
818-01I	960	1.27E+00	1.50E-02	2.36E-03	1.0E-16	3.4E+01	-9.6E-06	43.7	22.85	0.080	0.002
818-01J	1006	1.52E+00	1.50E-02	3.34E-03	1.2E-16	3.4E+01	1.9E-05	33.8	33.18	0.074	0.002
818-01K	995	2.60E+00	1.47E-02	6.83E-03	1.3E-16	3.5E+01	2.6E-05	21.4	43.56	0.080	0.002
818-01L	775	6.05E+00	1.47E-02	1.82E-02	1.7E-16	3.5E+01	-3.3E-05	10.9	57.77	0.095	0.005
818-01M	1400	6.71E+00	1.45E-02	1.89E-02	3.7E-16	3.5E+01	2.0E-04	16.3	88.53	0.158	0.004
818-01N	1500	9.60E+00	1.38E-02	2.66E-02	1.1E-16	3.7E+01	4.5E-04	17.8	97.93	0.246	0.007
818-01O	1604	4.50E+01	1.66E-02	1.47E-01	2.0E-17	3.1E+01	4.1E-03	3.5	99.58	0.229	0.058
818-01P	1598	5.97E+01	1.84E-02	1.90E-01	5.1E-18	2.8E+01	3.7E-03	5.9	100.00	0.508	0.073
total gas age					1.2E-15				n=16	0.126	0.007
Y26:LWFVP-142-HOT, SANIDINE, 154.8 MG, J=0.0000803±0.0000002											
819-01A	848	1.36E+02	3.87E-02	4.04E-01	6.2E-18	1.3E+01	3.6E-03	12.0	1.56	2.370	0.115
819-01B	760	2.49E+01	2.72E-02	4.76E-02	8.2E-18	1.9E+01	9.6E-04	43.4	3.63	1.562	0.024
819-01C	827	1.61E+01	2.57E-02	2.21E-02	2.0E-17	2.0E+01	2.2E-04	53.2	8.61	1.376	0.010
819-01D	685	1.41E+01	2.45E-02	1.45E-02	3.0E-17	2.1E+01	2.4E-04	69.4	16.15	1.421	0.007
819-01E	754	1.40E+01	2.30E-02	1.09E-02	1.8E-17	2.2E+01	2.8E-04	76.9	20.80	1.557	0.008
819-01F	829	1.41E+01	2.24E-02	7.49E-03	5.0E-17	2.3E+01	9.4E-05	84.2	33.33	1.721	0.006
819-01G	883	1.57E+01	2.16E-02	5.08E-03	5.1E-17	2.4E+01	1.9E-04	90.3	46.11	2.059	0.006
819-01H	807	1.95E+01	2.08E-02	5.92E-03	5.4E-17	2.5E+01	2.5E-04	90.9	59.61	2.567	0.007
819-01I	1037	3.66E+01	2.04E-02	7.48E-03	1.1E-16	2.5E+01	5.2E-04	93.9	87.89	4.966	0.015
819-01J	591	6.92E+01	2.00E-02	5.01E-02	1.5E-17	2.6E+01	1.7E-03	78.6	91.67	7.863	0.019
819-01K	1075	7.33E+01	1.84E-02	2.60E-02	1.8E-17	2.8E+01	1.6E-03	89.5	96.26	9.475	0.018
819-01L	922	7.48E+01	2.01E-02	6.19E-02	1.5E-17	2.5E+01	6.1E-03	75.5	100.00	8.161	0.021

28 A

EXAMPLE

COMPLETE VACE TABLE

L#	Temp	40/39	37/39	36/39	39K moles	K/Ca	Cl/K	%40*	%39Ar	Age	± Err
total gas age					4.0E-16				n=12	3.584	0.013
Y16:LWFVP-143-a, sanidine 76.7 mg, J=0.0000802±0.0000002											
821-01A	750	1.09E+02	2.81E-01	3.61E-01	1.2E-17	1.8E+00	4.1E-03	1.9	0.94	0.294	0.087
821-01B	850	5.20E+01	6.52E-02	1.70E-01	2.2E-17	7.8E+00	1.3E-03	3.2	2.63	0.240	0.043
821-01C	950	1.73E+01	3.31E-02	5.54E-02	5.6E-17	1.5E+01	5.5E-04	5.1	6.88	0.128	0.013
821-01D	1025	7.82E+00	1.76E-02	2.38E-02	8.2E-17	2.9E+01	1.4E-04	9.6	13.10	0.109	0.006
821-01E	1075	4.41E+00	1.21E-02	1.25E-02	9.4E-17	4.2E+01	-4.1E-05	15.6	20.22	0.099	0.004
821-01F	1120	3.10E+00	1.09E-02	8.29E-03	1.2E-16	4.7E+01	1.2E-05	20.2	29.12	0.091	0.002
821-01G	1140	2.62E+00	9.55E-03	6.90E-03	8.9E-17	5.3E+01	-2.7E-05	21.2	35.91	0.080	0.003
821-01H	1160	2.76E+00	9.58E-03	7.45E-03	8.2E-17	5.3E+01	-1.8E-05	19.4	42.13	0.077	0.003
821-01I	1180	3.09E+00	8.87E-03	8.44E-03	8.1E-17	5.7E+01	2.1E-05	18.6	48.27	0.083	0.003
821-01J	1200	3.98E+00	9.49E-03	1.13E-02	9.9E-17	5.4E+01	3.5E-05	15.4	55.74	0.088	0.004
821-01K	1260	5.70E+00	9.47E-03	1.69E-02	1.2E-16	5.4E+01	9.8E-05	12.0	64.59	0.098	0.005
821-01L	1320	8.91E+00	9.76E-03	2.63E-02	1.6E-16	5.2E+01	1.6E-04	12.5	77.07	0.162	0.006
821-01M	1450	8.36E+00	8.12E-03	2.14E-02	2.3E-16	6.3E+01	2.0E-04	24.2	94.14	0.292	0.005
821-01N	1603	1.44E+01	9.58E-03	3.89E-02	5.9E-17	5.3E+01	2.7E-04	19.9	98.62	0.414	0.012
821-01O	1598	1.91E+01	9.75E-03	5.23E-02	1.8E-17	5.2E+01	3.1E-04	19.0	100.00	0.525	0.016
total gas age					1.3E-15				n=15	0.161	0.007
Y9:LWFVP-139-j, sanidine 107.0 mg, J=0.000079±0.0000002											
822-01A	750	6.25E+01	6.58E-02	2.07E-01	1.9E-17	7.8E+00	1.6E-03	2.1	1.53	0.191	0.049
822-01B	850	1.32E+01	1.47E-02	4.06E-02	3.5E-17	3.5E+01	1.9E-04	8.8	4.28	0.165	0.014
822-01C	900	6.43E+00	8.07E-03	1.81E-02	3.8E-17	6.3E+01	2.5E-05	16.7	7.29	0.154	0.007
822-01D	940	5.82E+00	7.22E-03	1.58E-02	4.6E-17	7.1E+01	6.0E-05	19.4	10.94	0.161	0.005
822-01E	970	5.90E+00	6.71E-03	1.60E-02	4.9E-17	7.6E+01	-4.2E-05	19.4	14.83	0.163	0.005
822-01F	1010	6.12E+00	6.50E-03	1.65E-02	5.6E-17	7.8E+01	-7.6E-06	20.0	19.28	0.175	0.005
822-01G	1050	6.16E+00	6.40E-03	1.64E-02	6.4E-17	8.0E+01	1.3E-05	21.1	24.30	0.185	0.006
822-01H	1100	6.19E+00	6.66E-03	1.61E-02	8.8E-17	7.7E+01	2.1E-05	22.7	31.24	0.200	0.005
822-01I	1200	7.79E+00	6.71E-03	1.85E-02	2.1E-16	7.6E+01	2.0E-04	29.7	48.15	0.329	0.004
822-01J	1002	1.46E+01	6.72E-03	2.90E-02	1.6E-16	7.6E+01	3.2E-04	41.0	60.88	0.851	0.007
822-01K	1400	3.29E+01	6.71E-03	5.28E-02	3.5E-16	7.6E+01	-1.5E-04	52.4	88.22	2.453	0.020

EXAMPLE

29 A

COMPLETE NACE TABLE

L#	Temp	40/39	37/39	36/39	39K moles	K/Ca	Cl/K	%40*	%39Ar	Age	± Err
822-01L	1609	3.00E+01	7.17E-03	4.01E-02	1.5E-16	7.1E+01	8.3E-04	60.5	100.00	2.587	0.012
total gas age					1.3E-15				n=12	1.195	0.011
Y18:LWFVP-143-g, melted stuff 85.9 mg, J=0.0000796±0.000000											
825-01A	650	1.21E+02	1.16E-01	4.09E-01	6.9E-18	4.4E+00	3.2E-03	-0.4	1.73	-0.065	0.116
825-01B	726	1.14E+02	1.16E-01	3.85E-01	1.2E-17	4.4E+00	3.5E-03	-0.1	4.80	-0.017	0.095
825-01C	800	9.50E+01	1.15E-01	3.22E-01	1.6E-17	4.4E+00	2.9E-03	-0.1	8.88	-0.012	0.079
825-01D	875	4.47E+01	1.23E-01	1.54E-01	2.7E-17	4.2E+00	1.7E-03	-1.7	15.62	-0.107	0.037
825-01E	925	4.21E+01	1.42E-01	1.45E-01	2.9E-17	3.6E+00	1.7E-03	-1.8	22.92	-0.109	0.034
825-01F	975	4.55E+01	1.60E-01	1.56E-01	2.5E-17	3.2E+00	1.8E-03	-1.5	29.21	-0.100	0.039
825-01G	1025	4.93E+01	1.71E-01	1.70E-01	2.7E-17	3.0E+00	1.7E-03	-1.9	36.03	-0.133	0.045
825-01H	1075	5.17E+01	1.66E-01	1.78E-01	2.9E-17	3.1E+00	2.0E-03	-1.7	43.35	-0.123	0.043
825-01I	1100	5.67E+01	1.65E-01	1.94E-01	2.2E-17	3.1E+00	1.9E-03	-0.9	49.01	-0.077	0.046
825-01J	1125	5.93E+01	1.63E-01	2.07E-01	5.2E-18	3.1E+00	1.1E-03	-3.4	50.31	-0.296	0.072
825-01K	1150	6.33E+01	1.64E-01	2.19E-01	2.0E-17	3.1E+00	2.1E-03	-2.3	55.23	-0.[illegible]	0.055
825-01L	1200	7.45E+01	1.62E-01	2.58E-01	1.8E-17	3.1E+00	2.5E-03	-2.3	59.86	-0.243	0.063
825-01M	1250	7.77E+01	1.57E-01	2.71E-01	1.7E-17	3.3E+00	1.7E-03	-3.1	64.12	-0.341	0.064
825-01N	1400	8.50E+01	1.65E-01	2.93E-01	2.7E-17	3.1E+00	2.8E-03	-1.8	70.88	-0.217	0.066
825-01O	1600	4.47E+01	1.47E-01	1.53E-01	7.7E-17	3.5E+00	1.9E-03	-1.2	90.27	-0.076	0.036
825-01P	1621	4.61E+01	1.31E-01	1.57E-01	3.2E-17	3.9E+00	2.8E-03	-0.5	98.35	-0.033	0.036
825-01Q	1618	6.74E+02	1.16E-01	2.28E+00	6.6E-18	4.4E+00	1.1E-02	0.1	100.00	0.057	0.617
total gas age					4.0E-16				n=17	-0.117	0.058
Y10:LWFVP-139-d, sanidine glass 50.4 mg, J=0.0000791±0.0000002											
826-01A	650	7.51E+02	2.71E+00	2.47E+00	9.1E-19	1.9E-01	1.7E-02	2.8	2.73	2.978	1.350
826-01B	750	1.09E+02	2.41E+00	3.43E-01	1.9E-18	2.1E-01	4.7E-03	7.3	8.31	1.136	0.168
826-01C	825	3.23E+01	2.14E+00	8.95E-02	3.1E-18	2.4E-01	2.5E-03	18.6	17.63	0.861	0.051
826-01D	875	3.56E+01	2.19E+00	9.57E-02	3.2E-18	2.3E-01	2.5E-03	21.1	27.17	1.072	0.049
826-01E	925	3.92E+01	2.34E+00	9.79E-02	3.2E-18	2.2E-01	2.4E-03	26.6	36.71	1.490	0.050
826-01F	1000	6.40E+01	2.25E+00	1.03E-01	3.9E-18	2.3E-01	1.7E-03	52.8	48.28	4.825	0.094
826-01G	1070	1.35E+02	1.88E+00	1.83E-01	3.4E-18	2.7E-01	3.4E-03	60.0	58.46	11.542	0.101
826-01H	1150	2.59E+02	2.20E+00	3.27E-01	3.5E-18	2.3E-01	7.1E-03	62.7	68.98	23.053	0.165

EXAMPLE

30A

L#	Temp	40/39	37/39	36/39	39K moles	K/Ca	Cl/K	%40*	%39Ar	Age	± Err
826-01I	1220	3.46E+02	3.23E+00	3.55E-01	3.3E-18	1.6E-01	1.0E-02	69.8	78.80	34.259	0.199
826-01J	1300	6.54E+02	4.08E+00	4.10E-01	2.8E-18	1.3E-01	2.1E-02	81.5	87.27	74.770	0.352
826-01K	1400	1.73E+03	5.25E+00	6.31E-01	4.3E-18	9.7E-02	7.3E-03	89.3	100.00	208.957	1.185
total gas age					3.3E-17				n=11	40.925	0.299
Y25:NM-10:LWFVP-145, sanidine 14.2 mg, J=0.0000798±0.0000002											
827-01A	700	3.71E+02	3.92E-02	1.22E+00	8.1E-19	1.3E+01	1.0E-02	2.5	0.52	1.343	0.780
827-01B	800	1.29E+01	2.84E-02	1.93E-02	1.6E-18	1.8E+01	5.8E-04	55.8	1.57	1.039	0.074
827-01C	875	4.55E+00	2.80E-02	-5.76E-03	2.5E-18	1.8E+01	4.4E-04	137.0	3.19	0.897	0.036
827-01D	930	5.25E+00	2.52E-02	-2.89E-03	3.2E-18	2.0E+01	-1.1E-04	115.9	5.26	0.876	0.034
827-01E	980	9.[illegible]E+00	3.55E-02	9.17E-03	4.2E-18	1.4E+01	4.4E-05	69.8	7.96	0.908	0.021
827-01F	1030	8.56E+00	3.33E-02	7.48E-03	5.0E-18	1.5E+01	4.7E-04	74.0	11.21	0.911	0.018
827-01G	1070	8.89E+00	3.08E-02	8.42E-03	5.7E-18	1.7E+01	4.1E-04	71.8	14.93	0.919	0.015
827-01H	1100	1.03E+01	2.98E-02	8.89E-03	6.0E-18	1.7E+01	1.2E-04	74.3	18.86	1.101	0.013
827-01I	1120	1.02E+01	2.65E-02	2.47E-03	6.2E-18	1.9E+01	8.9E-05	92.6	22.93	1.357	0.017
827-01J	1140	1.91E+02	2.92E-02	6.01E-01	6.3E-18	1.7E+01	6.6E-03	6.9	27.03	1.902	0.192
827-01K	1170	2.21E+01	2.91E-02	2.35E-02	5.3E-18	1.8E+01	1.8E-04	66.5	30.45	2.179	0.024
827-01L	1200	2.47E+01	2.73E-02	2.20E-02	8.5E-18	1.9E+01	2.9E-04	73.6	35.95	2.614	0.020
827-01M	1260	4.25E+01	2.87E-02	2.65E-02	2.1E-17	1.8E+01	8.7E-04	81.5	49.32	4.981	0.015
827-01N	1340	3.85E+01	2.74E-02	2.45E-02	2.7E-17	1.9E+01	6.8E-04	81.1	66.63	4.488	0.016
827-01O	1450	4.07E+01	2.63E-02	3.75E-02	7.6E-18	1.9E+01	7.6E-04	72.7	71.60	4.257	0.028
827-01P	1595	4.86E+01	3.00E-02	4.96E-02	3.3E-17	1.7E+01	1.2E-03	69.8	93.04	4.877	0.021
827-01Q	1617	1.57E+02	4.10E-02	4.12E-01	1.1E-17	1.2E+01	6.0E-03	22.3	100.00	5.029	0.108
total gas age					1.5E-16				n=17	3.583	0.037
Y14:LWFVP-143-0, sanidine 61.7 mg, J=0.00008±0.0000002											
828-01A	750	1.96E+02	9.04E-02	6.58E-01	1.2E-17	5.6E+00	6.8E-03	0.9	1.42	0.254	0.172
828-01B	850	1.53E+01	3.84E-02	4.94E-02	2.3E-17	1.3E+01	5.3E-04	4.3	4.23	0.095	0.015
828-01C	950	8.54E+00	2.07E-02	2.69E-02	4.8E-17	2.5E+01	6.3E-05	6.7	10.00	0.083	0.008
828-01D	1025	6.32E+00	1.51E-02	1.96E-02	6.8E-17	3.4E+01	1.1E-04	8.1	18.18	0.074	0.006
828-01E	1061	6.89E+00	1.35E-02	2.15E-02	6.8E-17	3.8E+01	3.9E-05	7.4	26.41	0.074	0.006
828-01F	1100	7.97E+00	1.28E-02	2.56E-02	6.0E-17	4.0E+01	8.4E-05	4.9	33.69	0.057	0.007

EXAMPLE

COMPLETE F JACE TABLE

L#	Temp	40/39	37/39	36/39	39K moles	K/Ca	Cl/K	%40*	%39Ar	Age	± Err
828-01G	1120	9.75E+00	1.24E-02	3.17E-02	5.5E-17	4.1E+01	1.8E-04	3.9	40.34	0.054	0.008
828-01H	1160	1.18E+01	1.18E-02	3.82E-02	7.2E-17	4.3E+01	1.9E-04	4.5	49.07	0.076	0.010
828-01I	1180	1.67E+01	1.13E-02	5.43E-02	5.9E-17	4.5E+01	2.3E-04	3.6	56.22	0.088	0.013
828-01J	1200	2.17E+01	1.15E-02	7.11E-02	5.3E-17	4.4E+01	3.1E-04	3.2	62.67	0.102	0.017
828-01K	1240	3.21E+01	1.12E-02	1.04E-01	7.5E-17	4.6E+01	5.4E-04	4.4	71.77	0.204	0.024
828-01L	1300	4.57E+01	1.10E-02	1.46E-01	1.1E-16	4.7E+01	2.3E-04	5.6	84.90	0.368	0.034
828-01M	1450	5.17E+01	1.05E-02	1.63E-01	7.8E-17	4.8E+01	1.1E-03	6.8	94.38	0.509	0.037
828-01N	1604	8.95E+01	1.15E-02	2.85E-01	4.6E-17	4.4E+01	2.1E-03	5.9	100.00	0.768	0.066
total gas age					8.3E-16				n=14	0.209	0.022
Y20:LWFVP-143-P, sanidine 60.0 mg, J=0.0000795±0.0000002											
829-01A	750	1.04E+02	1.08E-01	3.48E-01	1.1E-17	4.7E+00	2.0E-03	1.3	1.59	0.192	0.092
829-01B	850	2.70E+01	8.23E-02	8.97E-02	1.7E-17	6.2E+00	4.9E-04	1.7	3.90	0.065	0.025
829-01C	950	1.44E+01	5.09E-02	4.61E-02	3.4E-17	1.0E+01	3.1E-04	4.9	8.56	0.102	0.015
829-01D	1025	6.45E+00	3.02E-02	1.93E-02	4.8E-17	1.7E+01	1.0E-04	11.3	15.27	0.105	0.006
829-01E	1075	4.55E+00	2.16E-02	1.29E-02	5.5E-17	2.4E+01	1.1E-04	15.6	22.88	0.102	0.005
829-01F	1120	3.95E+00	1.79E-02	1.09E-02	5.8E-17	2.9E+01	5.5E-05	18.2	30.96	0.103	0.004
829-01G	1140	4.09E+00	1.63E-02	1.11E-02	4.9E-17	3.1E+01	1.8E-04	19.1	37.74	0.112	0.005
829-01H	1160	4.11E+00	1.40E-02	1.12E-02	4.4E-17	3.7E+01	1.2E-05	19.0	43.79	0.112	0.005
829-01I	1180	4.06E+00	1.28E-02	1.07E-02	4.3E-17	4.0E+01	3.3E-5	21.7	49.81	0.126	0.005
829-01J	1220	4.94E+00	1.19E-02	1.22E-02	6.0E-17	4.3E+01	8.1E-05	26.8	58.08	0.190	0.004
829-01K	1260	6.98E+00	1.11E-02	1.65E-02	5.5E-17	4.6E+01	5.1E-05	30.0	65.69	0.301	0.006
829-01L	1320	1.21E+01	9.87E-03	2.05E-02	9.1E-17	5.2E+01	3.1E-04	49.8	78.36	0.865	0.006
829-01M	1450	1.39E+01	8.65E-03	1.84E-02	1.2E-16	5.9E+01	3.3E-04	60.8	94.52	1.213	0.006
829-01N	1605	3.21E+01	1.42E-02	6.53E-02	2.0E-17	3.6E+01	5.8E-04	39.8	97.34	1.834	0.021
829-01O	1616	1.17E+02	1.45E-02	3.52E-01	1.9E-17	3.5E+01	4.6E-03	10.9	100.00	1.823	0.092
total gas age					7.2E-16				n=15	0.499	0.010
Y5:LWFVP-139-B, sanidine 43.9 mg, J=0.0000787±0.0000002											
853-01A	600	1.78E+03	2.28E-02	5.73E+00	5.8E-19	2.2E+01	2.1E-02	4.9	0.11	12.452	7.227
853-01B	675	2.15E+02	3.80E-02	5.19E-01	1.0E-18	1.3E+01	3.6E-03	28.7	0.30	8.731	0.451
853-01C	750	6.66E+01	1.31E-02	4.55E-02	2.1E-18	2.8E+01	-2.3E-04	79.8	0.70	7.533	0.097

COMPLETE RELEASE TABLE

L#	Temp	40/39	37/39	36/39	39K moles	K/Ca	Cl/K	%40*	%39Ar	Age	± Err
853-01D	850	4.97E+01	1.82E-02	1.08E-02	5.5E-19	2.8E+01	7.8E-04	93.5	1.73	6.593	0.039
853-01E	927	4.45E+01	1.43E-02	4.44E-03	9.6E-18	3.6E+01	5.4E-04	97.0	3.53	6.117	0.023
853-01F	1000	4.24E+01	1.23E-02	3.14E-03	2.3E-17	4.2E+01	4.2E-04	97.8	7.92	5.873	0.027
853-01G	1050	4.36E+01	1.18E-02	2.60E-03	2.8E-17	4.3E+01	7.7E-04	98.2	13.22	6.074	0.024
853-01H	1100	4.68E+01	1.12E-02	2.23E-03	3.7E-17	4.6E+01	9.2E-04	98.5	20.17	6.532	0.015
853-01I	1150	5.18E+01	1.10E-02	2.00E-03	4.6E-17	4.6E+01	9.9E-04	98.8	28.78	7.251	0.024
853-01J	1200	5.97E+01	1.05E-02	1.21E-03	5.4E-17	4.9E+01	1.1E-03	99.4	38.99	8.405	0.030
853-01K	1250	6.96E+01	1.09E-02	1.50E-03	6.0E-17	4.7E+01	1.2E-03	99.3	50.33	9.790	0.020
853-01L	1275	8.04E+01	1.15E-02	1.51E-03	5.6E-17	4.5E+01	1.3E-03	99.4	60.87	11.318	0.027
853-01M	1300	8.65E+01	1.18E-02	3.33E-03	5.2E-17	4.3E+01	1.7E-03	98.8	70.62	12.093	0.038
853-01N	1325	9.00E+01	1.26E-02	1.79E-03	4.9E-17	4.1E+01	1.8E-03	99.4	79.75	12.657	0.043
853-01O	1349	9.40E+01	1.31E-02	2.16E-03	4.1E-17	3.9E+01	2.0E-03	99.3	87.45	13.201	0.035
853-01P	1375	9.60E+01	4.70E-02	1.30E-03	3.2E-17	1.1E+01	1.9E-03	99.6	93.45	13.521	0.034
853-01Q	1400	1.00E+02	2.30E-02	6.17E-03	1.3E-17	2.2E+01	1.4E-03	98.2	95.96	13.928	0.074
853-01R	1425	1.03E+02	4.10E-02	2.07E-02	5.4E-18	1.2E+01	8.1E-04	94.1	96.98	13.714	0.098
853-01S	1450	1.08E+02	7.52E-02	5.11E-02	2.7E-18	6.8E+00	5.4E-04	86.0	97.49	13.153	0.115
853-01T	1500	9.96E+01	1.91E-01	4.52E-02	1.7E-18	2.7E+00	-4.1E-05	86.6	97.81	12.208	0.143
853-01U	1608	1.48E+02	3.16E-01	2.11E-01	9.9E-19	1.6E+00	-9.9E-04	58.0	98.00	12.156	0.351
853-01V	1620	4.00E+02	9.92E-01	1.18E+00	1.4E-18	5.1E-01	2.0E-02	12.5	98.26	7.072	0.789
853-01W	1617	3.04E+02	8.78E-01	8.60E-01	6.2E-18	5.8E-01	1.5E-02	16.3	99.42	6.998	0.651
853-01X	1613	1.06E+03	1.68E+00	3.49E+00	3.1E-18	3.0E-01	2.2E-02	3.3	100.00	4.965	2.115
total gas age					5.3E-16				n=24	9.967	0.063
Y7:LWFVP-139-G, sanidine 136.1 mg, J=0.0000802±0.0000002											
857-01A	650	1.82E+03	2.45E-02	5.97E+00	2.5E-19	2.1E+01	4.6E-03	2.8	0.04	7.477	5.226
857-01B	757	1.88E+02	2.04E-02	4.70E-01	1.7E-18	2.5E+01	-9.6E-05	26.3	0.34	7.147	0.242
857-01C	856	8.18E+01	1.22E-02	1.34E-01	4.4E-18	4.2E+01	3.5E-04	51.5	1.11	6.090	0.069
857-01A1	650	1.51E+02	5.66E-02	1.90E-01	3.5E-19	9.0E+00	2.2E-03	62.7	1.18	13.632	0.414
857-01B1	750	5.44E+01	8.77E-03	3.49E-02	4.0E-18	5.8E+01	2.7E-04	81.0	1.89	6.359	0.034
857-01C1	850	3.35E+01	1.02E-02	1.03E-02	2.1E-17	5.0E+01	4.4E-05	90.9	5.67	4.403	0.013
857-01D	900	3.23E+01	1.10E-02	6.68E-03	2.9E-17	4.6E+01	8.7E-05	93.8	10.88	4.381	0.013
857-01E	950	3.04E+01	1.05E-02	2.26E-03	4.2E-17	4.9E+01	1.3E-05	97.7	18.35	4.297	0.010

COMPLETE F IACE TABLE

L#	Temp	40/39	37/39	36/39	39K moles	K/Ca	Cl/K	%40*	%39Ar	Age	± Err
857-01F	975	3.30E+01	9.03E-03	2.29E-03	4.2E-17	5.6E+01	2.2E-04	97.9	25.77	4.665	0.011
857-01G	1000	3.55E+01	9.30E-03	2.08E-03	4.4E-17	5.5E+01	1.3E-04	98.2	33.66	5.030	0.011
857-01H	1025	3.85E+01	9.63E-03	2.04E-03	4.8E-17	5.3E+01	2.0E-04	98.4	42.23	5.470	0.015
857-01I	1050	4.22E+01	8.95E-03	1.14E-03	5.1E-17	5.7E+01	2.1E-04	99.2	51.26	6.049	0.014
857-01J	1075	4.69E+01	9.38E-03	1.41E-03	5.6E-17	5.4E+01	1.4E-04	99.1	61.14	6.715	0.013
857-01K	1100	5.23E+01	9.61E-03	1.51E-03	6.2E-17	5.3E+01	4.2E-04	99.1	72.09	7.488	0.016
857-01L	1125	5.79E+01	9.89E-03	1.39E-03	5.9E-17	5.2E+01	3.5E-04	99.3	82.59	8.293	0.019
857-01M	1150	6.43E+01	9.33E-03	8.94E-04	7.1E-17	5.5E+01	3.5E-04	99.6	95.28	9.237	0.022
857-01N	1200	7.78E+01	1.39E-02	7.51E-03	2.1E-18	3.7E+01	8.5E-05	97.1	95.67	10.897	0.019
857-01O	1250	9.00E+01	1.46E-02	1.12E-02	3.8E-18	3.5E+01	7.9E-04	96.3	96.35	12.491	0.021
857-01P	1275	9.69E+01	1.35E-02	1.16E-02	4.4E-18	3.8E+01	4.1E-04	96.4	97.13	13.465	0.023
857-01Q	1300	1.01E+02	1.24E-02	9.86E-03	4.6E-18	4.1E+01	5.6E-04	97.1	97.94	14.128	0.024
857-01R	1325	1.01E+02	1.61E-02	3.95E-03	4.9E-18	3.2E+01	-4.3E-04	98.8	98.82	14.381	0.024
857-01S	1349	1.03E+02	1.39E-02	9.81E-03	4.0E-18	3.7E+01	4.0E-04	97.2	99.53	14.426	0.024
857-01T	1375	1.11E+02	1.97E-02	2.52E-02	1.3E-18	2.6E+01	1.0E-03	93.3	99.76	14.905	0.028
857-01U	1400	1.24E+02	3.16E-02	6.39E-02	4.4E-19	1.6E+01	-4.5E-03	84.8	99.84	15.164	0.035
857-01V	1450	1.20E+02	7.74E-02	4.55E-02	1.6E-19	6.6E+00	3.0E-03	88.8	99.87	15.322	0.033
857-01W	1612	2.02E+02	5.77E-02	3.40E-01	7.1E-19	8.8E+00	3.9E-04	50.2	99.99	14.588	0.081
857-01X	1605	2.56E+02	2.67E-01	4.00E-01	3.7E-20	1.9E+00	-1.9E-03	53.7	100.00	19.788	0.125
total gas age					5.6E-16				n=27	6.772	0.019
LW142;Y1,nm-14,tube-7, san,51.3mg,850C 1200 min, J=0.0000698±0.0000002											
1256-01B	650	5.35E+02	4.24E-02	1.78E+00	2.5E-15	1.2E+01	1.8E-03	1.8	0.36	1.197	1.294
1256-01C	750	3.96E+01	3.72E-02	1.25E-01	9.4E-15	1.4E+01	3.6E-04	6.8	1.57	0.338	0.087
1256-01D	850	1.07E+01	2.76E-02	2.65E-02	2.2E-14	1.8E+01	-5.4E-05	26.8	4.80	0.363	0.021
1256-01E	950	9.51E+00	2.05E-02	1.16E-02	5.1E-14	2.5E+01	2.5E-04	63.8	12.08	0.764	0.010
1256-01F	1000	1.43E+01	1.84E-02	6.48E-03	4.7E-14	2.8E+01	-4.5E-05	86.6	18.92	1.504	0.011
1256-01G	1040	2.24E+01	1.89E-02	5.00E-03	5.1E-14	2.7E+01	8.2E-05	92.3	26.21	2.605	0.010
1256-01H	1080	3.29E+01	1.84E-02	6.07E-03	5.8E-14	2.8E+01	1.6E-04	94.5	34.52	3.909	0.011
1256-01I	1150	4.83E+01	2.04E-02	5.84E-03	9.7E-14	2.5E+01	3.6E-04	96.4	48.57	5.857	0.014
1256-01J	1175	6.28E+01	1.84E-02	2.81E-03	8.4E-14	2.8E+01	-8.6E-05	98.6	60.69	7.786	0.020
1256-01K	1250	8.02E+01	1.86E-02	3.54E-03	2.4E-13	2.7E+01	-2.2E-05	98.7	95.73	9.934	0.018

EXAMPLE

34 A

COMPLETE[illegible]NACE TABLE

L#	Temp	40/39	37/39	36/39	39K moles	K/Ca	Cl/K	%40*	%39Ar	Age	± Err
1256-01L	1300	9.68E+01	1.74E-02	2.18E-02	9.5E-15	2.9E+01	6.2E-04	93.3	97.10	11.337	0.014
1256-01M	1349	9.50E+01	1.96E-02	1.73E-02	1.3E-14	2.6E+01	1.4E-05	94.6	99.01	11.286	0.013
1256-01N	1400	3.19E+02	1.95E-02	7.71E-01	9.8E-16	2.6E+01	1.0E-02	28.7	99.15	11.487	0.087
1256-01O	1500	1.65E+02	1.96E-02	2.46E-01	3.4E-15	2.6E+01	1.4E-03	55.9	99.63	11.552	0.032
1256-01P	1610	9.94E+01	1.65E-02	4.12E-02	2.5E-15	3.1E+01	2.0E-03	87.7	100.00	10.942	0.014
total gas age					6.9E-13				n=15	6.428	0.021
FC-1:Y5, san,49.8mg,850C 1200 min, J=0.0000697±0.0000002											
1257-01B	650	1.57E+02	1.84E-02	5.20E-01	3.7E-14	2.8E+01	2.5E-03	2.3	1.49	0.457	0.088
1257-01C	750	2.91E+01	1.41E-02	7.13E-02	2.9E-14	3.6E+01	2.1E-04	27.5	2.66	1.007	0.029
1257-01D	850	1.30E+01	8.76E-03	1.16E-02	4.9E-14	5.8E+01	-4.5E-05	73.5	4.6[illegible]	1.201	0.008
1257-01E	950	2.36E+01	7.90E-03	4.74E-03	1.0E-13	6.5E+01	4.8E-05	94.0	8.71	2.792	0.008
1257-01F	1000	4.34E+01	7.60E-03	4.22E-03	1.1E-13	6.7E+01	1.3E-04	97.1	13.07	5.266	0.010
1257-01G	1040	6.61E+01	7.52E-03	6.27E-03	1.3E-13	6.8E+01	1.3E-04	97.2	18.20	8.062	0.014
1257-01H	1080	9.05E+01	8.51E-03	4.21E-03	1.4E-13	6.0E+01	2.1E-04	98.6	24.11	11.189	0.019
1257-01I	1130	1.22E+02	8.40E-03	4.21E-03	2.2E-13	6.1E+01	6.9E-05	99.0	33.00	15.164	0.034
1257-01J	1150	1.57E+02	8.91E-03	4.39E-03	2.4E-13	5.7E+01	6.1E-05	99.2	42.71	19.490	0.041
1257-01K	1150	1.85E+02	8.65E-03	3.55E-03	3.3E-13	5.9E+01	-1.8E-06	99.4	56.19	23.032	0.050
1257-01L	1150	2.03E+02	9.95E-03	2.81E-03	3.2E-13	5.1E+01	5.8E-05	99.6	69.23	25.272	0.041
1257-01M	1200	2.11E+02	8.08E-03	2.14E-03	5.4E-14	6.3E+01	3.2E-04	99.7	71.45	26.207	0.062
1257-01N	1250	2.14E+02	9.50E-03	1.55E-03	2.0E-13	5.4E+01	1.9E-04	99.8	7[illegible].43	26.636	0.059
1257-01O	1300	2.16E+02	8.57E-03	1.31E-03	3.1E-13	6.0E+01	5.1E-05	99.8	92.11	26.862	0.077
1257-01P	1349	2.18E+02	8.42E-03	1.78E-03	1.5E-13	6.1E+01	4.3E-06	99.7	98.16	27.081	0.063
1257-01Q	1400	2.21E+02	5.53E-03	4.78E-03	2.9E-14	9.2E+01	4.1E-07	99.4	99.34	27.430	0.112
1257-01R	1500	2.17E+02	0.00E+00	9.51E-03	8.6E-15	#DIV/0!	6.5E-04	98.7	99.69	26.742	0.148
1257-01S	1615	2.35E+02	2.70E-03	7.66E-02	7.6E-15	1.9E+02	4.1E-04	90.3	100.00	26.466	0.162
total gas age					2.5E-12				n=18	19.353	0.045
FC-1:Y17, san,35.8mg,850C 1200 min+HF, J=0.0000695±0.0000002											
1258-01B	650	1.34E+03	9.34E-02	4.34E+00	3.8E-15	5.5E+00	9.0E-03	4.2	0.20	6.965	2.507
1258-01C	750	6.03E+01	2.85E-02	8.14E-02	1.2E-14	1.8E+01	8.6E-06	60.1	0.81	4.543	0.057
1258-01D	850	4.18E+01	1.19E-02	3.52E-03	3.2E-14	4.3E+01	1.8E-04	97.5	2.5[illegible]	5.101	0.023

EXAMPLE

35A

COMPLETE F NACE TABLE

L#	Temp	40/39	37/39	36/39	39K moles	K/Ca	Cl/K	%40*	%39Ar	Age	± Err
1258-01E	950	5.43E+01	9.06E-03	1.18E-03	8.3E-14	5.6E+01	1.2E-04	99.3	6.92	6.745	0.016
1258-01F	1000	7.45E+01	1.01E-02	8.55E-04	8.6E-14	5.1E+01	2.9E-04	99.6	11.47	9.279	0.016
1258-01G	1040	9.58E+01	8.65E-03	6.83E-04	9.9E-14	5.9E+01	3.0E-04	99.8	16.69	11.943	0.017
1258-01H	1080	1.19E+02	9.40E-03	4.98E-04	1.1E-13	5.4E+01	-2.8E-05	99.9	22.63	14.884	0.024
1258-01I	1150	1.49E+02	9.03E-03	5.29E-04	1.7E-13	5.6E+01	5.4E-05	99.9	31.80	18.574	0.037
1258-01J	1150	1.77E+02	8.95E-03	7.95E-04	2.0E-13	5.7E+01	2.9E-05	99.9	42.29	22.038	0.050
1258-01K	1150	1.98E+02	1.05E-02	7.01E-04	2.8E-13	4.9E+01	6.5E-06	99.9	57.01	24.614	0.044
1258-01L	1150	2.10E+02	1.04E-02	1.18E-03	2.7E-13	4.9E+01	-1.1E-05	99.8	71.11	26.035	0.048
1258-01M	1250	2.18E+02	1.15E-02	8.99E-04	1.6E-13	4.4E+01	1.4E-04	99.9	79.31	27.052	0.061
1258-01N	1300	2.19E+02	8.74E-03	2.86E-04	2.6E-13	5.8E+01	1.5E-06	100.0	92.98	27.226	0.052
1258-01O	1362	2.22E+02	1.17E-02	9.18E-04	9.3E-14	4.4E+01	-4.2E-05	99.9	97.92	27.553	0.045
1258-01P	1592	2.26E+02	1.62E-02	5.86E-03	3.9E-14	3.2E+01	2.4E-04	99.2	100.00	27.936	0.090
total gas age					1.9E-12				n=15	21.547	0.048
FC-1:Y18:NM-13, single xstal fc-1, .4 mg, J=0.0006814±0.000002											
1373-01A	650	1.51E+01	0.00E+00	-8.29E-03	3.0E-18	#DIV/0!	3.6E-03	116.1	0.09	21.447	15.095
1373-01B	725	1.58E+01	0.00E+00	-1.64E-02	4.9E-18	#DIV/0!	-4.3E-03	130.6	0.23	25.136	9.087
1373-01C	800	1.63E+01	0.00E+00	2.96E-03	1.1E-17	#DIV/0!	2.9E-03	94.5	0.57	18.807	3.814
1373-01D	875	1.72E+01	0.00E+00	5.16E-03	2.3E-17	#DIV/0!	6.4E-04	91.0	1.27	19.117	1.953
1373-01E	950	1.77E+01	0.00E+00	-9.24E-05	4.6E-17	#DIV/0!	4.1E-04	100.0	2.64	21.620	1.025
1373-01F	1000	1.92E+01	0.00E+00	-3.07E-04	5.4E-17	#DIV/0!	-4.4E-04	100.4	4.25	23.500	0.998
1373-01G	1050	1.90E+01	3.71E-02	2.46E-03	8.2E-17	1.4E+01	-1.6E-04	96.1	6.68	22.299	0.715
1373-01H	1100	2.05E+01	7.05E-04	2.73E-03	1.2E-16	7.2E+02	-1.3E-04	96.0	10.[illegible]2	24.005	0.418
1373-01I	1100	2.14E+01	2.30E-05	3.86E-03	2.1E-16	2.2E+04	-2.1E-05	94.6	16.51	24.749	0.312
1373-01J	1100	2.37E+01	2.59E-03	7.71E-03	3.6E-16	2.0E+02	-1.2E-04	90.3	24.18	26.097	0.216
1373-01K	1100	2.60E+01	1.08E-02	1.38E-02	3.0E-16	4.7E+01	-2.4E-04	84.2	33.20	26.696	0.229
1373-01L	657	2.73E+01	1.05E-02	1.97E-02	2.8E-16	4.8E+01	-3.5E-04	78.6	41.66	26.187	0.258
1373-01M	1062	3.24E+01	6.59E-03	3.42E-02	6.0E-16	7.7E+01	1.1E-04	68.8	59.63	27.175	0.174
1373-01N	1221	2.26E+01	6.14E-03	6.33E-04	8.7E-16	8.3E+01	6.5E-05	99.1	85.46	27.279	0.064
1373-01O	1650	2.35E+01	4.08E-03	4.88E-03	4.9E-16	1.3E+02	6.0E-05	93.8	100.00	26.936	0.106
total gas age					3.4E-15				n=15	26.347	0.257

EXAMPLE

36A

COMPLETE F JACE TABLE

L#	Temp	40/39	37/39	36/39	39K moles	K/Ca	Cl/K	%40*	%39Ar	Age	± Err
LW-142:Y14:NM-13, single xstal san, 1.4 mg, J=0.0006827±0.000002											
1374-01A	650	283.80460	7.16E-02	9.45E-01	1.7E-17	7.1E+00	-4.0E-03	1.6	0.16	5.502	11.525
1374-01B	725	12.84007	4.44E-02	1.22E-02	-2.1E-17	1.1E+01	-7.5E-04	71.7	-0.04	11.303	1.259
1374-01C	800	10.49206	4.29E-02	5.36E-03	5.1E-17	1.2E+01	4.5E-04	84.7	0.43	10.917	0.716
1374-01D	875	10.18793	3.83E-02	5.76E-03	1.1E-16	1.3E+01	3.9E-04	83.1	1.44	10.397	0.318
1374-01E	950	9.81385	3.95E-02	2.94E-03	2.0E-16	1.3E+01	1.9E-05	90.9	3.34	10.959	0.208
1374-01F	1000	9.48721	3.76E-02	2.95E-03	2.1E-16	1.4E+01	3.2E-04	90.6	5.30	10.559	0.170
1374-01G	1050	9.85E+00	3.25E-02	3.04E-03	2.8E-16	1.6E+01	-1.0E-04	90.7	7.88	10.961	0.128
1374-01H	1100	9.66E+00	3.12E-02	2.92E-03	3.3E-16	1.6E+01	-1.9E-04	90.9	10.98	10.775	0.099
1374-01I	1100	9.90E+00	2.58E-02	2.60E-03	5.2E-16	2.0E+01	-1.1E-04	92.0	15.85	11.189	0.095
1374-01J	1100	1.05E+01	1.99E-02	4.41E-03	5.3E-16	2.6E+01	4.7E-05	87.4	20.79	11.277	0.086
1374-01K	1100	1.11E+01	1.90E-02	6.34E-03	5.7E-16	2.7E+01	-4.0E-06	83.0	26.13	11.335	0.094
1374-01L	646	1.19E+01	1.27E-02	6.69E-03	1.8E-16	4.0E+01	3.9E-04	83.2	27.79	12.152	0.388
1374-01M	634	1.40E+01	3.72E-02	1.74E-02	1.4E-15	1.4E+01	1.0E-05	63.0	40.43	10.797	0.074
1374-01N	1155	1.19E+01	3.69E-02	9.73E-03	1.4E-15	1.4E+01	1.9E-04	75.7	53.09	11.065	0.074
1374-01O	1658	1.12E+01	2.44E-02	6.58E-03	5.0E-15	2.1E+01	1.1E-04	82.5	99.53	11.368	0.036
1374-01P	1602	3.51E+01	2.14E-01	1.11E-01	5.1E-17	2.4E+00	3.2E-03	6.4	100.00	2.760	2.413
total gas age					1.1E-14				n=16	11.142	0.103
Y11:NM753:NM-14, BANDELIER SAN 16.6 MG, J=0.0000696±0.0000002											
1381-01A	650	6.66E+01	7.76E-03	2.31E-01	5.6E-16	6.6E+01	6.3E-04	-2.5	6.79	-0.206	0.051
1381-01B	750	5.37E+01	1.38E-02	1.87E-01	1.2E-15	3.7E+01	-3.9E-05	-3.1	21.48	-0.210	0.029
1381-01C	750	5.19E+01	7.71E-03	1.82E-01	5.3E-16	6.6E+01	2.2E-04	-3.5	27.87	-0.231	0.040
1381-01D	950	3.66E+01	1.30E-02	1.26E-01	2.9E-15	3.9E+01	4.6E-05	-1.7	62.46	-0.078	0.016
1381-01E	1000	2.73E+01	9.59E-03	9.41E-02	1.2E-15	5.3E+01	-1.1E-04	-1.8	76.80	-0.062	0.022
1381-01F	1050	1.98E+01	1.02E-02	6.88E-02	8.5E-16	5.0E+01	8.0E-05	-2.8	87.05	-0.070	0.021
1381-01G	1075	1.67E+01	7.63E-03	5.64E-02	4.9E-16	6.7E+01	1.4E-04	-0.2	93.00	-0.004	0.024
1381-01H	1100	2.72E+01	0.00E+00	9.32E-02	3.3E-16	#DIV/0!	4.2E-04	-1.5	97.00	-0.052	0.032
1381-01I	1130	1.19E+01	0.00E+00	3.91E-02	2.5E-16	#DIV/0!	-7.4E-05	3.0	100.00	0.046	0.025
total gas age					8.3E-15				n=9	-0.104	0.025
Y9:NM-14, FC-1 1100 C 20HRS 33.3 MG, J=0.0000696±0.0000002											

EXAMPLE

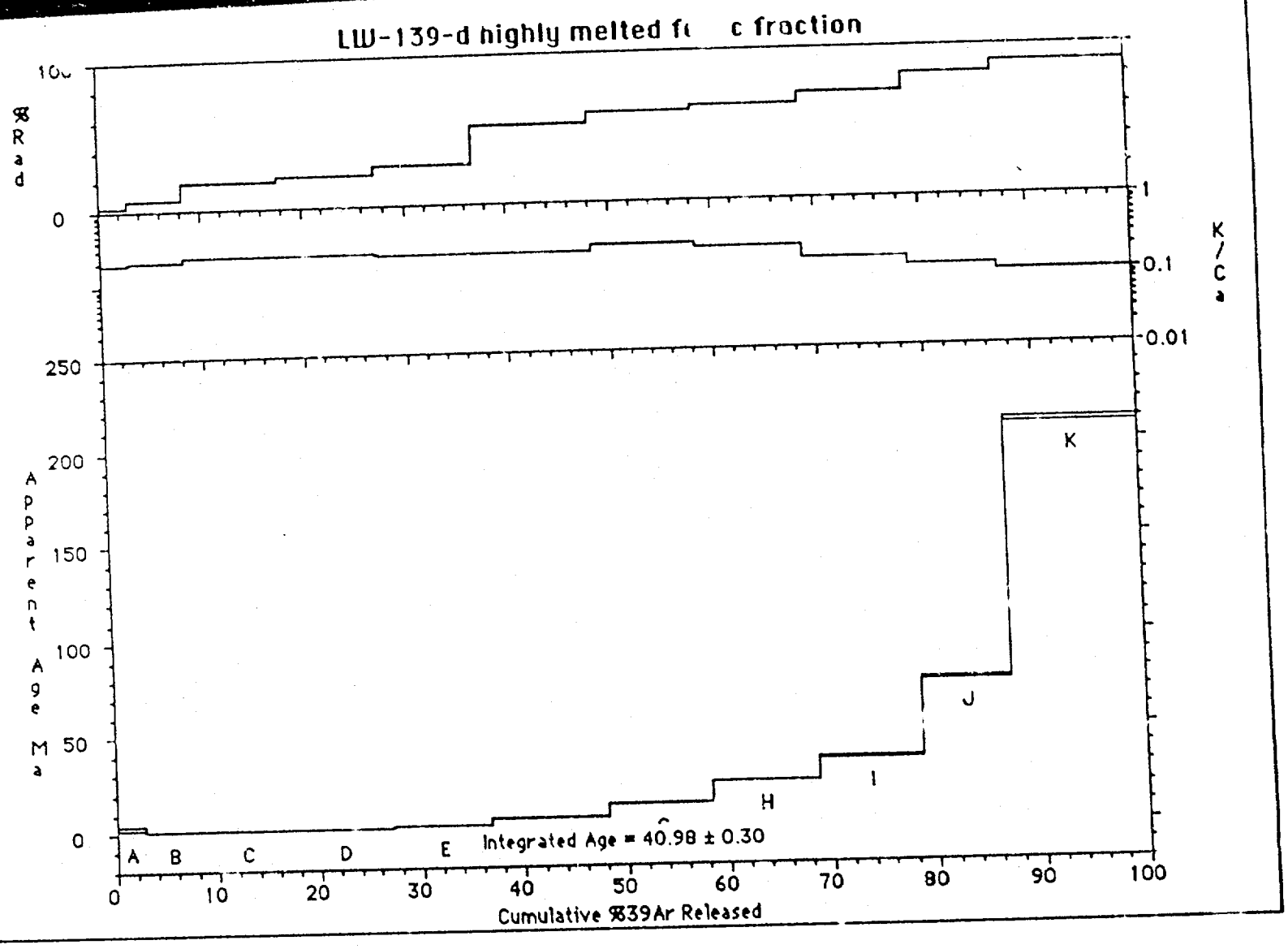
37 A

COMPLETE F JACE TABLE

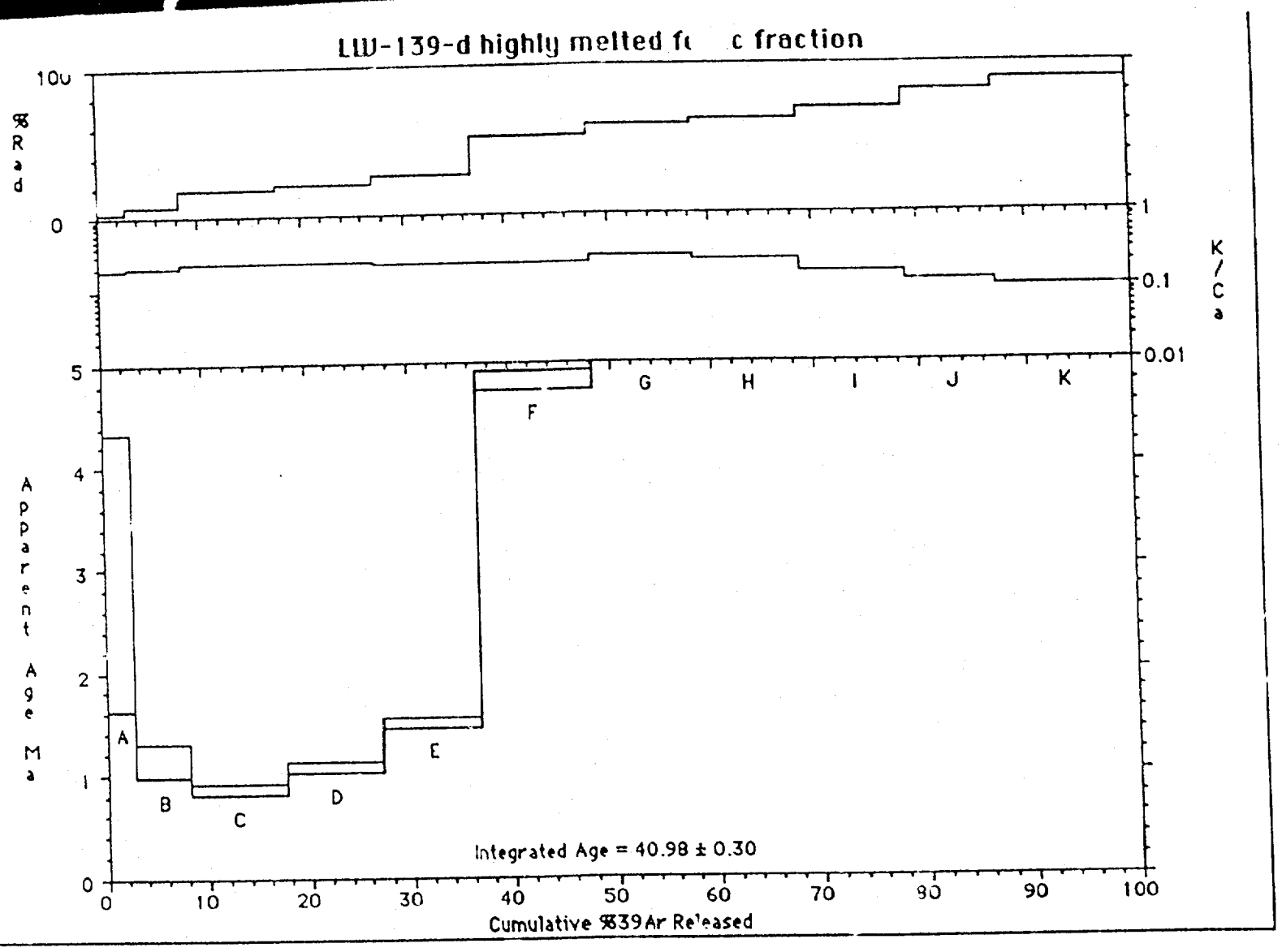
L#	Temp	40/39	37/39	36/39	39K moles	K/Ca	Cl/K	%40*	%39Ar	Age	± Err
1385-01A	600	4.74E+01	1.52E-02	1.62E-01	5.8E-16	3.4E+01	-2.8E-04	-1.4	2.63	-0.081	0.036
1385-01B	700	3.49E+01	1.66E-02	1.16E-01	3.1E-16	3.1E+01	1.5E-04	1.6	4.01	0.071	0.046
1385-01C	800	2.14E+01	7.04E-03	6.78E-02	5.1E-16	7.3E+01	3.3E-04	6.1	6.31	0.164	0.030
1385-01D	875	1.15E+01	4.30E-03	3.71E-02	6.0E-16	1.2E+02	9.0E-05	4.6	9.02	0.066	0.017
1385-01E	925	6.23E+0	0.00E+00	1.82E-02	5.8E-16	#DIV/0!	5.7E-05	13.3	11.63	0.104	0.013
1385-01F	975	4.15E+00	5.64E-03	1.12E-02	6.4E-16	9.0E+01	1.3E-05	19.8	14.55	0.103	0.011
1385-01G	1000	3.26E+00	3.64E-0	6.57E-03	5.4E-16	1.4E+03	7.7E-05	39.8	16.99	0.163	0.010
1385-01H	1030	2.54E+00	3.41E-03	5.04E-03	5.4E-16	1.5E+02	2.5E-04	40.4	19.42	0.129	0.010
1385-01I	1070	2.11E+00	9.83E-03	3.37E-03	6.5E-16	5.2E+01	-1.6E-04	51.9	22.34	0.138	0.008
1385-01J	1100	2.02E+00	2.66E-04	2.09E-03	6.9E-16	1.9E+03	1.2E-05	68.3	25.47	0.173	0.008
1385-01K	1100	2.48E+00	3.84E-03	3.03E-03	1.1E-15	1.3E+02	6.8E-05	63.0	30.36	0.196	0.005
1385-01L	1100	3.42E+00	3.85E-03	4.03E-03	2.1E-15	1.3E+02	-2.9E-05	64.5	39.86	0.277	0.003
1385-01M	1100	4.91E+00	6.09E-03	5.04E-03	2.4E-15	8.4E+01	6.6E-05	69.2	50.87	0 426	0.003
1385-01N	1100	7.14E+00	4.90E-03	5.90E-03	2.7E-15	1.0E+02	-3.9E-05	75.3	63.33	0.675	0.003
1385-01O	1200	6.41E+00	1.03E-02	1.55E-03	2.2E-16	4.9E+01	9.9E-05	92.5	64.34	0.744	0.019
1385-01P	1250	7.22E+00	1.38E-02	1.66E-03	6.2E-16	3.7E+01	2.9E-04	92.9	67.14	0.842	0 008
1385-01Q	1349	1.65E+01	6.97E-03	2.31E-03	5.5E-15	7.3E+01	1.9E-05	95.7	92.10	1.981	0.003
1385-01R	1450	2.86E+01	8.63E-03	8.26E-03	7.9E-16	5.9E+01	-1.3E-06	91.4	95.70	3.275	0.011
1385-01S	1650	3.45E+01	9.02E-03	2.72E-02	9.2E-16	5.7E+01	2.4E-04	76.7	99.89	3.320	0.013
1385-01T	1649	3.09E+02	8.88E-02	9.68E-01	2.4E-17	5.7E+00	1.3E-03	7.4	100 00	2.858	1.189
total gas age					2.2E-1				n=20	0.979	0.009

EXAMPLE

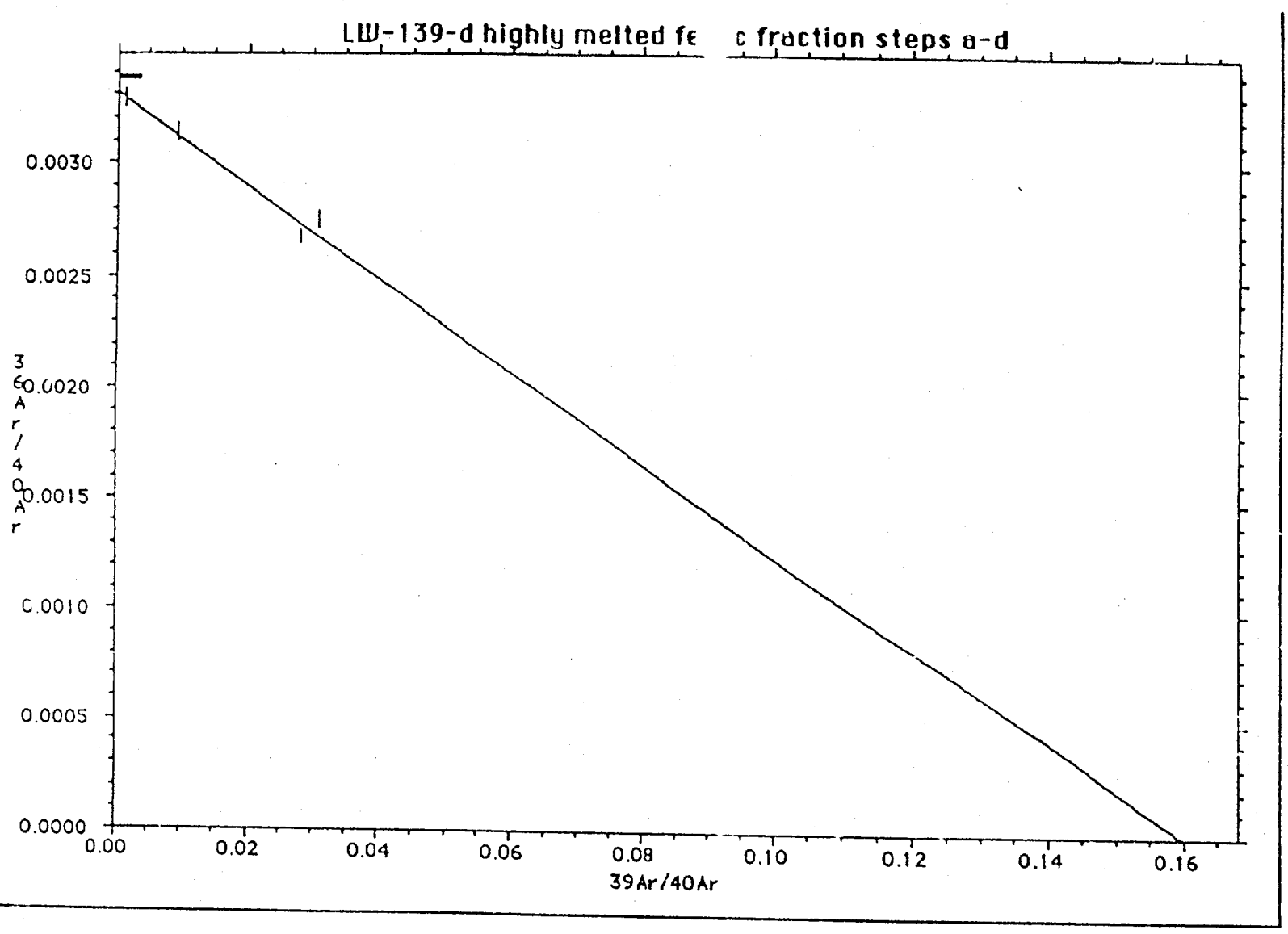
38 A


LW-139-d highly melted fi c fraction
100
%Rad
0
1
0.1
0.01
K/Ca
250
200
150
100
50
0
Apparent Age Ma
K
J
I
H
A
B
C
D
E
Integrated Age = 40.98 ± 0.30
0
10
20
30
40
50
60
70
80
90
100
Cumulative %39Ar Released

EXAMPLE


LW-139-d highly melted fc c fraction
100
%Rad
0
1
0.1
0.01
K/Ca
5
4
3
2
1
0
Apparent Age Ma
A
B
C
D
E
F
G
H
I
J
K
Integrated Age = 40.98 ± 0.30
0
10
20
30
40
50
60
70
80
90
100
Cumulative %39Ar Released

EXAMPLE


LW-139-d highly melted fe c fraction steps a-d
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
36Ar/40Ar
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
39Ar/40Ar

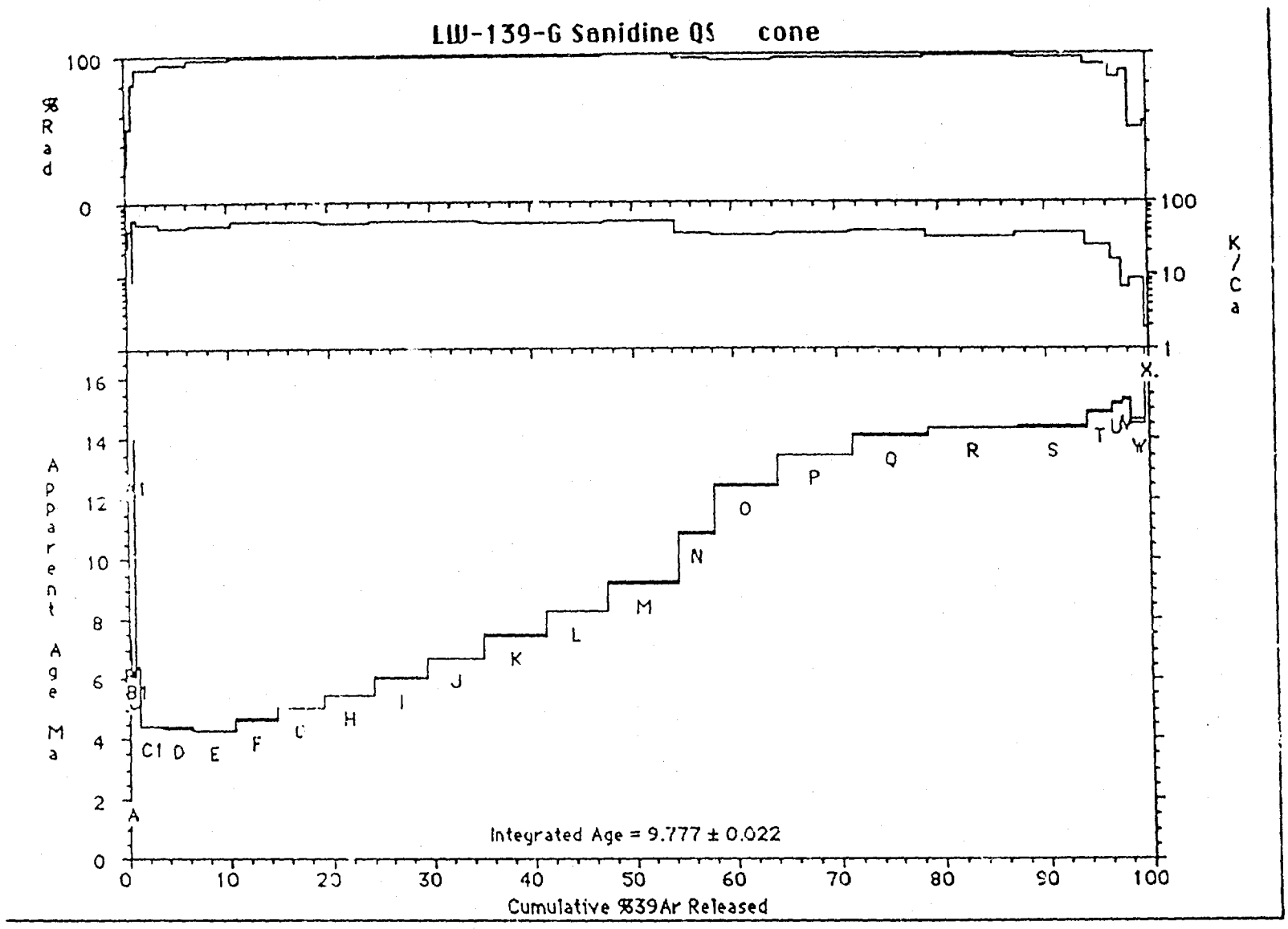
EXAMPLE

41 A

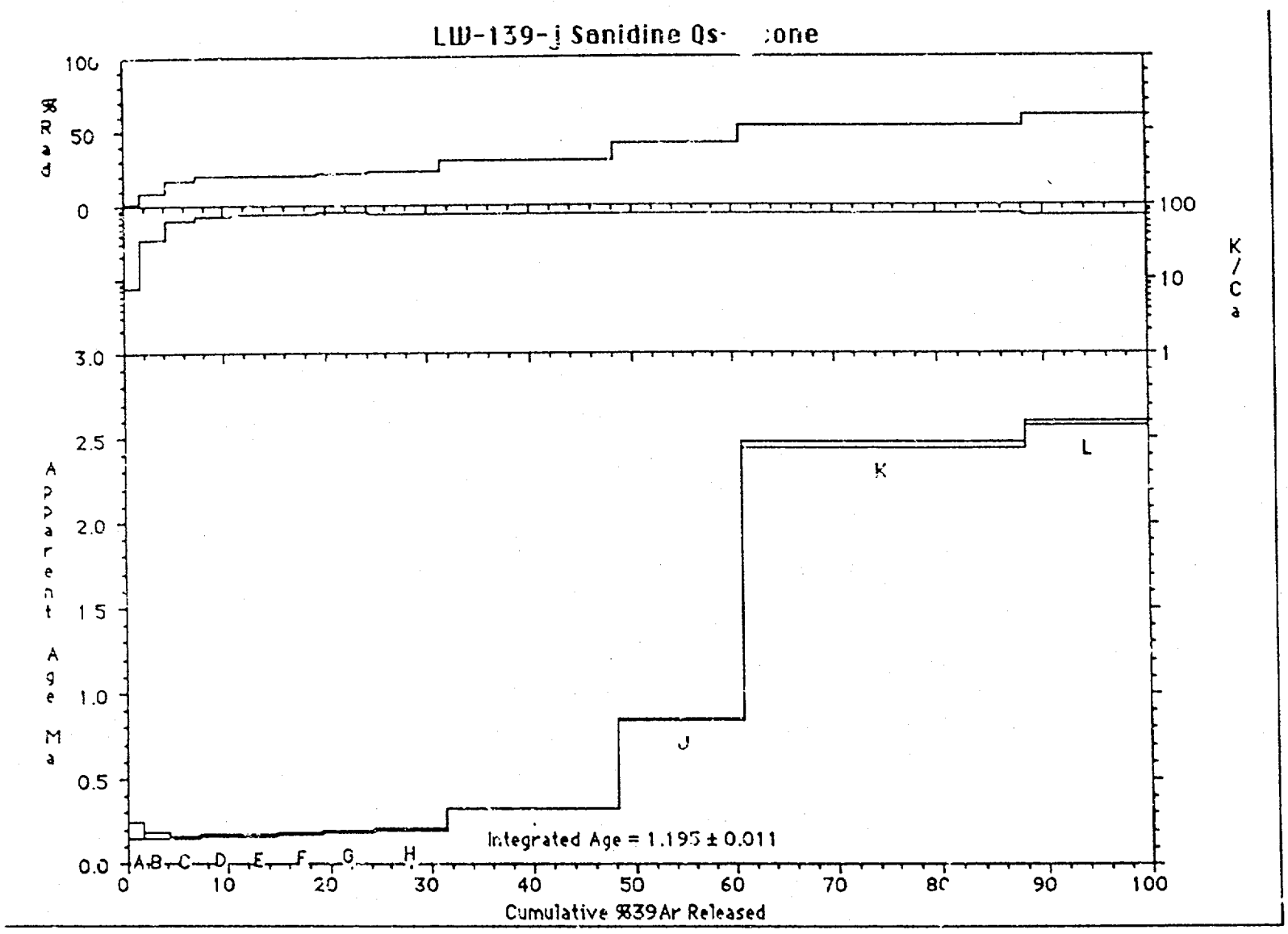
LW-139-4 highly melted felsic fraction steps a-d

J	=	.0000791	±	.0000002				
Conv. Criterion	=	.0001						
No. Iterations	=	5						
No. Points	=	4						
MSWD	=	4.475363			Prob=	1.138609E-02		
Slope (36tr/39K)=		-2.072E-02	±	1.498E-03	(7.2%),	±MSE	3.169E-03	(15.3%)
Intcpt (36/40)tr=		3.317E-03	±	3.391E-05	(1.0%),	±MSE	7.174E-05	(2.2%)
Intcpt (39K/40*)=		1.601E-01	±SE	9.989E-03	(6.2%),	±MSE	2.113E-02	(13.2%)
Intcpt (40*/39K)=		6.248E+00	±SE	3.899E-01	(6.2%),	±MSE	2.113E-02	(13.2%)
Intcpt (40/36)tr=		301.5	±SE	3.1	(1.0%),	±MSE	6.5	(2.2%)
Age (Ma)	=	0.8914	±SE	0.0557	(6.2%),	±MSE	0.1177	(13.2%)
Age (w/o J Er)	=	0.8914	±SE	0.0556	(6.2%),	±MSE	0.1176	(13.2%)

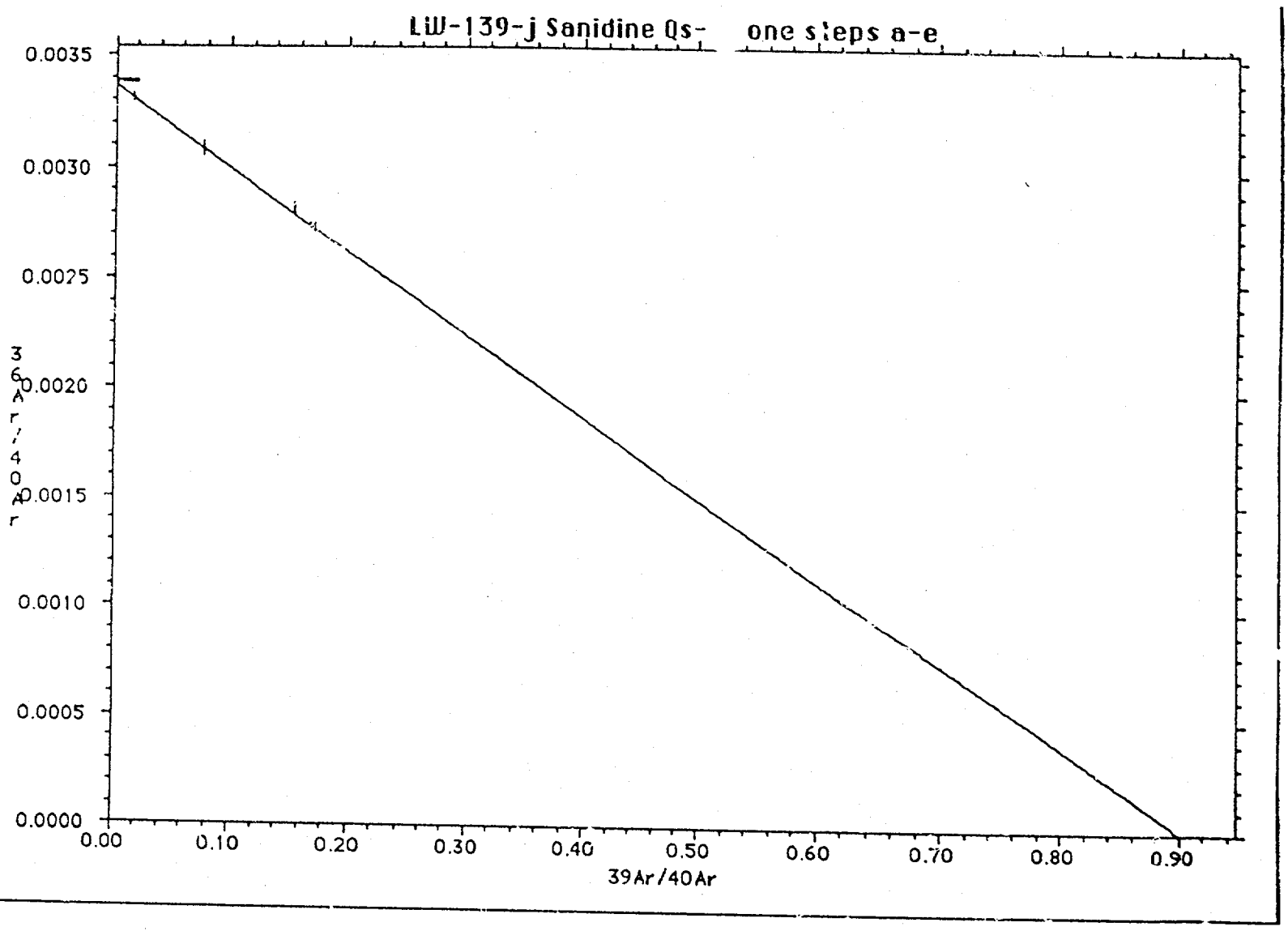
EXAMPLE


LW-139-G Sanidine QS cone
%Rad
100
0
100
10
1
K/Ca
Apparent Age Ma
16
14
12
10
8
6
4
2
0
A
B
C1
D
E
F
G
H
I
J
K
L
M
N
O
P
Q
R
S
T
U
W
X
Integrated Age = 9.777 ± 0.022
0
10
20
30
40
50
60
70
80
90
100
Cumulative %39Ar Released

EXAMPLE


LW-139-j Sanidine Qs- :one
100
50
0
%Rad
100
10
1
K/Ca
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Apparent Age Ma
K
L
J
Integrated Age = 1.195 ± 0.011
A
B
C
D
E
F
G
H
0
10
20
30
40
50
60
70
80
90
100
Cumulative %39Ar Released

EXAMPLE

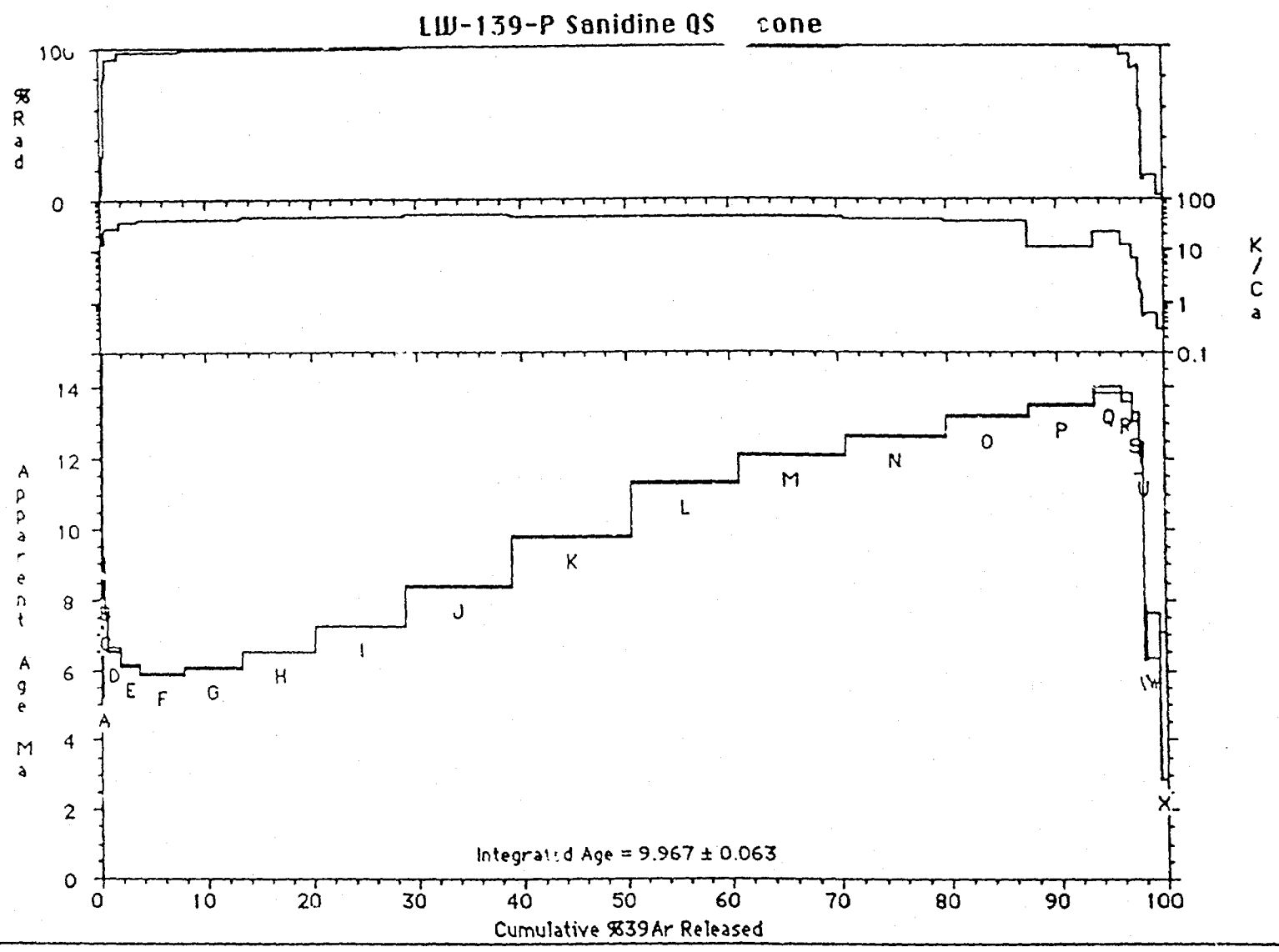

LW-139-j Sanidine Qs- one steps a-e
0.0035
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
36Ar/40Ar
0.00
0.10
0.20
0.30
0.40
0.50
0.60
0.70
0.80
0.90
39Ar/40Ar

EXAMP

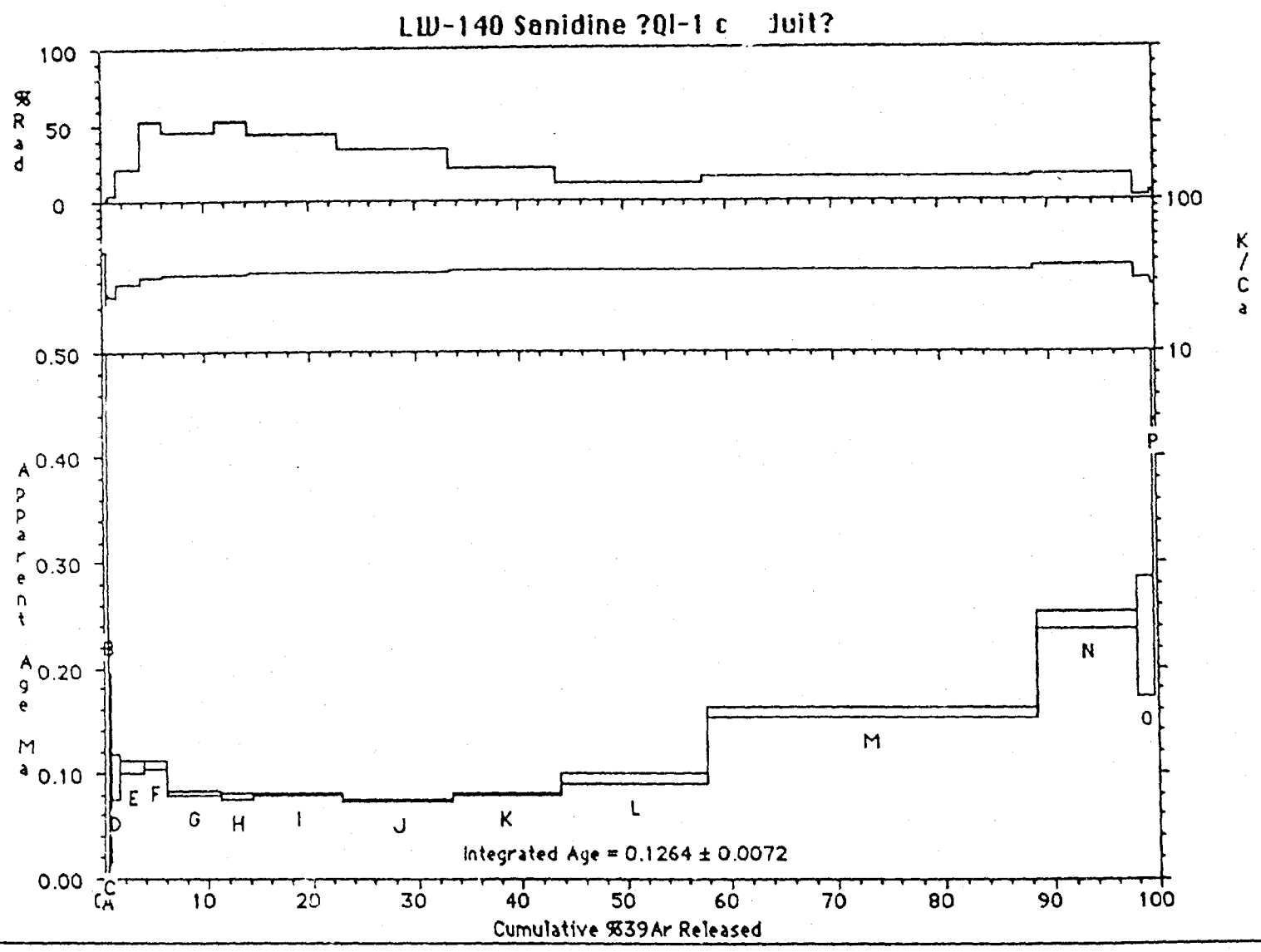
LW-139- anidine Qs-3 cone steps a-e

J	=	.000079	± .0000002					
Conv. Criterion	=	.0001						
No. Iterations	=	5						
No. Points	=	5						
MSWD	=	.4569393			Prob= .7123892			
Slope (36tr/39K)	=	-3.736E-03	±SE	1.415E-04	(3.8%),	±MSE	9.630E-05	(2.6%)
Intcpt (36/40)tr	=	3.372E-03	±SE	1.875E-05	(0.6%),	±MSE	1.281E-05	(0.4%)
Intcpt (39K/40*)	=	9.026E-01	±SE	3.010E-02	(3.3%),	±MSE	2.035E-02	(2.3%)
Intcpt (40*/39K)	=	1.108E+00	±SE	3.695E-02	(3.3%),	±MSE	2.035E-02	(2.3%)
Intcpt (40/36)tr	=	296.5	±SE	1.7	(0.6%),	±MSE	1.1	(0.4%)
Age (Ma)	=	0.1578	±SE	0.0053	(3.3%),	±MSE	0.0036	(2.3%)
Age (w/o J Er)	=	0.1578	±SE	0.0053	(3.3%),	±MSE	0.0036	(2.3%)

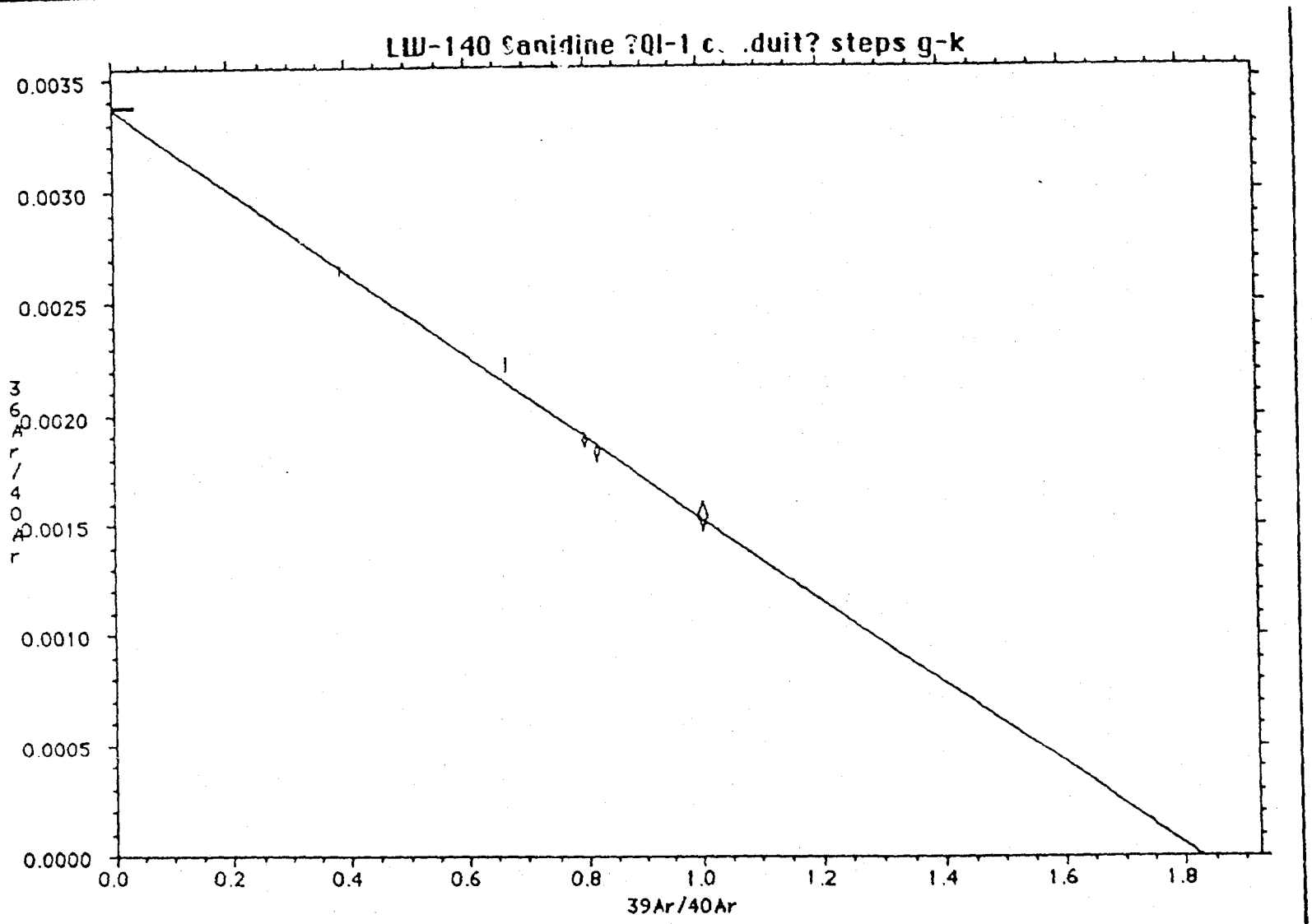
EXAMPLE


LW-139-P Sanidine QS cone
%Rad
100
0
100
10
1
0.1
K/Ca
Apparent Age Ma
14
12
10
8
6
4
2
0
A
D
E
F
G
H
I
J
K
L
M
N
O
P
Q
R
S
T
U
V
W
X
Integrated Age = 9.967 ± 0.063
0
10
20
30
40
50
60
70
80
90
100
Cumulative %39Ar Released

EXAMPLE


LW-140 Sanidine ?Ql-1 c Juit?
100
%Rad
50
0
100
K/Ca
0.50
10
Apparent Age Ma
0.40
0.30
0.20
0.10
0.00
A
B
C
D
E
F
G
H
I
J
K
L
M
N
O
P
Integrated Age = 0.1264 ± 0.0072
CA
10
20
30
40
50
60
70
80
90
100
Cumulative %39Ar Released

EXAMPLE


LW-140 Sanidine ?QI-1 c. .duit? steps g-k
0.0035
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
36Ar/40Ar
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
39Ar/40Ar

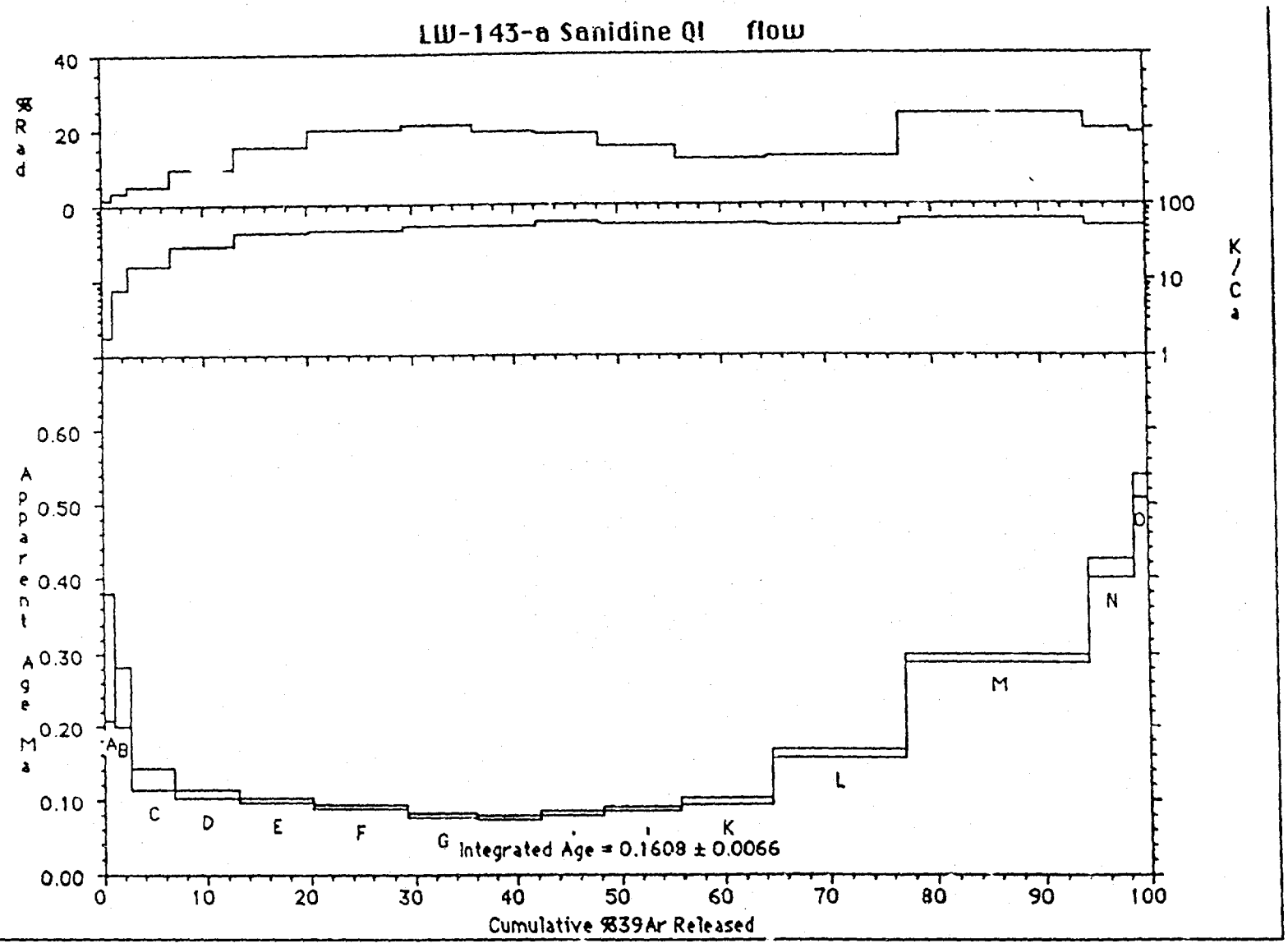
EXAMPLE

49A

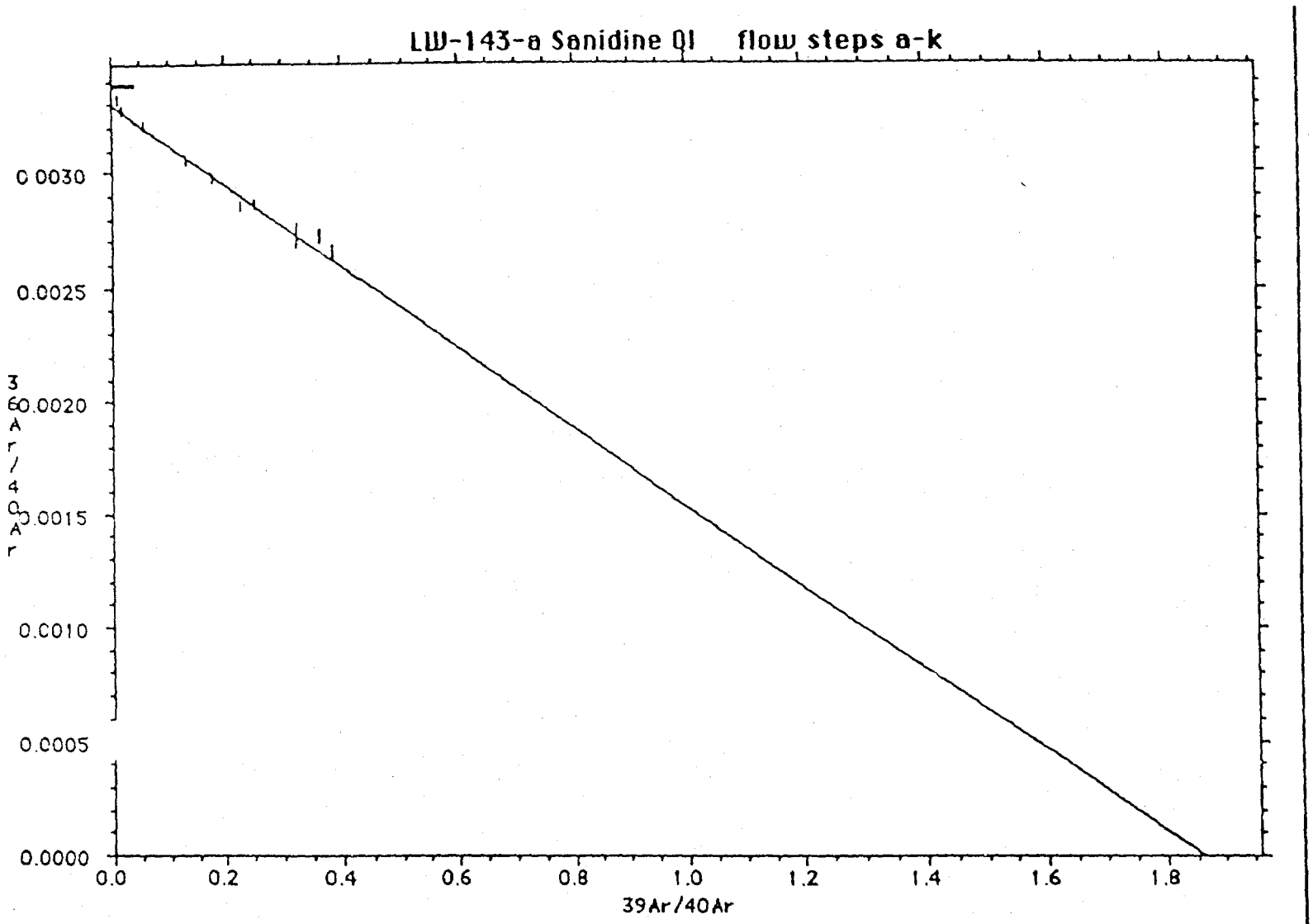
LW-140 S dine ?Q1-1 conduit? steps g-k

J	=	.0000798	± .0000002					
Conv. Criterion	=	.0001						
No. Iterations	=	6						
No. Points	=	5						
MSWD	=	3.427096			Prob= 1.632039E-02			
Slope (36tr/39K)	=	-1.842E-03	±SE	6.132E-05	(3.3%),	±MSE	1.135E-04	(6.2%)
Intcpt (36/40)tr	=	3.377E-03	±SE	3.765E-05	(1.1%),	±MSE	6.970E-05	(2.1%)
Intcpt (39K/40*)	=	1.833E+00	±SE	4.197E-02	(2.3%),	±MSE	7.770E-02	(4.2%)
Intcpt (40*/39K)	=	5.455E-01	±SE	1.249E-02	(2.3%),	±MSE	7.770E-02	(4.2%)
Intcpt (40/36)tr	=	296.1	±SE	3.3	(1.1%),	±MSE	6.1	(2.1%)
Age (Ma)	=	0.0785	±SE	0.0018	(2.3%),	±MSE	0.0033	(4.2%)
Age (w/o J Er)	=	0.0785	±SE	0.0018	(2.3%),	±MSE	0.0033	(4.2%)

EXAMPLE


LW-143-a Sanidine QI flow
40
20
0
%Rad
100
10
1
K/Ca
0.60
0.50
0.40
0.30
0.20
0.10
0.00
Apparent Age Ma
A
B
C
D
E
F
G
K
L
M
N
O
Integrated Age = 0.1608 ± 0.0066
0
10
20
30
40
50
60
70
80
90
100
Cumulative %39Ar Released

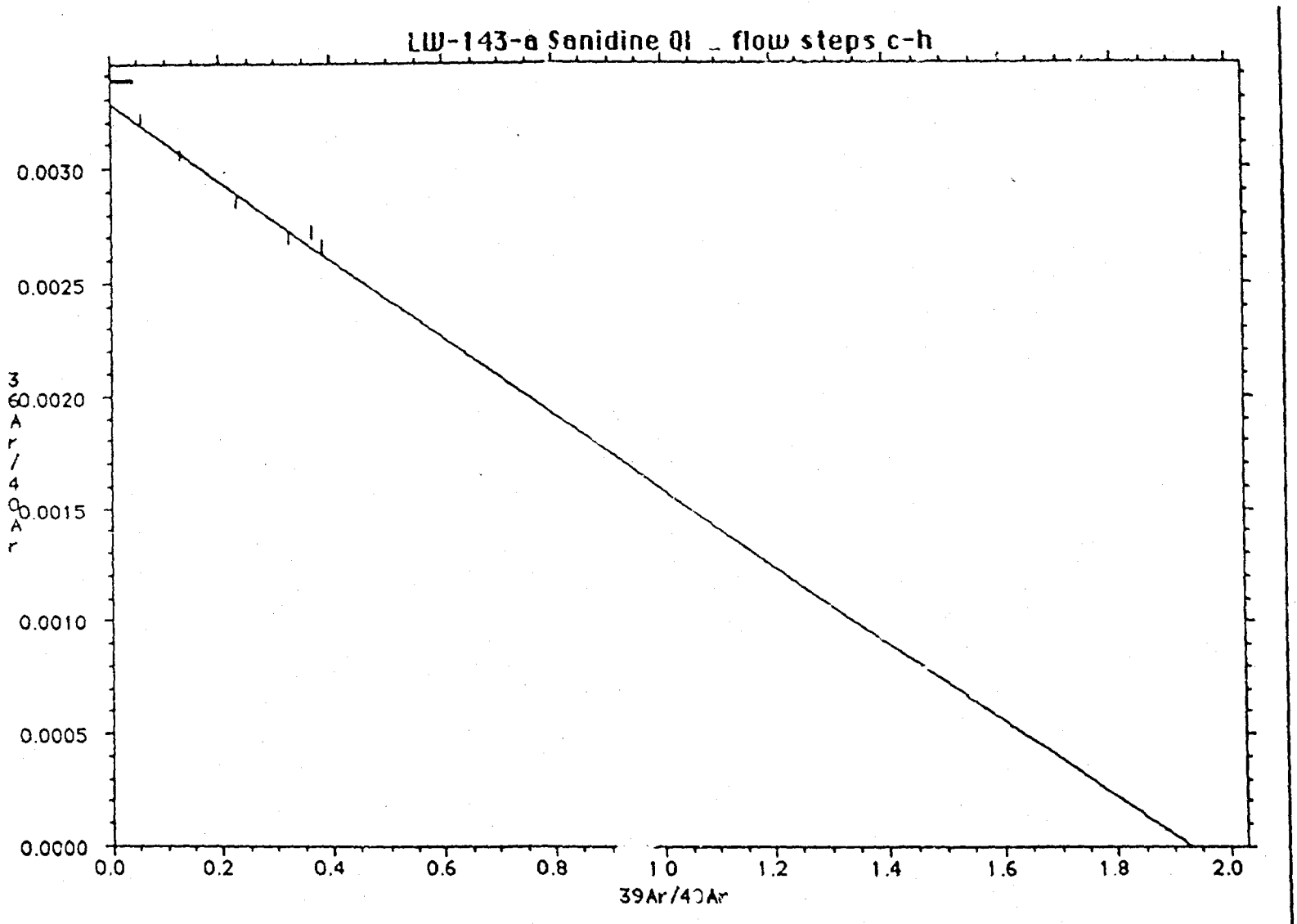
EXAMPLE


LW-143-a Sanidine 01 flow steps a-k
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
36Ar/40Ar
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
39Ar/40Ar

LW-143 Sanidine QI-2 flow steps a-k

J	=	.0000802	± .0000002					
Conv. Criterion	=	.0001						
No. Iterations	=	5						
No. Points	=	11						
MSWD	=	2.665994			Prob= 4.310916E-03			
Slope (36tr/39K)	=	-1.771E-03	±SE	4.730E-05	(2.7%),	±MSE	7.723E-05	(4.4%)
Intcpt (36/40)tr	=	3.306E-03	±SE	1.059E-05	(0.3%),	±MSE	1.729E-05	(0.5%)
Intcpt (39K/40*)	=	1.867E+00	±SE	4.471E-02	(2.4%),	±MSE	7.301E-02	(3.9%)
Intcpt (40*/39K)	=	5.357E-01	±SE	1.283E-02	(2.4%),	±MSE	7.301E-02	(3.9%)
Intcpt (40/36)tr	=	302.5	±SE	1.0	(0.3%),	±MSE	1.6	(0.5%)
Age (Ma)	=	0.0774	±SE	0.0019	(2.4%),	±MSE	0.0030	(3.9%)
Age (w/o J Er)	=	0.0774	±SE	0.0019	(2.4%),	±MSE	0.0030	(3.9%)

EXAMPLE

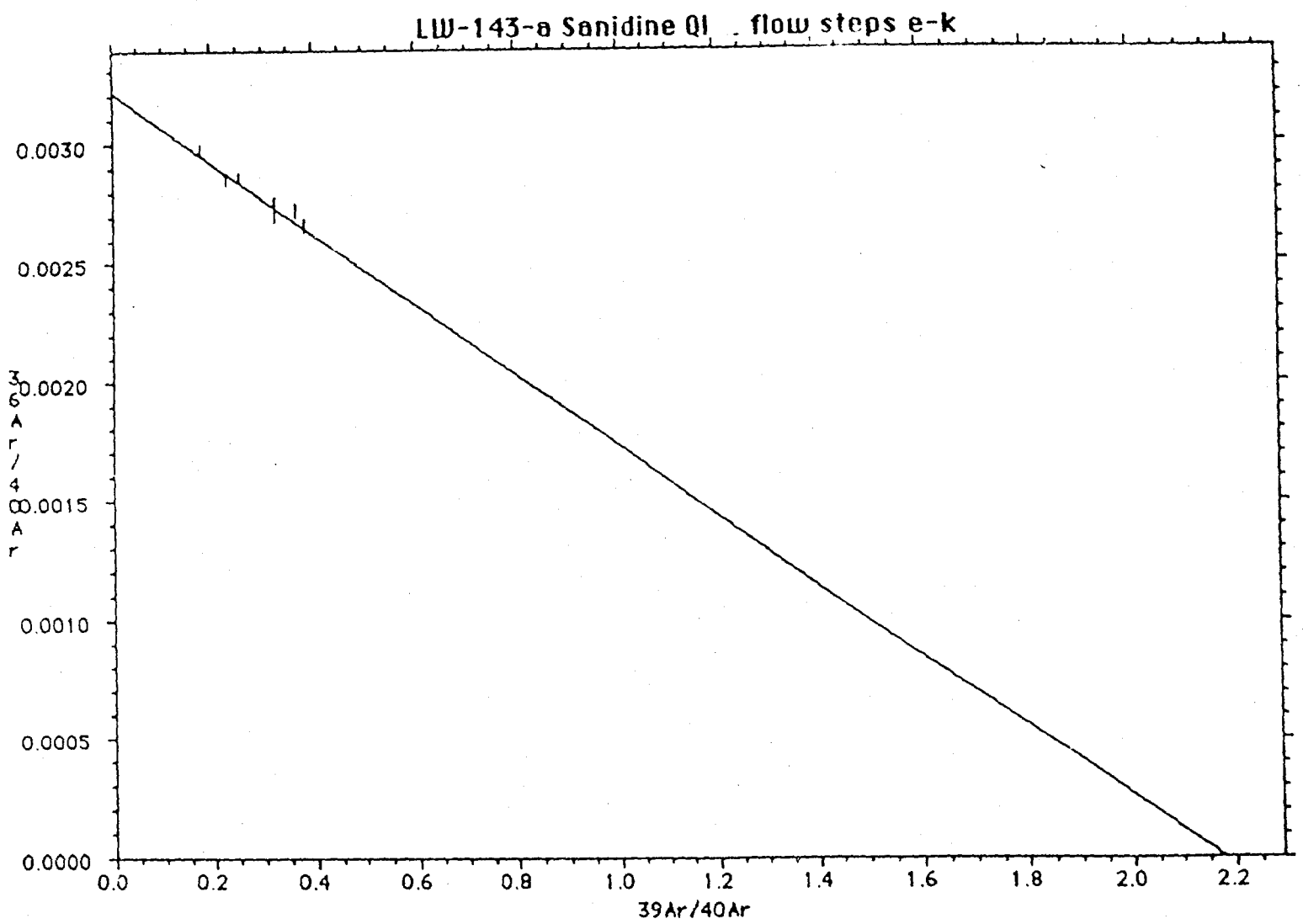

LW-143-a Sanidine 01 _ flow steps c-h
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
36Ar/40Ar
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
39Ar/40Ar

EXAMPLE

LW-143- anidine QI-2 flow steps c-h

J	=	.0000802	±	.0000002				
Conv. Criterion	=	.0001						
No. Iterations	=	5						
No. Points	=	6						
MSWD	=	4.502353			Prob=	1.228883E-03		
Slope (36tr/39K)=		-1.698E-03	±SE	6.730E-05	(4.0%),	±MSE	1.428E-04	(3.4%)
Intcpt (36/40)tr=		3.283E-03	±SE	1.712E-05	(0.5%),	±MSE	3.633E-05	(1.1%)
Intcpt (39K/40*)=		1.934E+00	±SE	6.706E-02	(3.5%),	±MSE	1.423E-01	(7.4%)
Intcpt (40*/39K)=		5.171E-01	±SE	1.793E-02	(3.5%),	±MSE	1.423E-01	(7.4%)
Intcpt (40/36)tr=		304.6	±SE	1.6	(0.5%),	±MSE	3.4	(1.1%)
Age (Ma)	=	0.0748	±SE	0.0026	(3.5%),	±MSE	0.0055	(7.4%)
Age (w/o J Er)	=	0.0748	±SE	0.0026	(3.5%),	±MSE	0.0055	(7.4%)

EXAMPLE

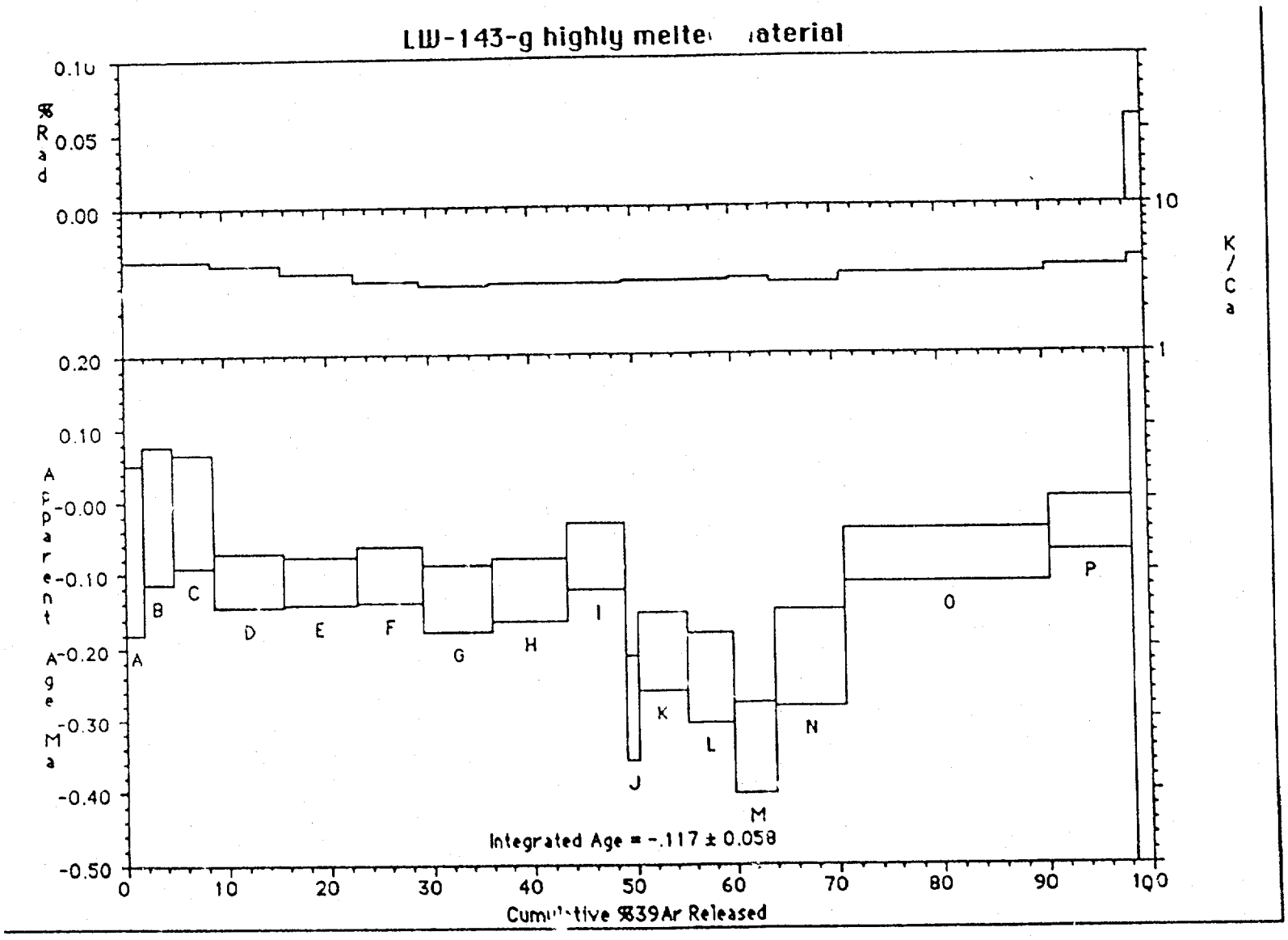

LW-143-a Sanidine QI . flow steps e-k
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
36Ar/40Ar
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
2.2
39Ar/40Ar

EXAMPLE

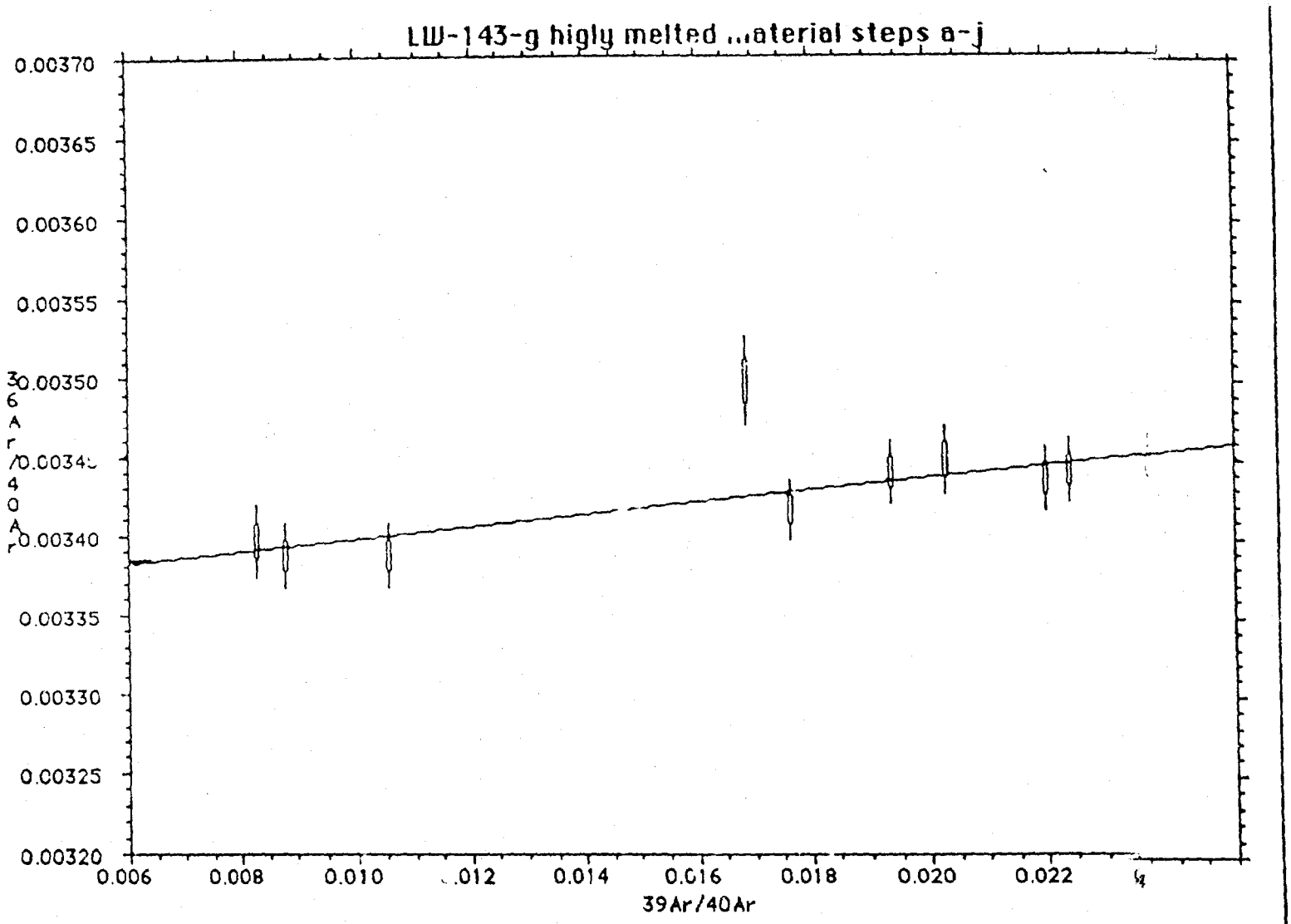
56A

LW-143- anidine Gl-2 flow steps e-k

J	=	.0000802	± .0000002						
Conv. Criterion	=	.0001							
No. Iterations	=	5							
No. Points	=	7							
MSWD	=	2.532755				Prob= 2.674182E-02			
Slope (36tr/39K)	=	-1.474E-03	±SE	1.145E-04	(7.8%),	±MSE	1.822E-04	(12.4%)	
Intcpt (36/40)tr	=	3.218E-03	±SE	3.344E-05	(1.0%),	±MSE	5.322E-05	(1.7%)	
Intcpt (39K/40*)	=	2.183E+00	±SE	1.425E-01	(6.5%),	±MSE	2.267E-01	(10.4%)	
Intcpt (40*/39K)	=	4.580E-01	±SE	2.989E-02	(6.5%),	±MSE	2.267E-01	(10.4%)	
Intcpt (40/36)tr	=	310.8	±SE	3.2	(1.0%),	±MSE	5.1	(1.7%)	
Age (Ma)	=	0.0662	±SE	0.0043	(6.5%),	±MSE	0.0069	(10.4%)	
Age (w/o J Er)	=	0.0662	±SE	0.0043	(6.5%),	±MSE	0.0069	(10.4%)	


LW-143-g highly melte material
0.10
0.05
0.00
%Rad
10
K/Ca
1
0.20
0.10
-0.00
-0.10
-0.20
-0.30
-0.40
-0.50
Apparent Age Ma
A
B
C
D
E
F
G
H
I
J
K
L
M
N
O
P
Integrated Age = -.117 ± 0.058
0
10
20
30
40
50
60
70
80
90
100
Cumulative %39Ar Released

EXAMPLE

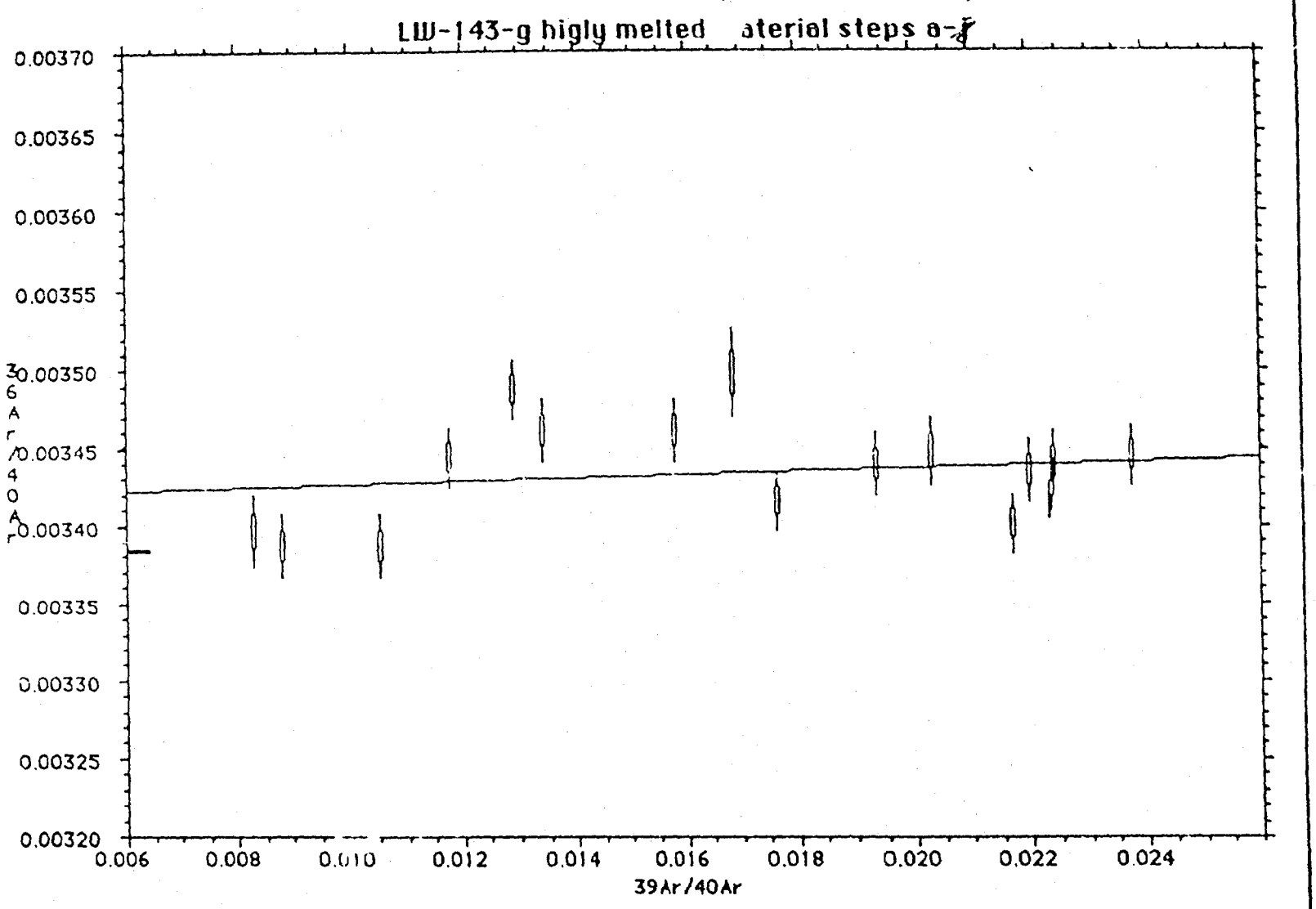

LW-143-g higly melted ...aterial steps a-j
0.00370
0.00365
0.00360
0.00355
0.00350
0.00345
0.00340
0.00335
0.00330
0.00325
0.00320
36Ar/40Ar
0.006
0.008
0.010
.012
0.014
0.016
0.018
0.020
0.022
39Ar/40Ar

EXAMPLE

574

LW-143- igly melted material steps a-j

J	=	.0000796	± .0000002				
Conv. Criterion	=	.0001					
No. Iterations	=	3					
No. Points	=	10					
MSWD	=	1.003838		Prob= .4304763			
Slope (36tr/39K)=	3.907E-03	±SE	1.171E-03	(-30.0%),	±MSE	1.173E-03	(-30.0%)
Intcpt (36/40)tr=	3.359E-03	±SE	2.118E-05	(0.6%),	±MSE	2.122E-05	(0.6%)
Intcpt (39K/40*)=	-8.596E-01	±SE	2.002E-01	(-23.3%),	±MSE	2.006E-01	(-23.3%)
Intcpt (40*/39K)=	-1.163E+00	±SE	2.710E-01	(-23.3%),	±MSE	2.006E-01	(-23.3%)
Intcpt (40/36)tr=	297.7	±SE	1.9	(0.6%),	±MSE	1.9	(0.6%)
Age (Ma)	=	-0.1671	±SE	0.0389	(-23.3%),	±MSE	0.0390 (-23.3%)
Age (w/o J Er)	=	-0.1671	±SE	0.0389	(-23.3%),	±MSE	0.0390 (-23.3%)


LW-143-g higly melted aterial steps a-f
0.00370
0.00365
0.00360
0.00355
0.00350
0.00345
0.00340
0.00335
0.00330
0.00325
0.00320
36Ar/40Ar
0.006
0.008
0.010
0.012
0.014
0.016
0.018
0.020
0.022
0.024
39Ar/40Ar

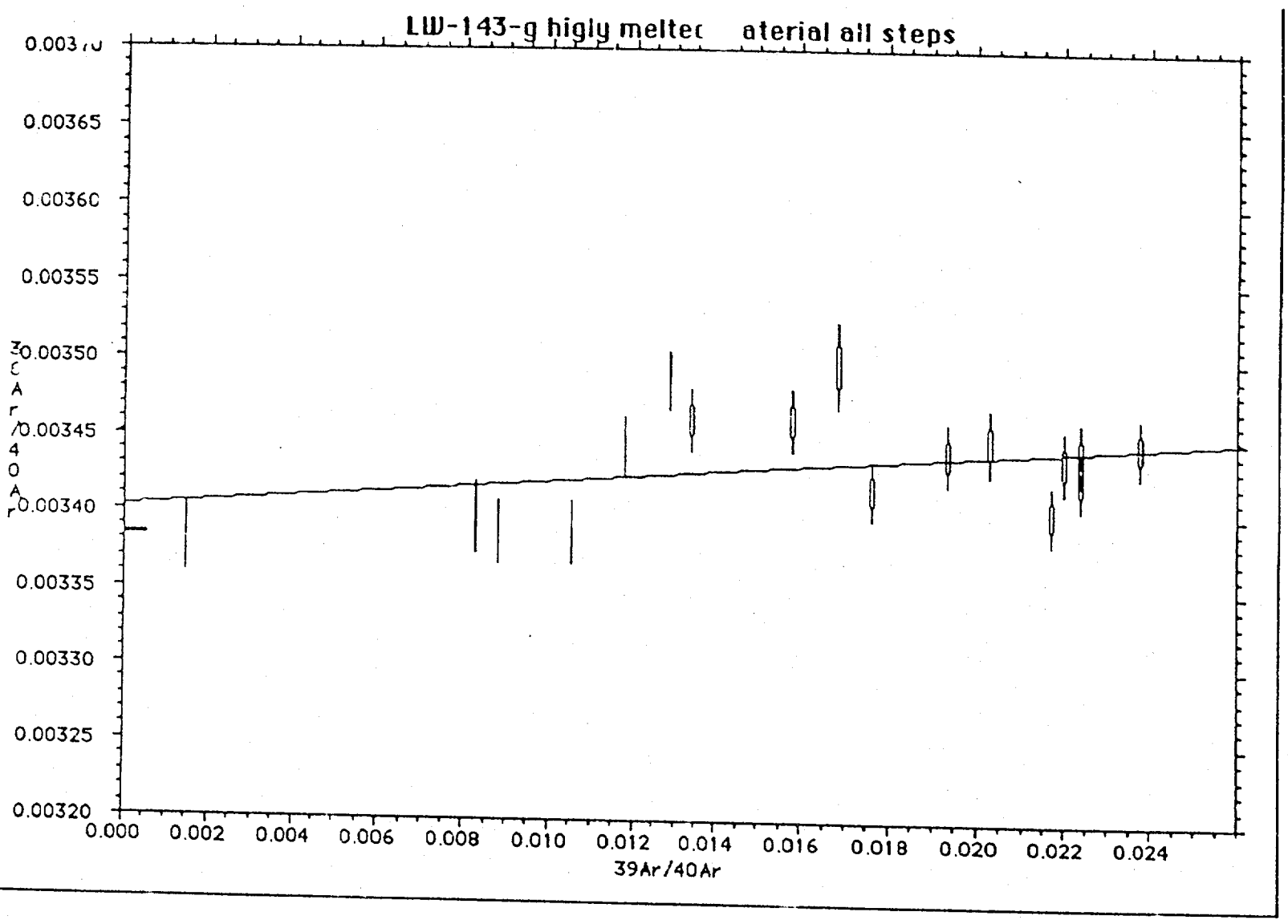
EXAMPLE

-143- igly melted material steps a-

J	=	0000796	± .0000002		
Conv. Criterion	=	.0001			
No. Iterations	=	4			
No. Points	=	16			
MSWD	=	2.453113		Prob= .0018368	
Slope (36tr/39K)=		1.101E-03	±SE 9.823E-04	(-89.2%)	±MSE 1.538E-03 (%-139.7%)
Intcpt (36/40)tr=		3.415E-03	±SE 1.732E-05	(0.5%),	±MSE 2.713E-05 (0.8%)
Intcpt (39K/40*)=		-3.101E+00	±SE 5.225E-01	(-16.8%)	±MSE 8.183E-01 (-26.4%)
Intcpt (40*/39K)=		-3.225E-01	±SE 5.434E-02	(-16.8%),	±MSE 8.183E-01 (-26.4%)
Intcpt (40/36)tr=		292.8	±SE 1.5	(0.5%),	±MSE 2.3 (0.8%)
Age (Ma)	=	-0.0463	±SE 0.0078	(-16.8%),	±MSE 0.0122 (-26.4%)
Age (w/o J Er)	=	-0.0463	±SE 0.0078	(-16.8%),	±MSE 0.0122 (-26.4%)

62A

EXAMPLE


LW-143-g higly melted aterial all steps
0.00370
0.00365
0.00360
0.00355
0.00350
0.00345
0.00340
0.00335
0.00330
0.00325
0.00320
36Ar/40Ar
0.000
0.002
0.004
0.006
0.008
0.010
0.012
0.014
0.016
0.018
0.020
0.022
0.024
39Ar/40Ar

EXAMPLE

63A

LW-143- igly melted material all steps

J = .0000796 ± .0000002
Conv. Criterion = .0001
No. Iterations = 3
No. Points = 17
MSWD = 2.402017 Prob= 1.750153E-03
Slope (36tr/39K)= 1.820E-03 ±SE 8.108E-04 (-44.5%), ±MSE 1.257E-03 (-69.0%)
Intcpt (36/40)tr= 3.402E-03 ±SE 1.393E-05 (0.4%), ±MSE 2.159E-05 (0.6%)
Intcpt (39K/40*)= -1.869E+00 ±SE 2.941E-01 (-15.7%), ±MSE 4.558E-01 (-24.4%)
Intcpt (40*/39K)= -5.351E-01 ±SE 8.421E-02 (-15.7%), ±MSE 4.558E-01 (-24.4%)

Intcpt (40/36)tr= 294.0 ±SE 1.2 (0.4%), ±MSE 1.9 (0.6%)
Age (Ma) = -0.0769 ±SE 0.0121 (-15.7%), ±MSE 0.0187 (-24.4%)
Age (w/o J Er) = -0.0769 ±SE 0.0121 (-15.7%), ±MSE 0.0187 (-24.4%)

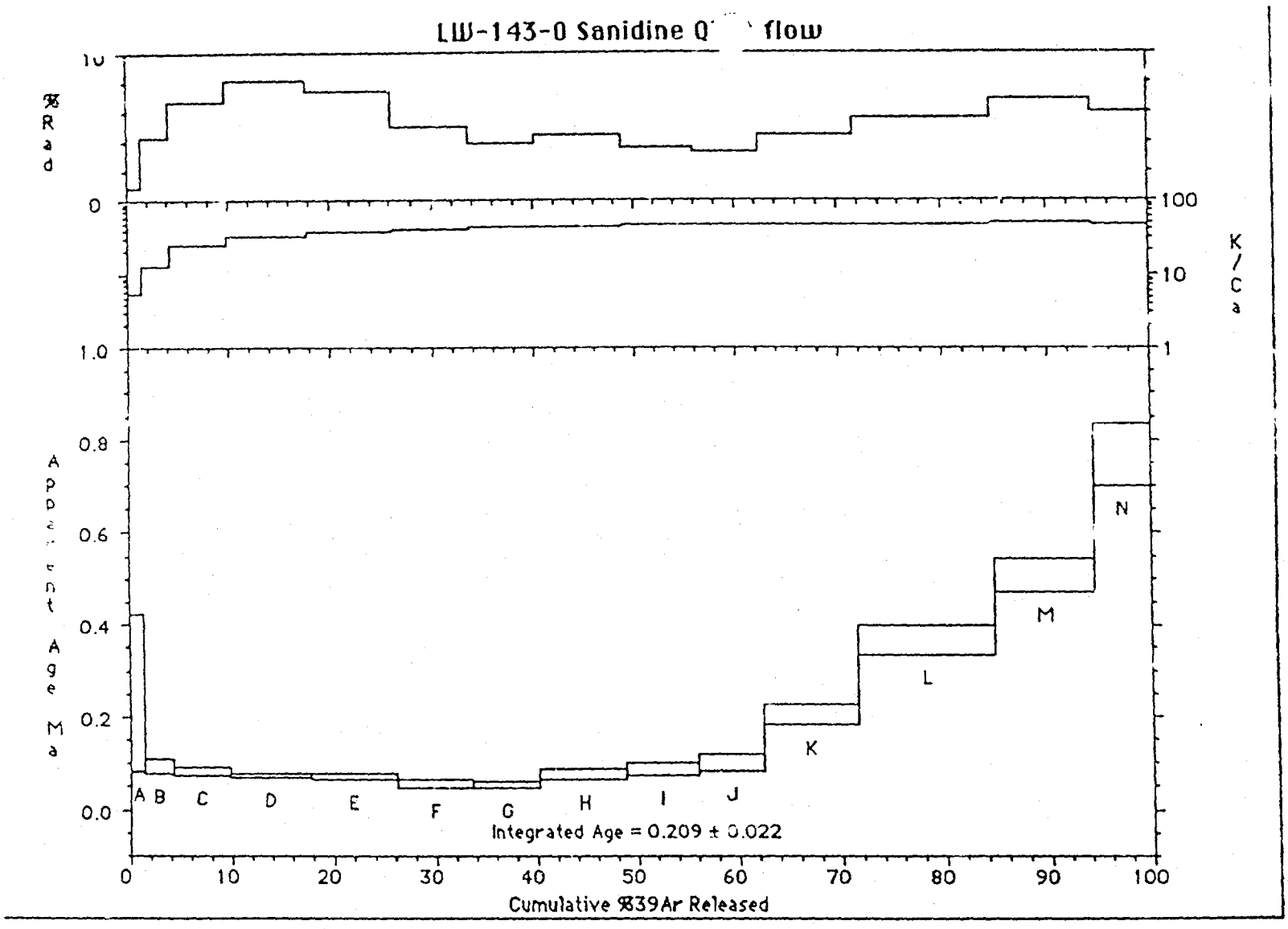
EXAMPLE

64 A

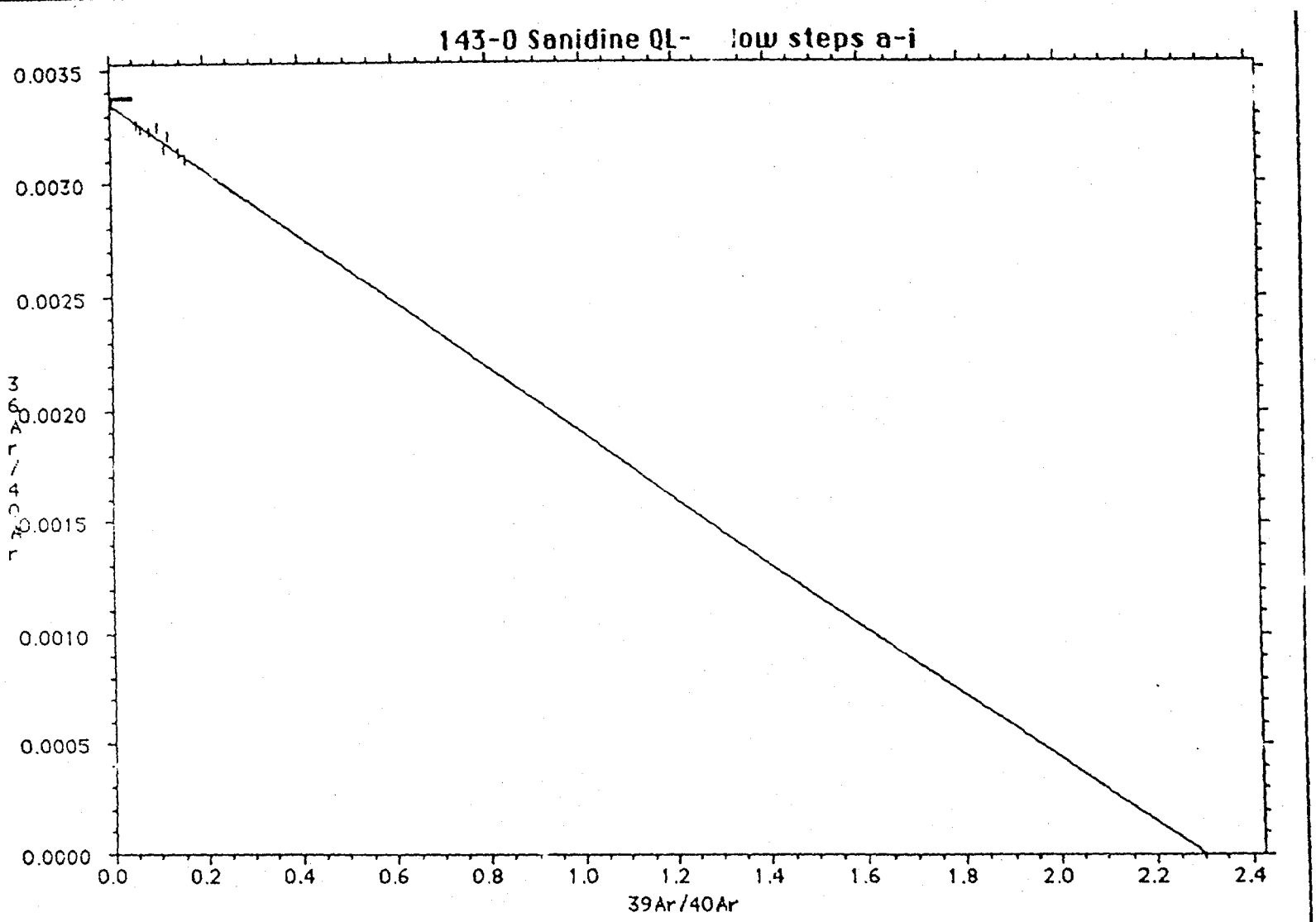
LW-143- igly melted material all steps

J	=	.0000796	± .0000002				
Conv. Criterion	=	.0001					
No. Iterations	=	3					
No. Points	=	17					
MSWD	=	2.402017		Prob= 1.750153E-03			
Slope (36tr/39K)=		1.820E-03	±SE 8.108E-04	(-44.5%),		±MSE 1.257E-03	(-69.0%)
Intcpt (36/40)tr=		3.402E-03	±SE 1.393E-05	(0.4%),		±MSE 2.159E-05	(0.6%)
Intcpt (39K/40*)=		-1.869E+00	±SE 2.941E-01	(-15.7%),		±MSE 4.558E-01	(-24.4%)
Intcpt (40*/39K)=		-5.351E-01	±SE 8.421E-02	(-15.7%),		±MSE 4.558E-01	(-24.4%)
Intcpt (40/36)tr=		294.0	±SE 1.2	(0.4%),		±MSE 1.9	(0.6%)
Age (Ma)	=	- .0769	±SE 0.0121	(-15.7%),		±MSE 0.0187	(-24.4%)
Age (w/o J Er)	=	-0.0769	±SE 0.0121	(-15.7%),		±MSE 0.0187	(-24.4%)

EXAMPLE


LW-143-0 Sanidine Q flow
10
0
100
10
1
K/Ca
1.0
0.8
0.6
0.4
0.2
0.0
Apparent Age Ma
A B C D E F G H I J K L M N
Integrated Age = 0.209 ± 0.022
0 10 20 30 40 50 60 70 80 90 100
Cumulative %39Ar Released

EXAMPLE

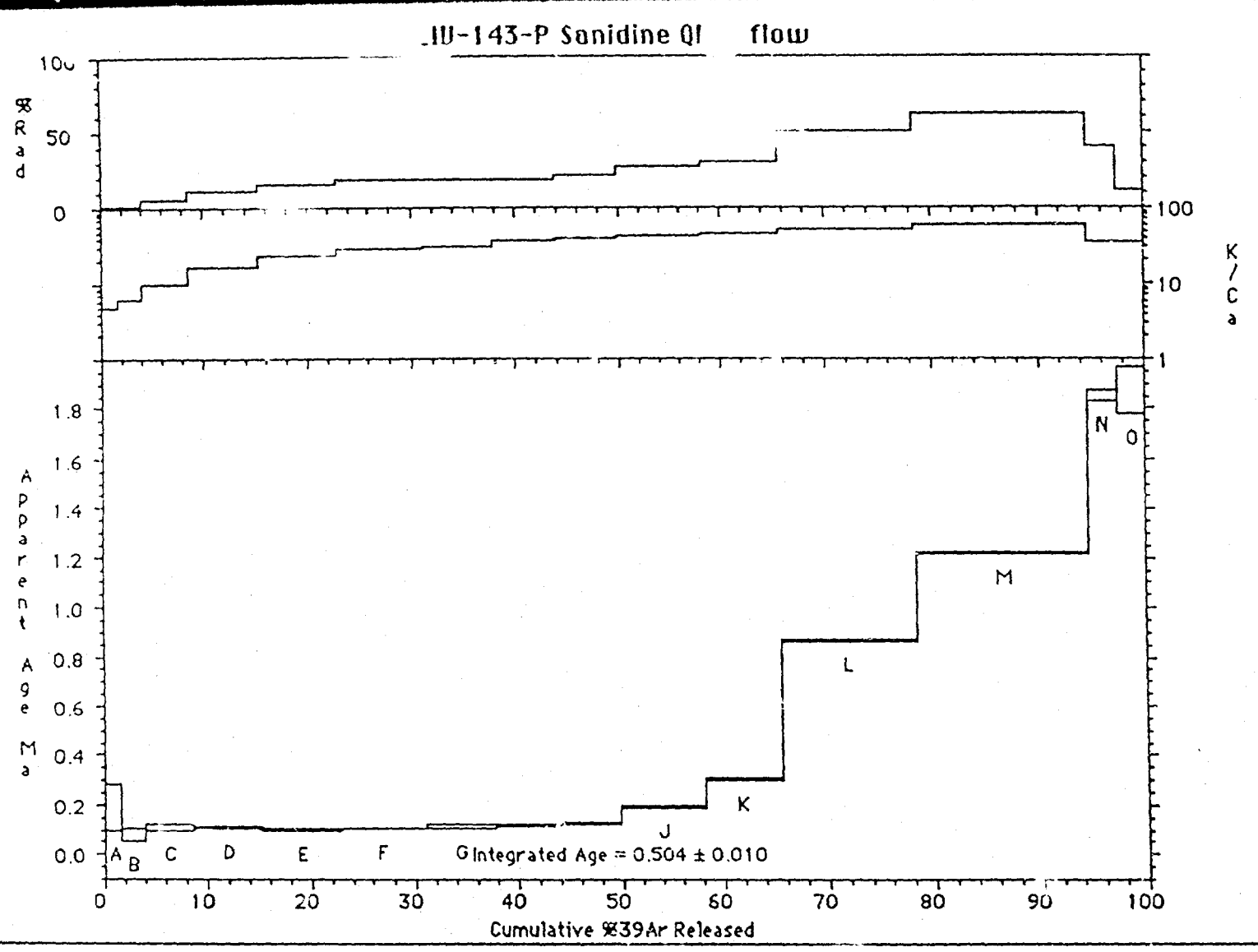

143-0 Sanidine QL- low steps a-i
0.0035
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
2.2
2.4
39Ar/40Ar

EXAMPLE

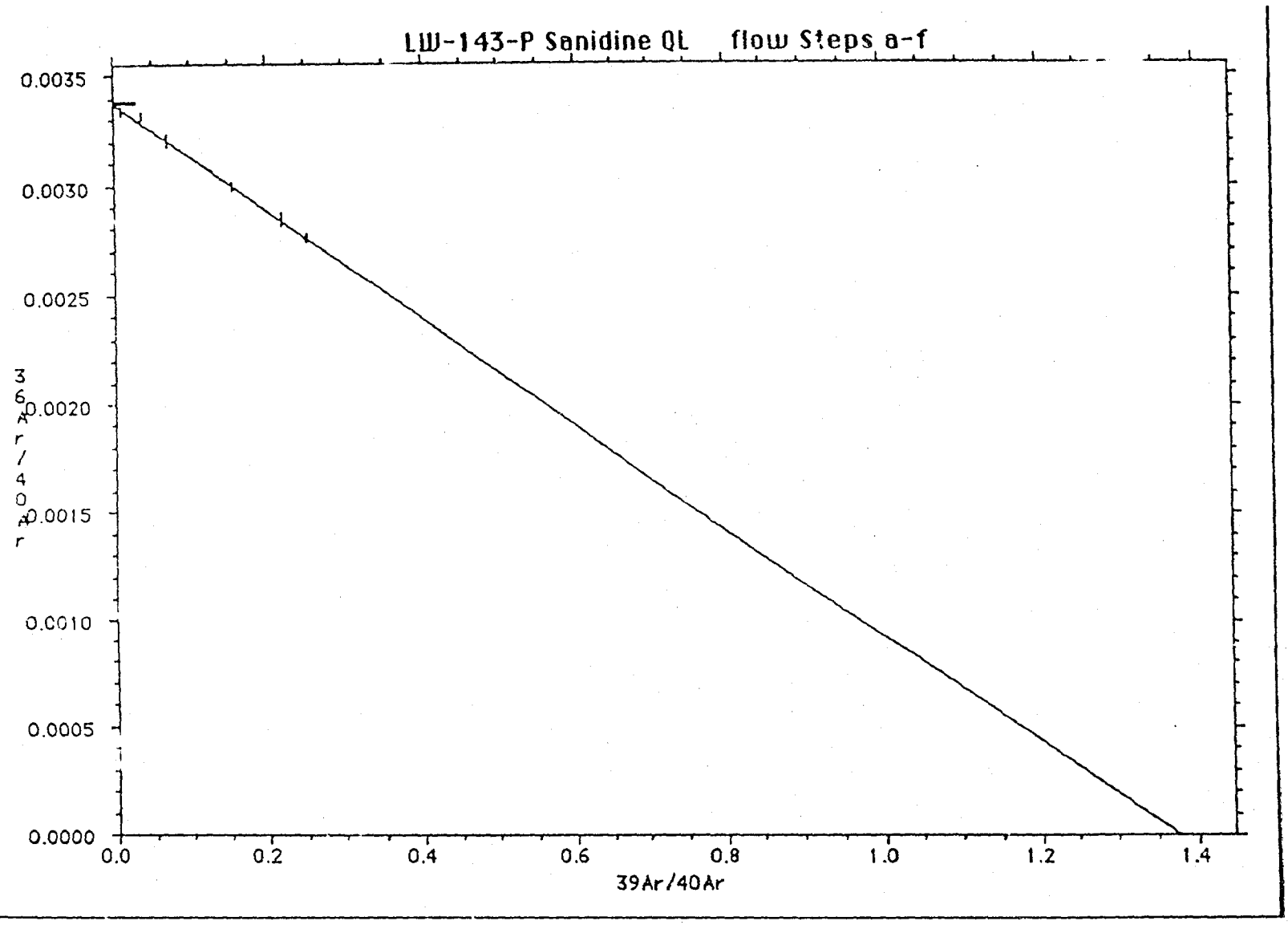
143-0 S 'dine QL-2 flow steps a-i

J	=	.00008	± .0000002					
Conv. Criterion	=	.0001						
No. Iterations	=	4						
No. Points	=	9						
MSWD	=	1.886185			Prob= 6.730733E-02			
Slope (36tr/39K)	=	-1.454E-03	±SE	1.542E-04	(10.6%),	±MSE	2.117E-04	(14.6%)
Intcpt (36/40)tr	=	3.358E-03	±SE	1.613E-05	(0.5%),	±MSE	2.215E-05	(0.7%)
Intcpt (39K/40*)	=	2.309E+00	±SE	2.191E-01	(9.5%),	±MSE	3.010E-01	(13.0%)
Intcpt (40*/39K)	=	4.331E-01	±SE	4.111E-02	(9.5%),	±MSE	3.010E-01	(13.0%)
Intcpt (40/36)tr	=	297.8	±SE	1.4	(0.5%),	±MSE	2.0	(0.7%)
Age (Ma)	=	0.0624	±SE	0.0059	(9.5%),	±MSE	0.0082	(13.1%)
Age (w/o J Er)	=	0.0624	±SE	0.0059	(9.5%),	±MSE	0.0081	(13.1%)

EXAMPLE


IW-143-P Sanidine Qf flow
100
50
0
%Rad
100
10
1
K/Ca
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Apparent Age Ma
A
B
C
D
E
F
G Integrated Age = 0.504 ± 0.010
J
K
L
M
N
O
0
10
20
30
40
50
60
70
80
90
100
Cumulative %39Ar Released

EXAMPLE


LW-143-P Sanidine QL flow Steps a-f
0.0035
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
36Ar/40Ar
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
39Ar/40Ar

EXAMPLE

LW-143- anidine QL-2 flow steps a-f

J	=	.0000795	± .0000002					
Conv. Criterion	=	.0001						
No. Iterations	=	5						
No. Points	=	6						
MSWD	=	.83878	Prob= .5002466					
Slope (36tr/39K)	=	-2.431E-03	±SE	9.848E-05	(4.0%),	±MSE	9.019E-05	(3.7%)
Intcpt (36/40)tr	=	3.386E-03	±SE	1.508E-05	(0.4%),	±MSE	1.381E-05	(0.4%)
Intcpt (39K/40*)	=	1.393E+00	±SE	5.147E-02	(3.7%),	±MSE	4.714E-02	(3.4%)
Intcpt (40*/39K)	=	7.180E-01	±SE	2.653E-02	(3.7%),	±MSE	4.714E-02	(3.4%)
Intcpt (40/36)tr	=	295.3	±SE	1.3	(0.4%),	±MSE	1.2	(0.4%)
Age (Ma)	=	0.1030	±SE	0.0038	(3.7%),	±MSE	0.0035	(3.4%)
Age (w/o J Er)	=	0.1030	±SE	0.0038	(3.7%),	±MSE	0.0035	(3.4%)

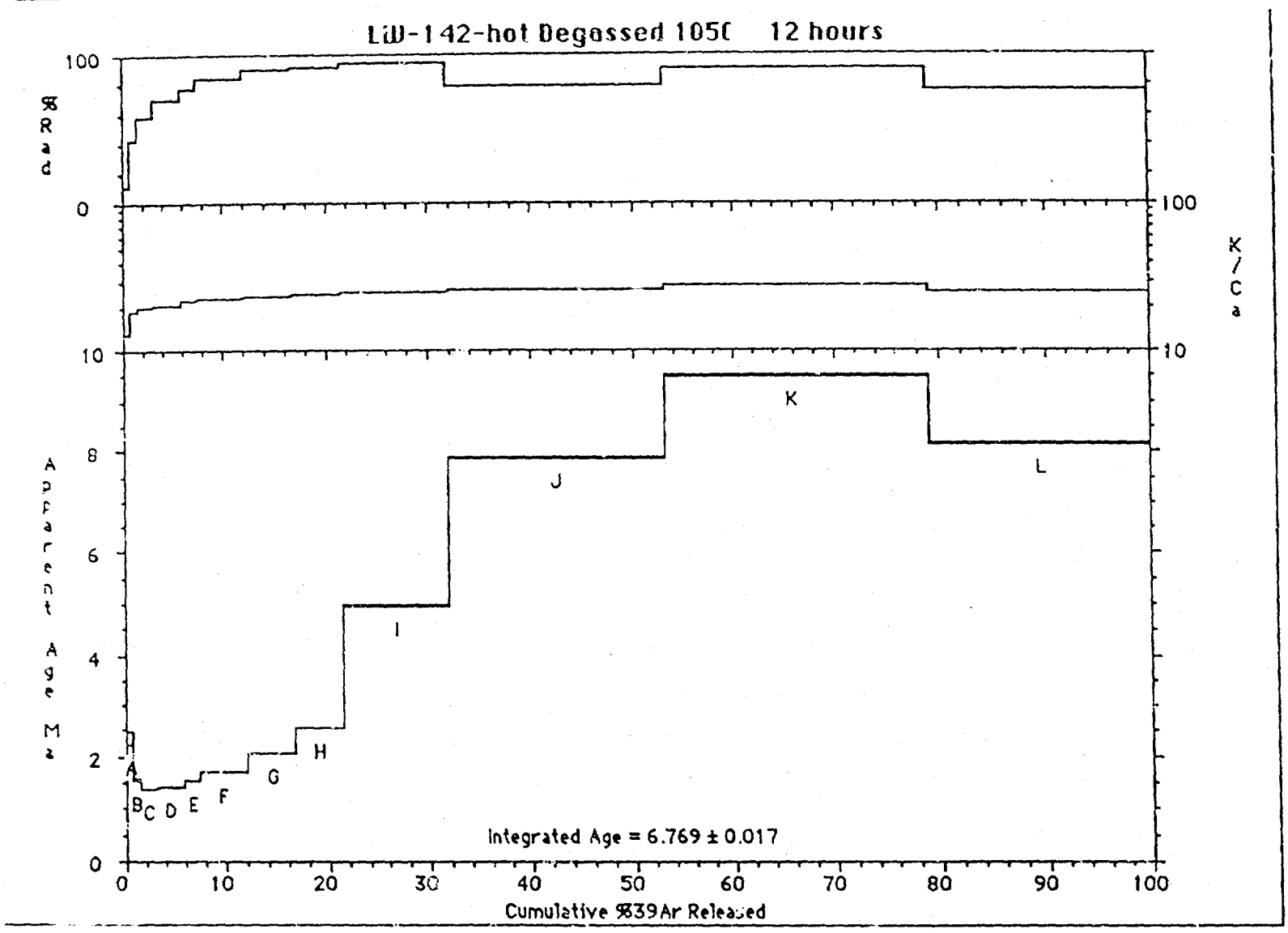
EXAMPLE

LW-143- anidine QL-2 flow steps a-f

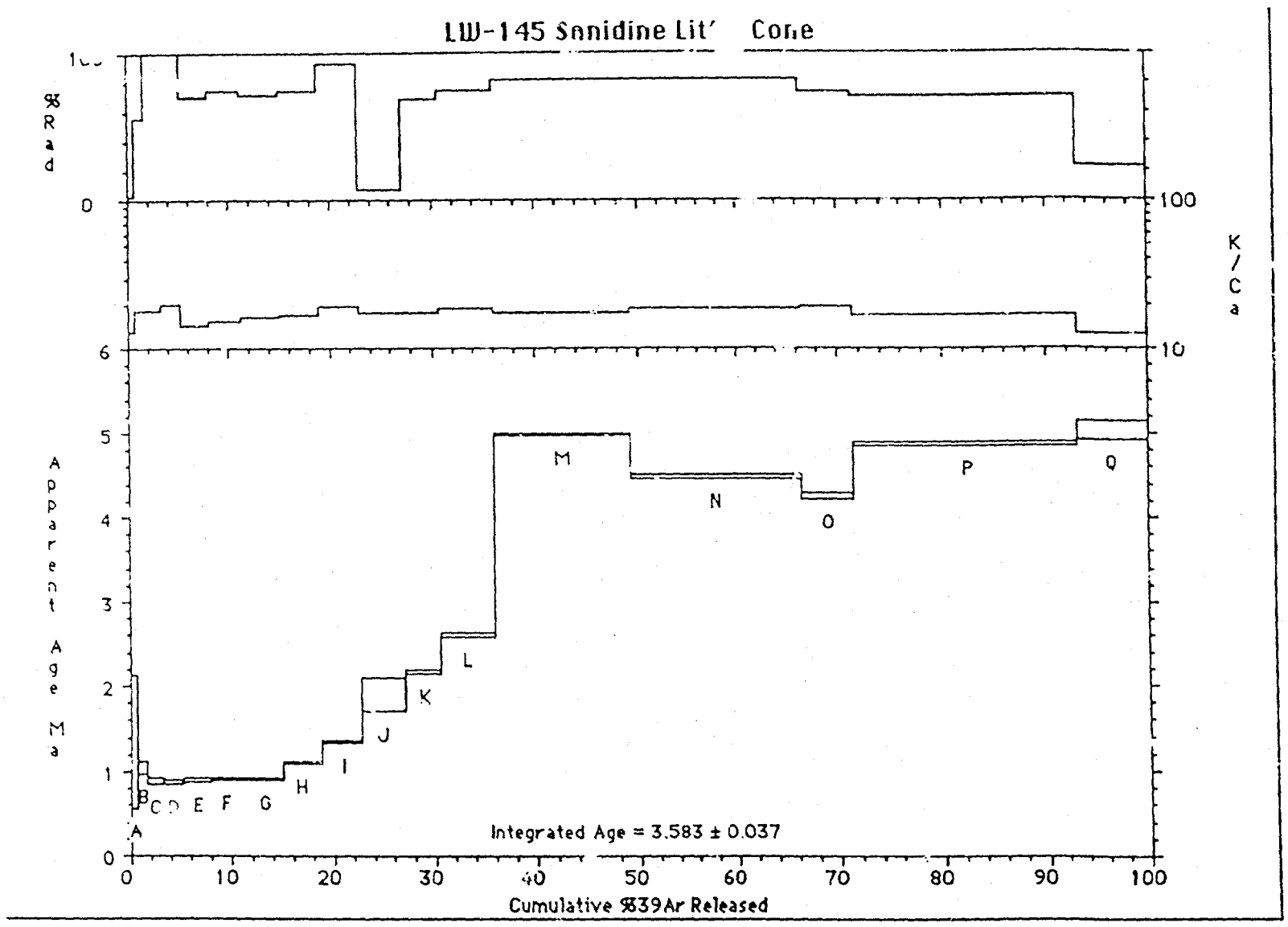
J	=	.0000795	± .0000002					
Conv. Criterion	=	.0001						
No. Iterations	=	5						
No. Points	=	6						
MSWD	=	.83878	Prob= .5002466					
Slope (36tr/39K)=	-2.431E-03	±SE	9.848E-05	(4.0%),	±MSE	9.019E-05	(3.7%)	
Intcpt (36/40)tr=	3.386E-03	±SE	1.508E-05	(0.4%),	±MSE	1.391E-05	(0.4%)	
Intcpt (39K/40*)=	1.393E+00	±SE	5.147E-02	(3.7%),	±MSE	4.714E-02	(3.4%)	
Intcpt (40*/39K)=	7.180E-01	±SE	2.653E-02	(3.7%),	±MSE	4.714E-02	(3.4%)	
Intcpt (40/36)tr=	295.3	±SE	1.3	(0.4%),	±MSE	1.2	(0.4%)	
Age (Ma)	=	0.1030	±SE	0.0038	(3.7%),	±MSE	0.0035	(3.4%)
Age (w/o J Er)	=	0.1030	±SE	0.0038	(3.7%),	±MSE	0.0035	(3.4%)

EXAMPLE

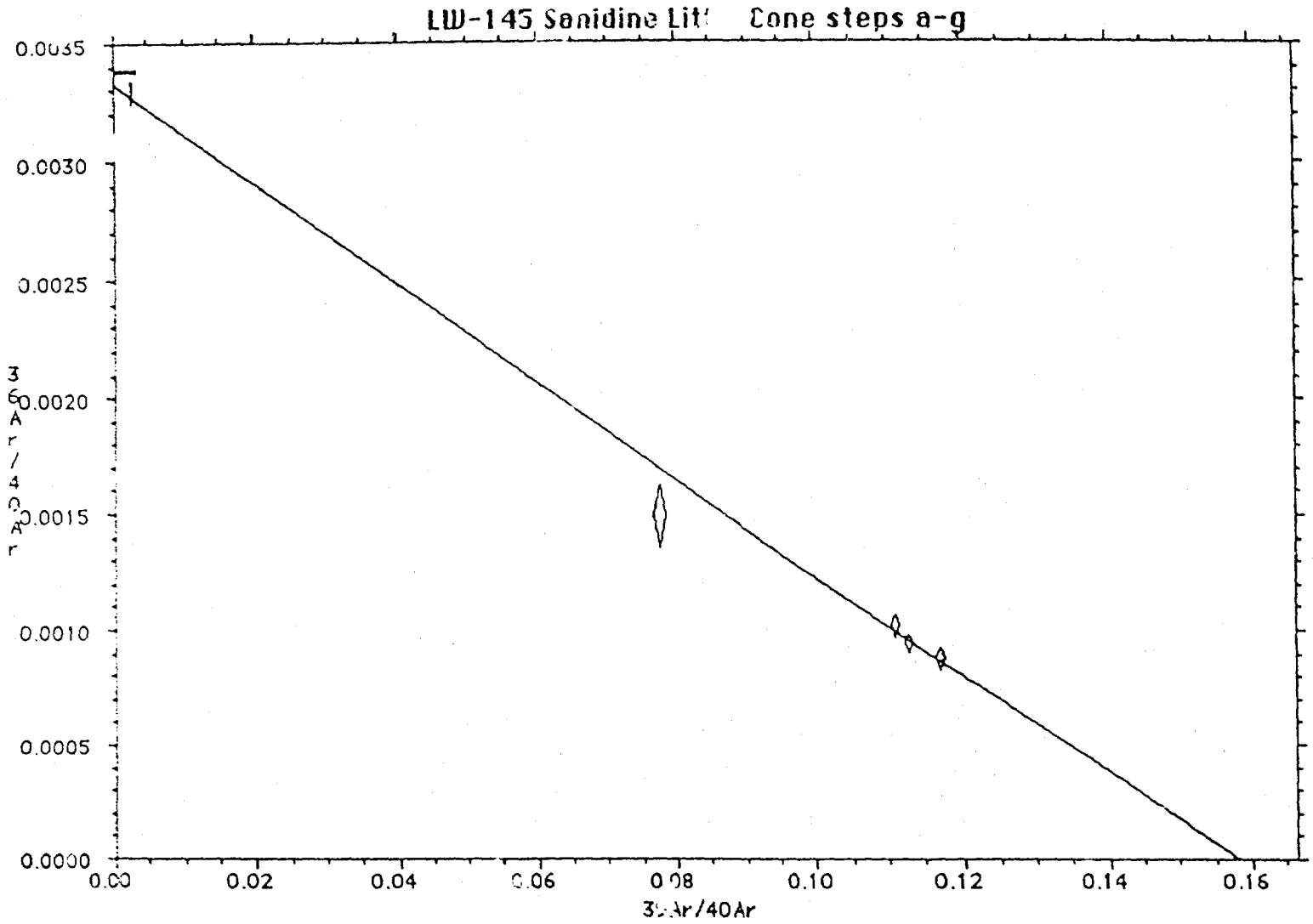
72 A


LW-142-hot Degassed 105C 12 hours
100
0
%Rad
100
K/Ca
10
10
8
6
4
2
0
Apparent Age Ma
A
B
C
D
E
F
G
H
I
J
K
L
Integrated Age = 6.769 ± 0.017
0
10
20
30
40
50
60
70
80
90
100
Cumulative %39Ar Released

EXAMPLE


LW-145 Sanidine Lit' Core
%Rad
100
0
K/Ca
100
10
Apparent Age Ma
6
5
4
3
2
1
0
A
B
C D
E
F
G
H
I
J
K
L
M
N
O
P
Q
Integrated Age = 3.583 ± 0.037
0
10
20
30
40
50
60
70
80
90
100
Cumulative %39Ar Released

EXAMPLE


LW-145 Sanidine Lit' Cone steps a-g
0.0035
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
39Ar/40Ar

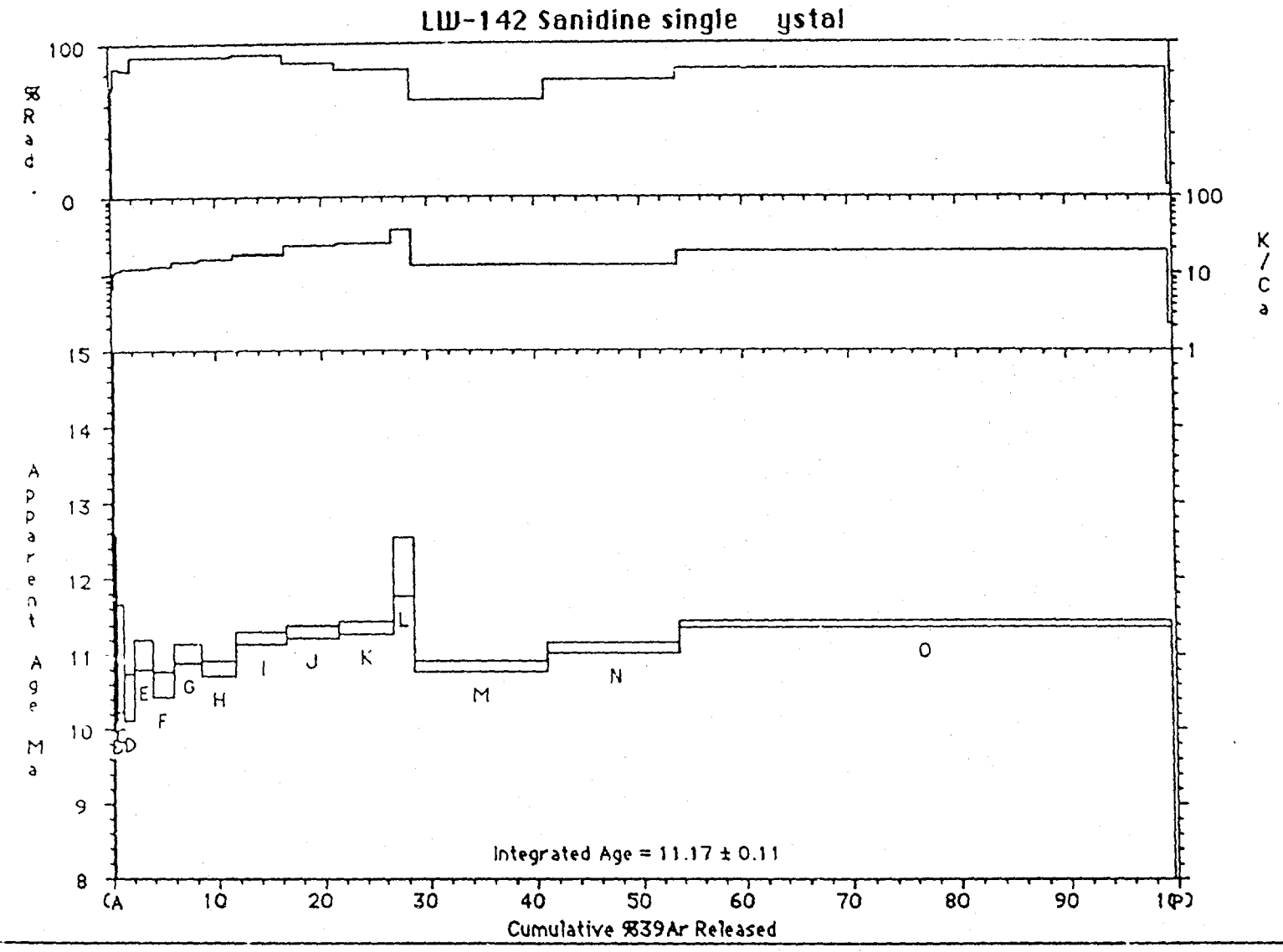
EXAMPLE

LW-145 nidine Little Cone steps a-g

J	=	.0000798	± .0000002				
Conv. Criterion	=	.0001					
No Iterations	=	5					
No. Points	=	7					
MSWD	=	.7420365		Prob= .5918494			
Slope (36tr/39K)=		-2.104E-02	±SE 4.570E-04	(2.2%),		±MSE 3.936E-01	(1.9%)
Intcpt (36/40)tr=		3.335E-03	±SE 4.771E-05	(1.4%),		±MSE 4.110E-05	(1.2%)
Intcpt (39K/40*)=		1.585E-01	±SE 1.794E-03	(1.1%),		±MSE 1.546E-03	(1.0%)
Intcpt (40*/39K)=		6.309E+00	±SE 7.143E-02	(1.1%),		±MSE 1.546E-03	(1.0%)
Intcpt (40/36)tr=		299.8	±SE 4.3	(1.4%),		±MSE 3.7	(1.2%)
Age (Ma)	=	0.9082	±SE 0.0105	(1.2%),		±MSE 0.0091	(1.0%)
Age (w/o J Er)	=	0.9082	±SE 0.0103	(1.1%),		±MSE 0.0089	(1.0%)

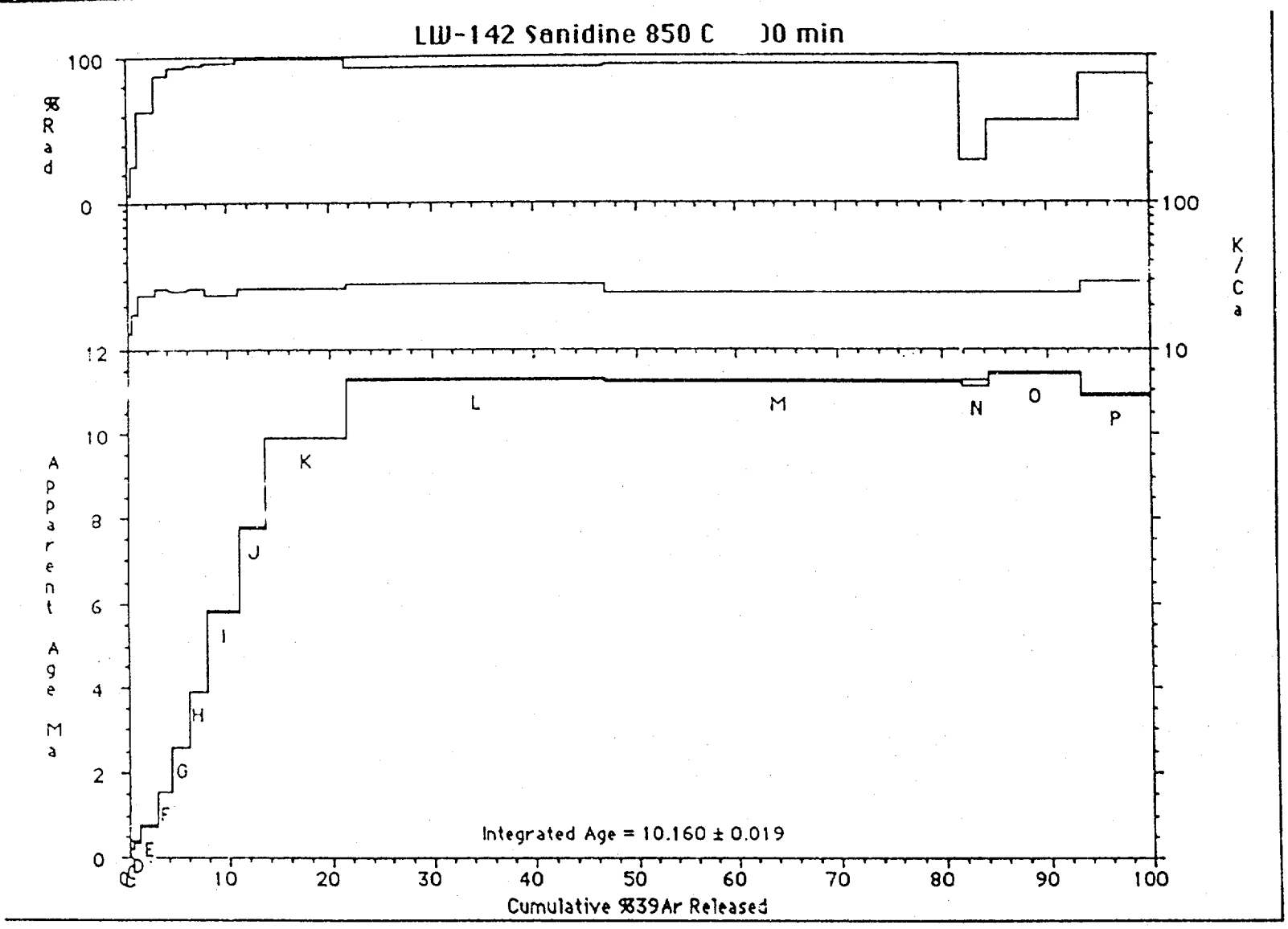
EXAMPLE

76 A

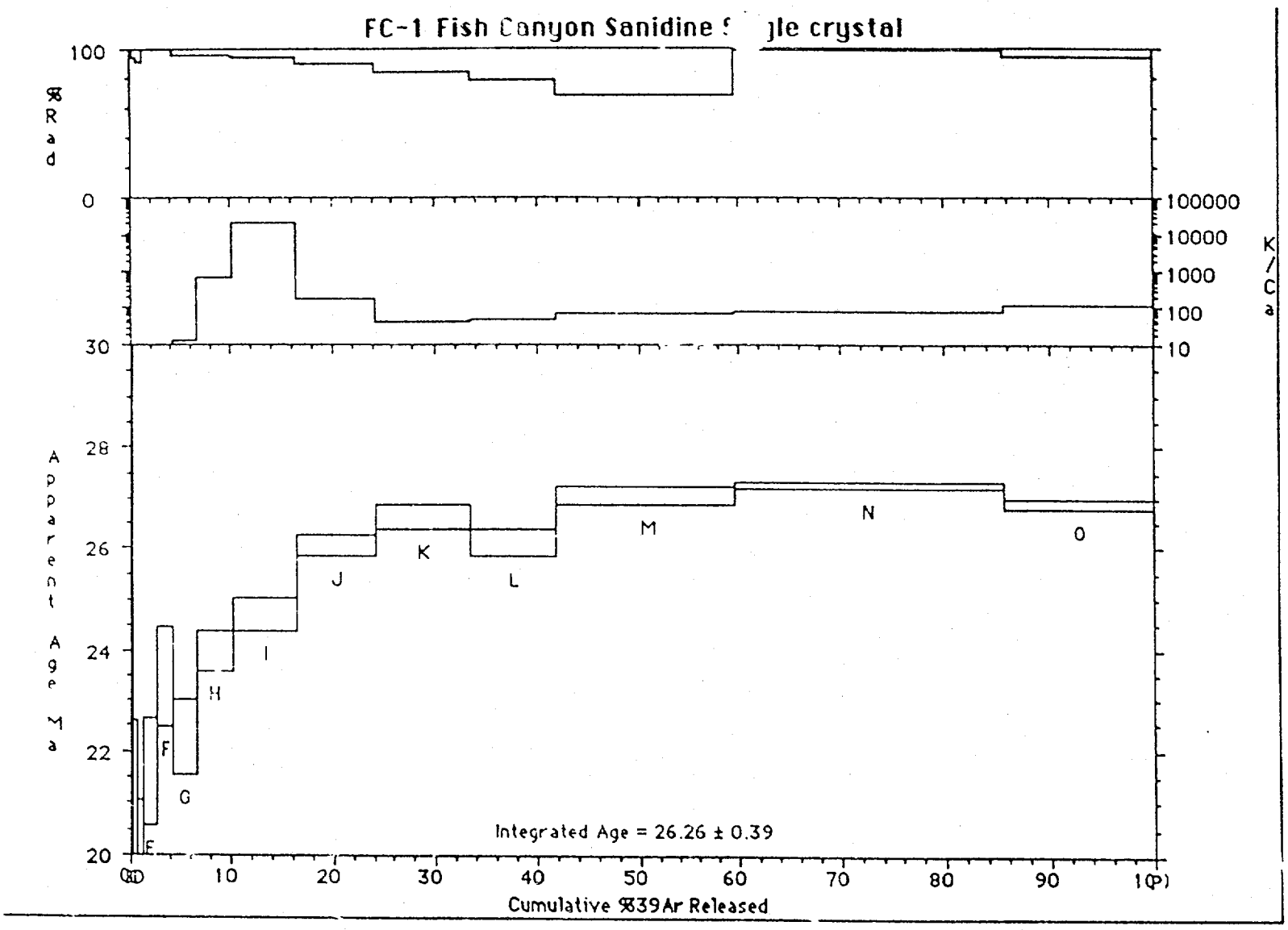

LW-142 Sanidine single ystal
100
0
%Rad.
100
10
1
K/Ca
15
14
13
12
11
10
9
8
Apparent Age Ma
A
B
C
D
E
F
G
H
I
J
K
L
M
N
O
Integrated Age = 11.17 ± 0.11
(A
10
20
30
40
50
60
70
80
90
100)
Cumulative %39Ar Released

EXAMPLE

77 A

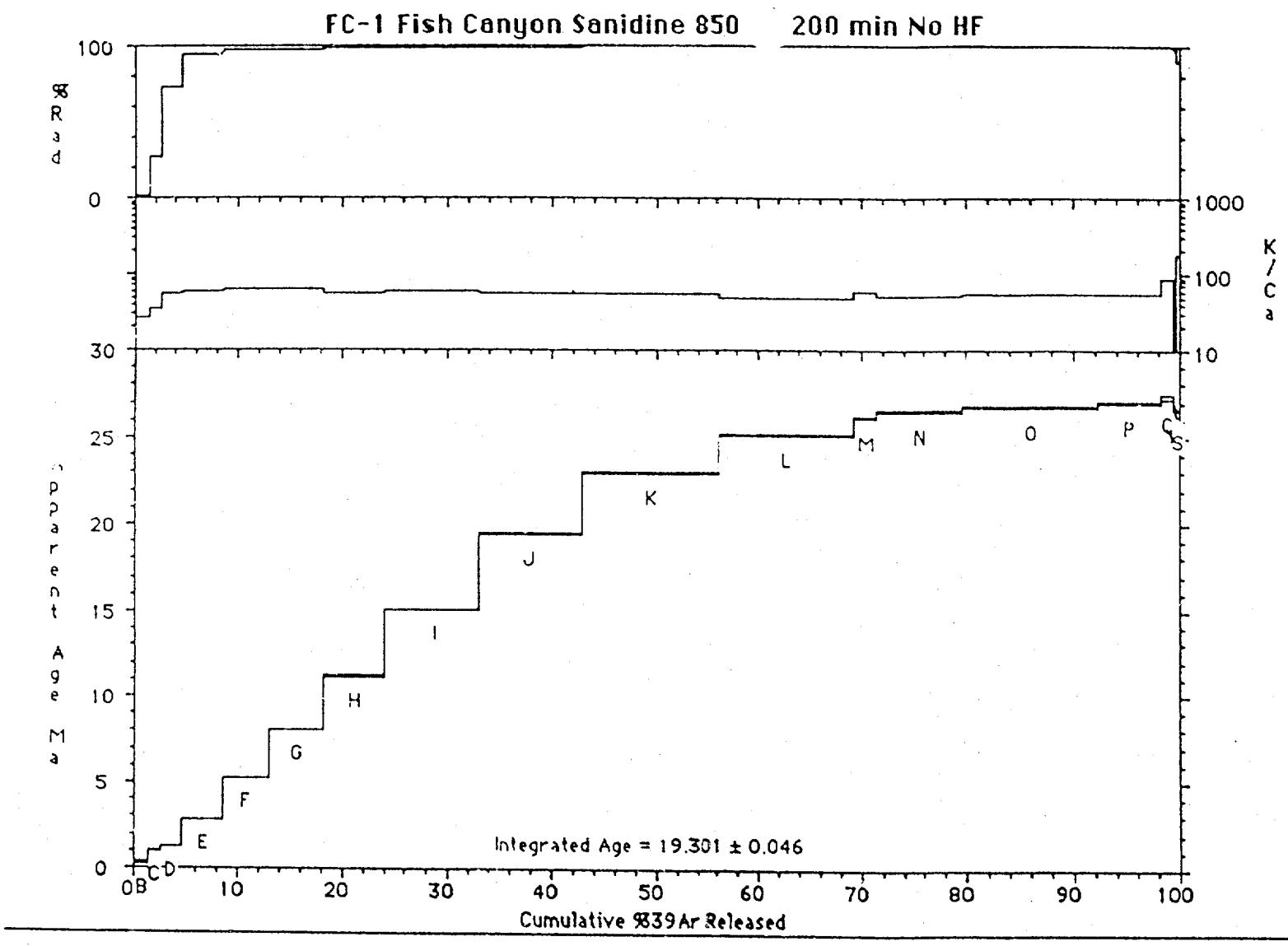

LW-142 Sanidine 850 C 30 min
100
0
%Rad
100
10
K/Ca
12
10
8
6
4
2
0
Apparent Age Ma
L
M
N
O
P
K
J
I
H
G
F
E
Integrated Age = 10.160 ± 0.019
10
20
30
40
50
60
70
80
90
100
Cumulative %39Ar Released

EXAMPLE

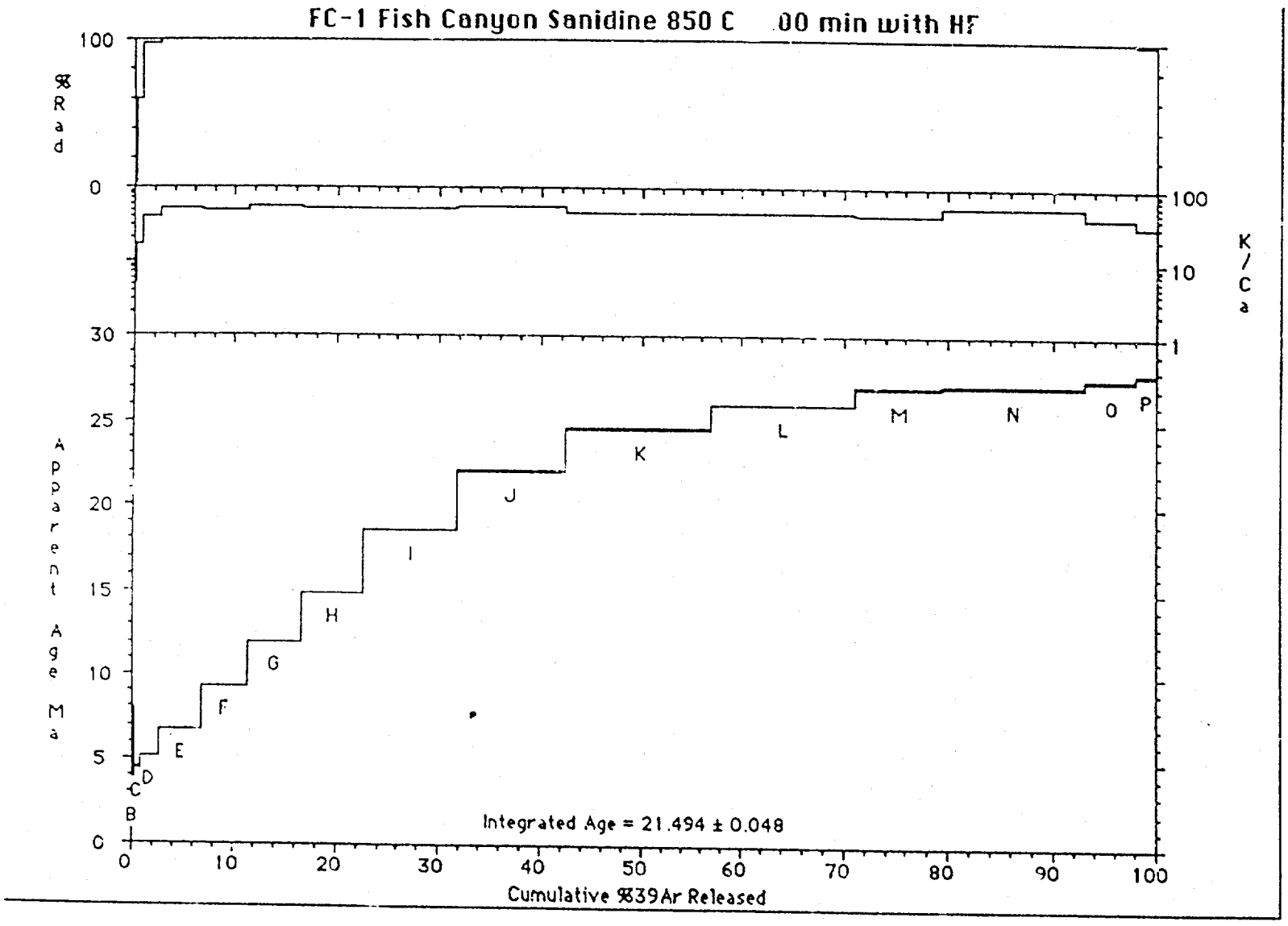

FC-1 Fish Canyon Sanidine s gle crystal
100
%Rad
0
30
100000
10000
1000
100
10
K/Ca
28
26
24
22
20
Apparent Age Ma
M
N
O
K
L
J
I
H
F
G
E
Integrated Age = 26.26 ± 0.39
0
10
20
30
40
50
60
70
80
90
100
Cumulative %39Ar Released

EXAMPLE

79A

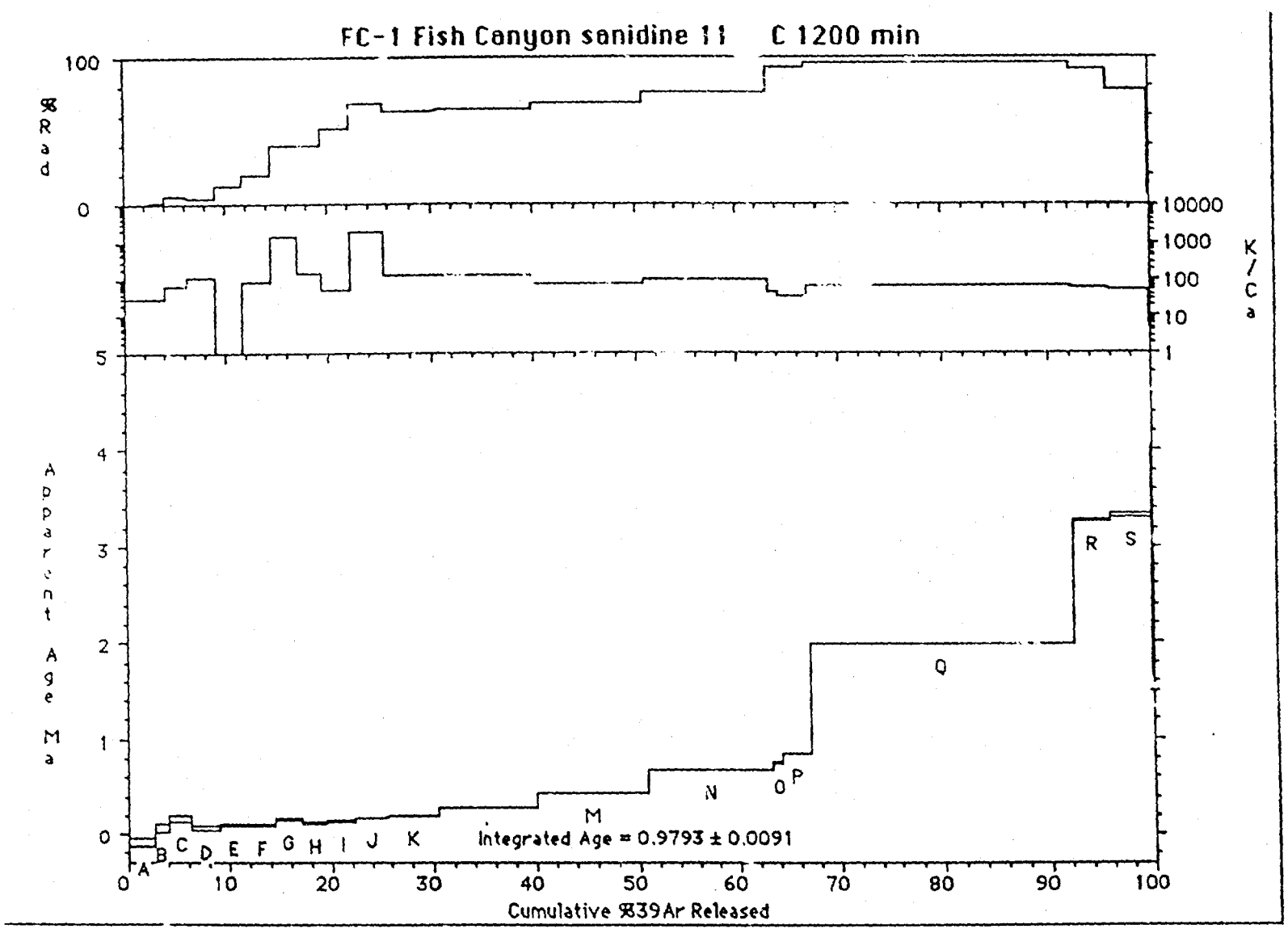

FC-1 Fish Canyon Sanidine 850 200 min No HF
% Rad
100
0
1000
100
10
K/Ca
30
25
20
15
10
5
0
Apparent Age Ma
A
B
C
D
E
F
G
H
I
J
K
L
M
N
O
P
Q
S
Integrated Age = 19.301 ± 0.046
0B
10
20
30
40
50
60
70
80
90
100
Cumulative %39Ar Released

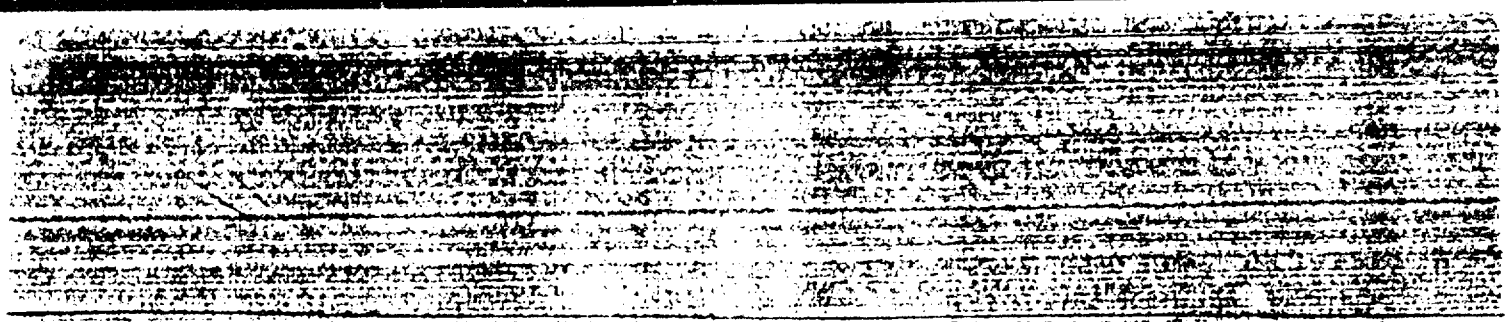
EXAMPLE

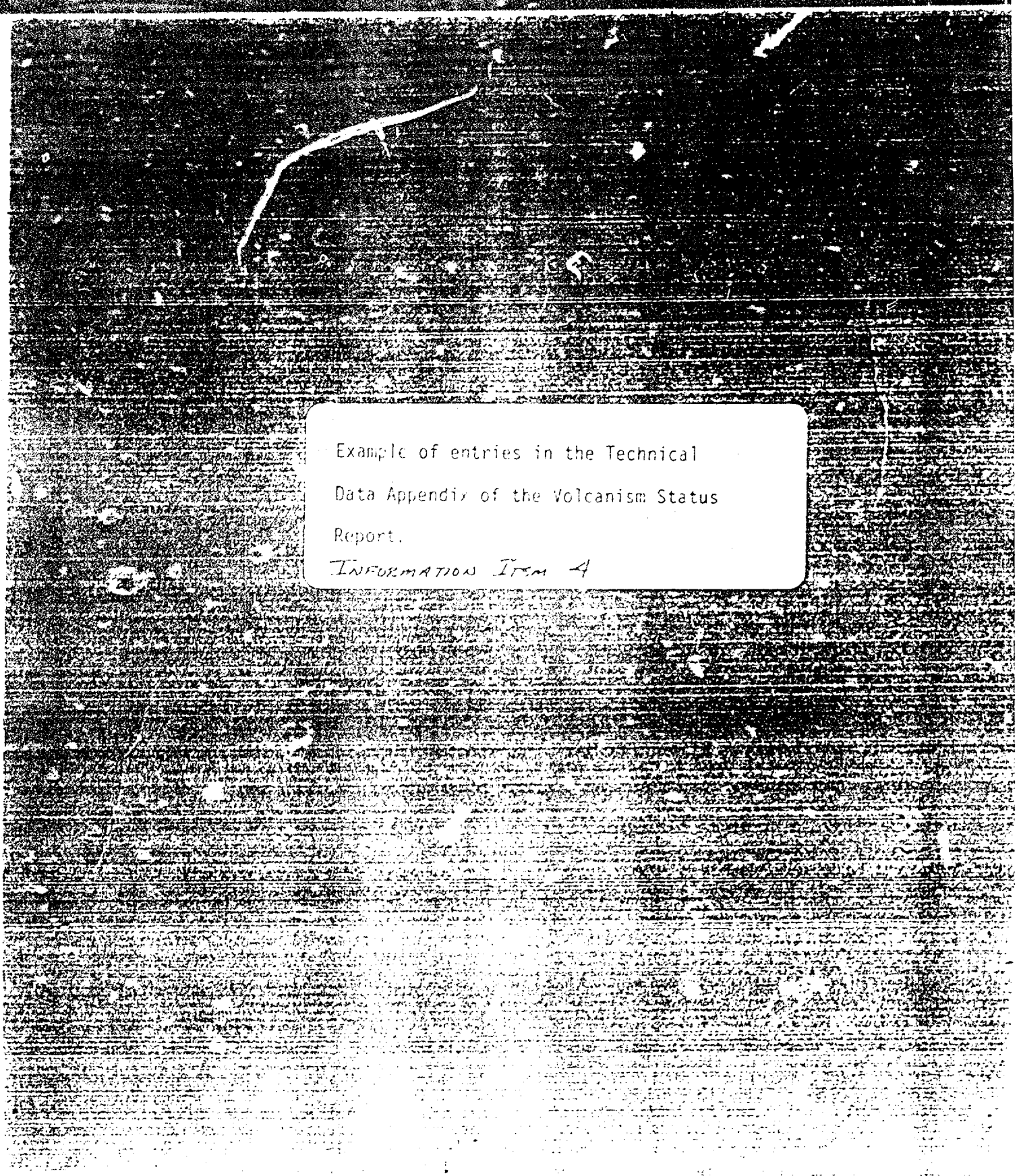

FC-1 Fish Canyon Sanidine 850 C 00 min with HF
%Rad
100
0
30
100
10
1
K/Ca
Apparent Age Ma
25
20
15
10
5
0
A
B
C
D
E
F
G
H
I
J
K
L
M
N
O
P
Integrated Age = 21.494 ± 0.048
0
10
20
30
40
50
60
70
80
90
100
Cumulative %39Ar Released

EXAMPLE

814


FC-1 Fish Canyon sanidine 11 C 1200 min
100
%Rad
0
10000
1000
100
10
1
K/Ca
5
4
3
2
1
0
Apparent Age Ma
R
S
Q
T
N
O
P
M
A
B
C
D
E
F
G
H
I
J
K
Integrated Age = 0.9793 ± 0.0091
0
10
20
30
40
50
60
70
80
90
100
Cumulative %39Ar Released





Example of entries in the Technical Data Appendix of the Volcanism Status Report.

INFORMATION ITEM 4

Data Appendix for Status of Volcanism Studies for the Yucca Mountain Site Characterization Project (Crowe et al. 1995)

Example of Data Appendix for One Field Volcanism Notebook with Sample, Unit, Map, and Trench references and references to the Relevant Pages of the Crowe et al. (1995) report. This appendix is provided as an illustration of the type of information that will be included in the data appendix milestone.

EXAMPLE

Volcanic Unit	Volcanic Center	Basalt Cycle	Page(s)	Date work performed	QA Status	Comments	Sample Number	Photo or Map Number	Trench Number	Status Report Reference Pages
trenching tephra units: Qs2	Lathrop Wells	YPC	3-4	15-Mar-93	QA	Trenching studies on the south flank of the main cone in largely unmodified black tephra.	NA	Lathrop Wells VC-Area 25 #21-BMC	QS-1, QS6-1	2-34 to 2-48
trenching tephra units: Qs4	Lathrop Wells	YPC	4-9	15-Mar-93	QA	Extended trench LW-1, Les Mc Fadden redescribed the soil sequences in the quarry, measured tephra clasts.	Q6-1A	EG&GS826-26-BMC	LW-5	2-54 to 2-59
conduit, plugs, dikes	Southern Nye Center	OPC	9-11	21-Apr-93	QA	Work in Nye Canyon/Scarp Canyon, examined dikes and plugs for Subsurface Effects s'	NA	USGS Quad Map of Plutonium Valley	NA	NA
lava units	Lathrop Wells	YPC	12-13	22-Apr-93	non-QA	Samples collected to run CO2 solubility experiments of basalt. Non-YMP samples for J. Holloaway at Arizona State University	LW 4-22-93-BMC-A, LW 4-22-93-BMC-B, LW 4-22-93-BMC-C, LW 4-22-93-BMC-1	Lathrop Wells VC-Area 25 #11-BMC	NA	NA
trenching tephra units: Qs4	Lathrop Wells	YPC	14	25-May-93	QA	Check of the results of local trenching studies by Frank Perry. He exposed a sequence of eolian reworked tephra that overlies loess in quarry exposures that are now removed	NA	NA	NA	2-54 to 2-59
lava and tephra units: Qs2a	Little Cone, Red Cone and Black	YPC	14	26-May-93	QA	Two types of vents at Little Cones have different geomorphology, and could be of different ages	NA	NA	NA	2-21 to 2-27
tephra units Qs2a	Lathrop Wells	YPC	15-21	17-Jun-93	QA	Mapped scoria-lava contacts and made measurements of tephra size distributions / old quarry site	QW-1	Lathrop Wells VC-Area 25 #22-BMC	QW-1	2-34 to 2-48
tephra units Qs2a	Lathrop Wells	YPC	15-21	17-Jun-93	QA	Described tephra stratigraphic relations and measured clast sizes / old quarry site	QW-2	Lathrop Wells VC-Area 25 #22-BMC	QW-2	2-42 to 2-48
tephra units Qs2a	Lathrop Wells	YPC	15-21	17-Jun-93	QA	Described tephra stratigraphic relations and measured clast sizes / old quarry site	QW-3	Lathrop Wells VC-Area 25 #22-BMC	QW-3	2-42 to 2-48
tephra units Qs2a	Lathrop Wells	YPC	15-21	17-Jun-93	QA	Described tephra stratigraphic relations and measured clast sizes / old quarry site	QW-4	Lathrop Wells VC-Area 25 #22-BMC	QW-4	2-42 to 2-48
tephra units Qs2a	Lathrop Wells	YPC	15-21	17-Jun-93	QA	Described tephra stratigraphic relations and measured clast sizes / old quarry site	QW-5	Lathrop Wells VC-Area 25 #22-BMC	QW-5	2-42 to 2-48
tephra units Qs2a	Lathrop Wells	YPC	15-21	17-Jun-93	QA	Described tephra stratigraphic relations and measured clast sizes / old quarry site	QW-6	Lathrop Wells VC-Area 25 #22-BMC	QW-6	2-42 to 2-48
tephra units Qs2a	Lathrop Wells	YPC	15-21	17-Jun-93	QA	Described tephra stratigraphic relations and measured clast sizes / south Topopah site	QW-7-1	Lathrop Wells VC-Area 25 #28-BMC	QW-7-1	2-42 to 2-48
tephra units Qs2a	Lathrop Wells	YPC	15-21	17-Jun-93	QA	Described tephra stratigraphic relations and measured clast sizes / south Topopah site	QW-7-2	Lathrop Wells VC-Area 25 #28-BMC	QW-7-2	2-42 to 2-48
tephra units Qs2a	Lathrop Wells	YPC	15-21	17-Jun-93	QA	Described tephra stratigraphic relations and measured clast sizes / south Topopah site.	QW-7-3	Lathrop Wells VC-Area 25 #28-BMC	QW-7-3	2-42 to 2-48
tephra units Qs2a	Lathrop Wells	YPC	15-21	17-Jun-93	QA	Described tephra stratigraphic relations and measured clast sizes / equipment storage site	QW-8	Lathrop Wells VC-Area 25 #22-BMC	QW-8	2-42 to 2-48
tephra units: Qs2a	Lathrop Wells	YPC	15-21	17-Jun-93	QA	Described tephra stratigraphic relations and measured clast sizes / equipment storage site.	QW-9	Lathrop Wells VC-Area 25 #22-BMC	QW-9	2-42 to 2-48
tephra units: Qs1 Qs2	Lathrop Wells	YPC	22-27	21-Jun-93	QA	Described tephra stratigraphic relations and measured clast sizes / south mound.	QW-10	Lathrop Wells VC-Area 25 #20-BMC	QW-10	2-34 to 2-48
tephra units: Qs2/Qs4	Lathrop Wells	YPC	22-27	21-Jun-93	QA	Described tephra stratigraphic relations and measured clast sizes / water tanks.	QW-11	Lathrop Wells VC-Area 25 #20-BMC	QW-11	2-42 to 2-48; 2-54 to 2-59

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Volcanic Unit	Volcanic Center	Basalt Cycle	Page(s)	Date work performed	QA Status	Comments	Sample Number	Photo or Map Number	Trench Number	Status Report Reference Pages
lava and tephra units: Qs2	Lathrop Wells	YPC	22-27	21-Jun-93	QA	Described tephra stratigraphic relations and measured clast sizes / west fall apron.	QW-12	Lathrop Wells VC-Area 25 #14-BMC	QW-12	2-42 to 2-48
lava and tephra unit: 2	Lathrop Wells	YPC	22-27	21-Jun-93	QA	Described tephra stratigraphic relations and measured clast sizes / west fall apron.	QW-13	Lathrop Wells VC-Area 25 #14-BMC	QW-13	2-42 to 2-48
tephra units Qs2a	Lathrop Wells	YPC	22-27	21-Jun-93	QA	Described tephra stratigraphic relations and measured clast sizes / southwest fall apron	QW-14	Lathrop Wells VC-Area 25 #14-BMC	QW-14	2-42 to 2-48
distal tephra units	Lathrop Wells	YPC	27-29	29-Jun-93	QA	Worked north of Lathrop Wells Center primary as an observer of field work conducted by Steve Wells, Frank Perry and Les McFadden. They are describing the scoria-fall several kilometers north of Lathrop Wells.	NA	NA	NA	2-42 to 2-48
tephra units Qs2a	Lathrop Wells	YPC	30-31	30-Jun-93	QA	Cross-checking samples collected from Lathrop Wells in 1992	NA	NA	NA	2-42 to 2-48, 2-53
tephra units Qs2a	Lathrop Wells	YPC	33-40	30-Jul-93	QA	Described tephra stratigraphic relations and measured clast sizes / southwest fall apron	TP-1-1	EG&G5826-26-BMC	TP-1	2-42 to 2-48
tephra units Qs2a	Lathrop Wells	YPC	33-40	30-Jul-93	QA	Described tephra stratigraphic relations and measured clast sizes / southwest fall apron	TP-1-2	EG&G5826-26-BMC	TP-1	2-42 to 2-48
tephra units Qs2a	Lathrop Wells	YPC	33-40	30-Jul-93	QA	Described tephra stratigraphic relations and measured clast sizes / southwest fall apron	TP-1-3	EG&G5826-26-BMC	TP-1	2-42 to 2-48
tephra units Qs2a	Lathrop Wells	YPC	33-40	30-Jul-93	QA	Described tephra stratigraphic relations and measured clast sizes / southwest fall apron	TP-2-1	EG&G5826-26-BMC	TP-2	2-42 to 2-48
tephra units Qs2a	Lathrop Wells	YPC	33-40	30-Jul-93	QA	Described tephra stratigraphic relations and measured clast sizes / southwest fall apron	TP-2-2	EG&G5826-26-BMC	TP-2	2-42 to 2-48
tephra units Qs2a	Lathrop Wells	YPC	33-40	30-Jul-93	QA	Described tephra stratigraphic relations and measured clast sizes / southwest fall apron	TP-2-3	EG&G5826-26-BMC	TP-2	2-42 to 2-48
tephra units Qs2a	Lathrop Wells	YPC	33-40	30-Jul-93	QA	Described tephra stratigraphic relations and measured clast sizes / southwest fall apron	TP-3-1	EG&G5826-26-BMC	TP-3	2-42 to 2-48
tephra units Qs2a	Lathrop Wells	YPC	33-40	30-Jul-93	QA	Described tephra stratigraphic relations and measured clast sizes / southwest fall apron	TP-3-2	EG&G5826-26-BMC	TP-3	2-42 to 2-48
tephra units Qs2a	Lathrop Wells	YPC	33-40	30-Jul-93	QA	Described tephra stratigraphic relations and measured clast sizes / southwest fall apron	TP-3-3	EG&G5826-26-BMC	TP-3	2-42 to 2-48
NA: sand\loess mantle	Lathrop Wells	NA	33-40	30-Jul-93	QA	Unable to penetrate sand\loess cover / southwest fall apron	NA	EG&G5826-26-BMC	TP-4	NA
NA: sand\loess mantle	Lathrop Wells	NA	33-40	30-Jul-93	QA	Unable to penetrate sand\loess cover / southwest fall apron	NA	EG&G5826-26-BMC	TP-5	NA
NA: sand\loess mantle	Lathrop Wells	NA	33-40	30-Jul-93	QA	Unable to penetrate sand\loess cover / southwest fall apron	NA	EG&G5826-26-BMC	TP-6	NA
NA: sand\loess mantle	Lathrop Wells	NA	33-40	30-Jul-93	QA	Unable to penetrate sand\loess cover / southwest fall apron	NA	EG&G5826-26-BMC	TP-7	NA
tephra units: Qs2a	Lathrop Wells	YPC	41-48	6-Aug-93	QA	Mapped scoria-lava contacts and made measurements of tephra size distributions / old Quarry area.	TP-8-1	EG&G5826-26-BMC	TP-8	2-42 to 2-48
tephra units: Qs2a	Lathrop Wells	YPC	41-48	6-Aug-93	QA	Mapped scoria-lava contacts and made measurements of tephra size distributions / old Quarry area.	TP-8-2	EG&G5826-26-BMC	TP-8	2-42 to 2-48

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tephra units: Qs2a	Lathrop Wells	YPC	41-48	6-Aug-93	QA	Mapped scoria-lava contacts and made measurements of tephra size distributions / old Quarry area.	TP-9-1	Lathrop Wells VC-Area 25 #30-BMC	TP-9	2-42 to 2-48
NA: sand/ loess	Lathrop Wells	NA	41-48	6-Aug-93	QA	Unable to penetrate sand/loess cover / old Quarry area.	NA	Lathrop Wells VC-Area 25 #30-BMC	TP-10	NA
tephra units: Qs2a, Qs4	Lathrop Wells	YPC	41-48	6-Aug-93	QA	Mapped scoria-lava contacts and made measurements of tephra size distributions / equipment storage site.	TP-11-1	Lathrop Wells VC-Area 25 #30-BMC	TP-11	2-42 to 2-48, 2-54 to 2-59
tephra units: Qs2a, Qs4	Lathrop Wells	YPC	41-48	6-Aug-93	QA	Mapped scoria-lava contacts and made measurements of tephra size distributions / equipment storage site.	TP-11-2	Lathrop Wells VC-Area 25 #30-BMC	TP-11	2-42 to 2-48, 2-54 to 2-59
tephra units: Qs2a, Qs4	Lathrop Wells	YPC	41-48	6-Aug-93	QA	Described tephra stratigraphy relations and measured clast sizes / equipment storage site.	TP-11-3	Lathrop Wells VC-Area 25 #30-BMC	TP-11	2-42 to 2-48, 2-54 to 2-59
NA: sand/ loess	Lathrop Wells	NA	41-48	6-Aug-93	QA	Unable to penetrate sand/loess cover / south of old Quarry site	NA	Lathrop Wells VC-Area 25 #30-BMC	TP-12	NA
Erosional Surface	Lathrop Wells	YPC	41-48	6-Aug-93	QA	Described erosional unconformity / south of old Quarry site	NA	Lathrop Wells VC-Area 25 #30-BMC	TP-13	2-42 to 2-48
tephra units: Qs2a	Lathrop Wells	YPC	48-53	6-Aug-93	QA	Described tephra stratigraphy relations and measured clast sizes / south fall apron	TP-14-2	Lathrop Wells VC-Area 25 #21-BMC	TP-14	2-42 to 2-48
tephra units: Qs1	Lathrop Wells	YPC	48-53	6-Aug-93	QA	Described tephra stratigraphy relations and measured clast sizes / south fall apron	TP-15-1	Lathrop Wells VC-Area 25 #21-BMC	TP-15A, TP-15B	2-37 to 2-42
NA: sand/ loess	Lathrop Wells	NA	48-53	6-Aug-93	QA	Unable to penetrate sand/loess cover / south fall apron.	NA	Lathrop Wells VC-Area 25 #28-BMC	TP-16, TP-17	2-42 to 2-48
tephra units: Qs2a	Lathrop Wells	YPC	48-53	6-Aug-93	QA	Described tephra stratigraphy relations and measured clast sizes / south fall apron	NA	Lathrop Wells VC-Area 25 #28-BMC	TP-18	2-42 to 2-48
Trench 14 Busted Butte: Qs2a	NA	YPC	53-54	12-Aug-93	QA	Working at the NTS with S. Wells, F. Perry, and C. Menges. Examining trenches to improve correlation between volcanism and tectonic studies.Trenches # TP-14a and Stagecoach.	NA	NA	TP-14a	2-42 to 2-48
Busted Butte: Qs2a	NA	NA	54	13-Aug-93	QA	Examined Busted Butte sample under binocular microscope in the USGS library. Examined the Stagecoach trench.	NA	NA	NA	2-42 to 2-48
distal tephra units	Lathrop Wells	YPC	54	13-Aug-93	QA	Re-examined the double-ash section North of Lathrop Wells.	NA	NA	NA	2-42 to 2-48
trenching tephra units: Qs1, Qs2a	Lathrop Wells	YPC	55-60	18-Aug-93	QA	Described tephra stratigraphic relations and measured tephra-clast sizes / south-fall apron.	TP-18A-1	Lathrop Wells VC Area 25 #21-BMC	TP-18A	2-37 to 2-48
trenching tephra units: Qs1	Lathrop Wells	YPC	55-60	18-Aug-93	QA	Described tephra stratigraphic relations and measured tephra-clast sizes / south-fall apron.	TP-18A-2	Lathrop Wells VC-Area 25 #21-BMC	TP-18A	2-37 to 2-42
trenching tephra units: Qs1, Qs2a	Lathrop Wells	YPC	55-60	18-Aug-93	QA	Qs2a-fall sheet present but to deep to enter trench, fall-sheet verified but not described.	NA	Lathrop Wells VC-Area 25 #21-BMC	TP-18	2-42 to 2-48

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trenching tephra units: Qs1	Lathrop Wells	YPC	55-60	18-Aug-93	QA	Reworked sand/loess directly on Qs1 / south fall apron.	NA	Lathrop Wells VC-Area 25 #21-BMC	TP-20	2-37 to 2-42
trenching tephra units: Qs2a	Lathrop Wells	YPC	55-60	18-Aug-93	QA	Reoccupied site LW-6-21-93-4-BMC, described tephra stratigraphic relations and measured clast sizes.	LW6-21-93-4-BMC-A	Lathrop Wells VC-Area 25 #22-BMC	QW-13	2-42 to 2-48
trenching tephra units: Qs2a	Lathrop Wells	YPC	55-60	18-Aug-93	QA	Reoccupied site LW-6-21-93-4-BMC, described tephra stratigraphic relations and measured clast sizes.	LW6-21-93-4-BMC-B	Lathrop Wells VC-Area 25 #22-BMC	QW-13	2-42 to 2-48
trenching units: Ql1 lava	Lathrop Wells	YPC	55-60	18-Aug-93	QA	Attempted to Q2sa fall-sheet on Ql1a lava, fall deposits not present; described soil.	NA	Lathrop Wells VC-Area 25 #30-BMC	TP-20	2-37 to 2-42
NA: sand/ loess	Lathrop Wells	NA	55-60	18-Aug-93	QA	Could not penetrate sand/loess sequence.	NA	Lathrop Wells VC-Area 25 #30-BMC	TP-22	NA
trenching tephra units: Qs2a, Qs4?	Lathrop Wells	YPC	61-67	26-Aug-93	QA	Reoccupied TP-13 site, Qs2a described and measured tephra-clast sizes,possible unit observed that may correlateed with Qs4b; Geochemisty studies show it is reworked, Qs1	TP-13A-1-BMC	Lathrop Wells VC-Area 25 #30-BMC	TP-13A	2-42 to 2-48
trenching tephra units: Qs2a, Qs4?	Lathrop Wells	YPC	61-67	26-Aug-93	QA	Reoccupied TP-13 site, Qs2a described and measured tephra-clast sizes,possible unit observed that may correlateed with Qs4b; Geochemisty Studies show it is reworked, Qs1	TP-13A-2	Lathrop Wells VC-Area 25 #30-BMC	TP-13A	2-42 to 2-48
trenching tephra units: Qs2a, Qs4?	Lathrop Wells	YPC	61-67	26-Aug-93	QA	Reoccupied TP-13 site, Qs2a described and measured tephra-clast sizes,possible unit observed that may correlate with Qs4b; Geochemisty Studies show it is reworked, Qs1	TP-13A-3	Lathrop Wells VC-Area 25 #30-BMC	TP-13A	2-42 to 2-48
trenching tephra units: Qs2a, Qs4?	Lathrop Wells	YPC	61-67	26-Aug-93	QA	Reoccupied TP-13 site, Qs2a described and measured tephra-clast sizes,possible unit observed that may correlated with Qs4b; Geochemisty Studies show it is reworked, Qs1.	TP-13A-4	Lathrop Wells VC-Area 25 #30-BMC	TP-13A	2-42 to 2-48
trenching tephra units: Qs2a	Lathrop Wells	YPC	61-67	26-Aug-93	QA	Described tephra stratigraphic relations and measured clast sizes; described possible soil but inferred to be alteration along zone of lateral flow / west fall-apron.	TP-23-1	Lathrop Wells VC-Area 25 #22-BMC	TP-23	2-42 to 2-48
trenching tephra units: Qs2a	Lathrop Wells	YPC	61-67	26-Aug-93	QA	Described tephra stratigraphic relations and measured clast sizes; described possible soil but inferred to be alteration along zone of lateral flow / west fall-apron.	TP-23-2	Lathrop Wells VC-Area 25 #22-BMC	TP-23	2-42 to 2-48
trenching tephra units: Qs2a	Lathrop Wells	YPC	61-67	26-Aug-93	QA	Described tephra stratigraphic relations and measured clast sizes; described possible soil but inferred to be alteration along zone of lateral flow / west fall-apron.	TP-23-3	Lathrop Wells VC-Area 25 #22-BMC	TP-23	2-42 to 2-48
trenching tephra units: Qs2a	Lathrop Wells	YPC	61-67	26-Aug-93	QA	Described tephra stratigraphic relations and measured clast sizes / west fall-apron.	TP-24-1	Lathrop Wells VC-Area 25 #14-BMC	TP-24	2-42 to 2-48

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trenching tephra units: Qs2a	Lathrop Wells	YPC	61-67	26-Aug-93	QA	Described tephra stratigraphic relations and measured clast sizes / west fall-apron.	TP-24-2	Lathrop Wells VC-Area 25 #14-BMC	TP-24	2-37 to 2-42
trenching tephra units: Qs2a	Lathrop Wells	YPC	61-67	26-Aug-93	QA	Described tephra stratigraphic relations and measured clast sizes / west fall-apron.	TP-24-3	Lathrop Wells VC-Area 25 #14-BMC	TP-24	2-37 to 2-42
lava and tephra units	Lathrop Wells	YPC	68-69	23-Nov-93	QA	Doing reconnaissance evaluation of the Lathrop Wells volcanic center units with S. Wells and F. Perry. Examined TP-13a; Qs4b, conduit plugs and	NA	NA	NA	2-37 to 2-48, 2-54 to 2-59
conduit plugs and dikes	Basalt dike	OPC	70-71	5-Jan-94	QA	Working in Scarp Canyon area with G. Valentine examining a basalt dike mapped on the Plutonium Valley Quad. Work is for Subsurface Effects.	NA	GQ 384	NA	2-14 to 2-15
lava and tephra units, Qs2a, Qs4b	Lathrop Wells	YPC	72-73	6-Jan-94	QA	Examining contacts at selected spots to field check the evolving geologic map of the Lathrop Wells center. Working with F. Perry, Kear Finnegan and Greg Valentine. TP-13a, Qs4b, TP-23	NA	Lathrop Wells VC-Area 25 #30-BMC	TP-13A	2-42 to 2-48, 2-54 to 2-59
trenching tephra units: Qs1, Qs2a	Lathrop Wells	YPC	74-78	4-Apr-94	QA	Described tephra stratigraphic relations and measured clast sizes / north fall-apron.	TP-25-1	Lathrop Wells VC-Area 25 #14-BMC	TP-25	2-37 to 2-48
trenching tephra units: Qs1, Qs2a	Lathrop Wells	YPC	74-78	4-Apr-94	QA	Described tephra stratigraphic relations and measured clast sizes / north fall-apron.	TP-25-2	Lathrop Wells VC-Area 25 #14-BMC	TP-25	2-37 to 2-48
trenching tephra units: Qs1, Qs2a	Lathrop Wells	YPC	74-78	4-Apr-94	QA	Described tephra stratigraphic relations and measured clast sizes / north fall-apron.	TP-25-2a	Lathrop Wells VC-Area 25 #14-BMC	TP-25	2-37 to 2-48
trenching tephra units: Qs1	Lathrop Wells	YPC	74-78	4-Apr-94	QA	Described tephra stratigraphic relations and measured clast sizes / north fall-apron.	NA	Lathrop Wells VC-Area 25 #14-BMC	TP-26	2-37 to 2-42
trenching tephra units: Qs1	Lathrop Wells	YPC	74-78	4-Apr-94	QA	Described tephra stratigraphic relations and measured clast sizes / north fall-apron.	NA	Lathrop Wells VC-Area 25 #14-BMC	TP-27	2-37 to 2-42
NA: sand/loess	Lathrop Wells	NA	74-78	4-Apr-94	QA	Could not penetrate sand/loess cover / north fall apron.	NA	Lathrop Wells VC-Area 25 #14-BMC	TP-28	NA
NA: sand/loess	Lathrop Wells	NA	74-78	4-Apr-94	QA	Could not penetrate sand/loess cover / north fall apron.	NA	Lathrop Wells VC-Area 25 #14-BMC	TP-29	NA
trenching tephra units: Qs2a	Lathrop Wells	YPC	74-78	4-Apr-94	QA	Described tephra stratigraphic relations and collected sample for geochemistry / north of fall apron.	TP-30-1	Lathrop Wells VC-Area 25 #14-BMC	TP-30	2-42 to 2-48
Center # 6; lava flows	3.7 Ma basalt	YPC	78-81	14-Apr-94	QA	Mapping the southeast end of the 3.7 Ma basalt unit in southern Crater Flat. Tracing the basalt contacts on air photos.	NA	EG&G 7488-67-BMC	NA	2-19 to 2-20; 7-31
trenching tephra units: Qs2a	Lathrop Wells	YPC	82-85	25-Apr-93	QA	Re-occupied TP-30 measuring and describing Qs2a deposits near northeast cone base that drape scoria mounds.	TP-30-2-BMC	Lathrop Wells VC-Area 5 #14-BMC	TP-30	2-42 to 2-48
trenching tephra units: Qs2a	Lathrop Wells	YPC	82-85	25-Apr-93	QA	Re-occupied TP-30, measuring and describing Qs2a deposits near northeast cone base that drape scoria mounds.	TP-30-3-BMC	Lathrop Wells VC-Area 25 #14-BMC	TP-30	2-42 to 2-48

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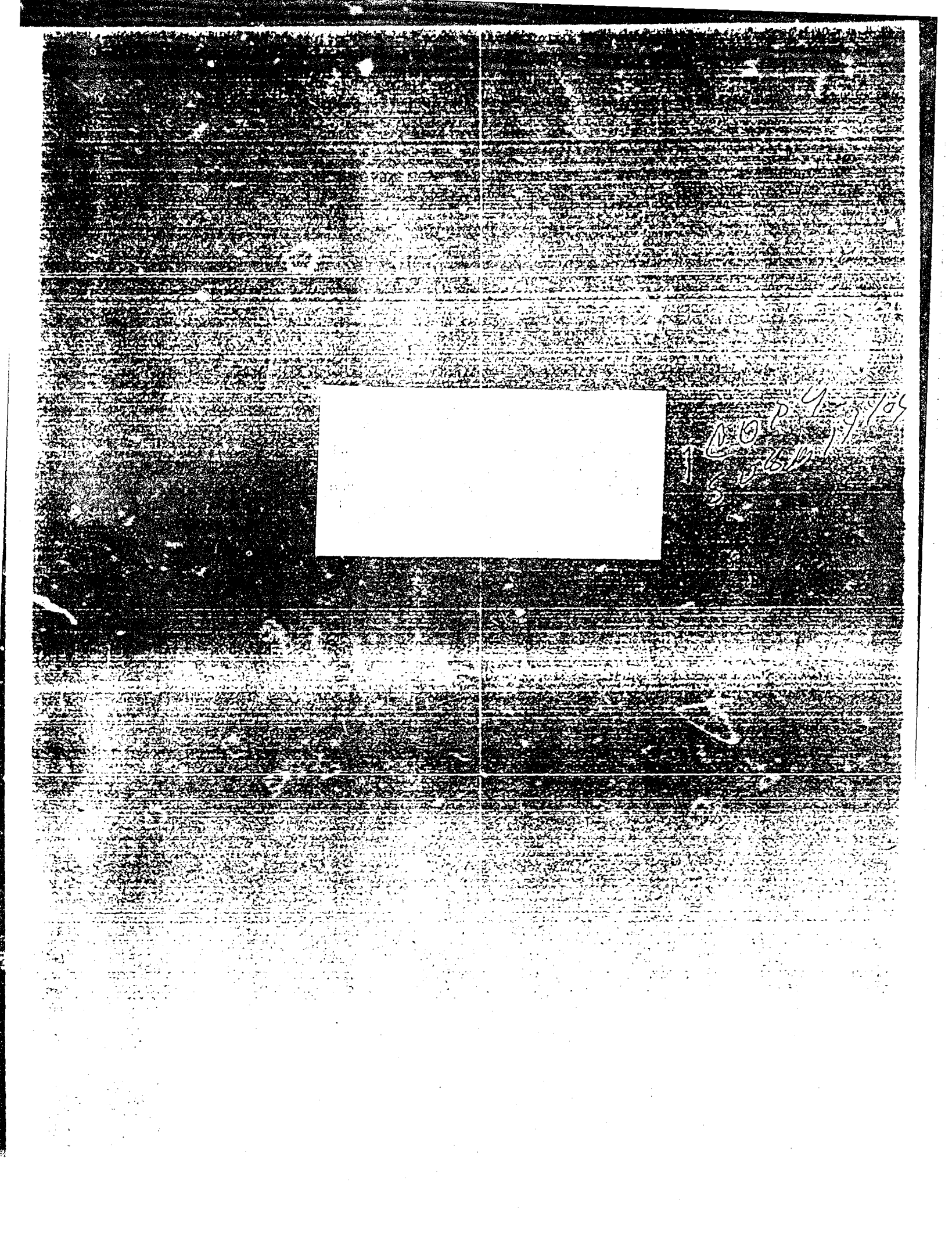
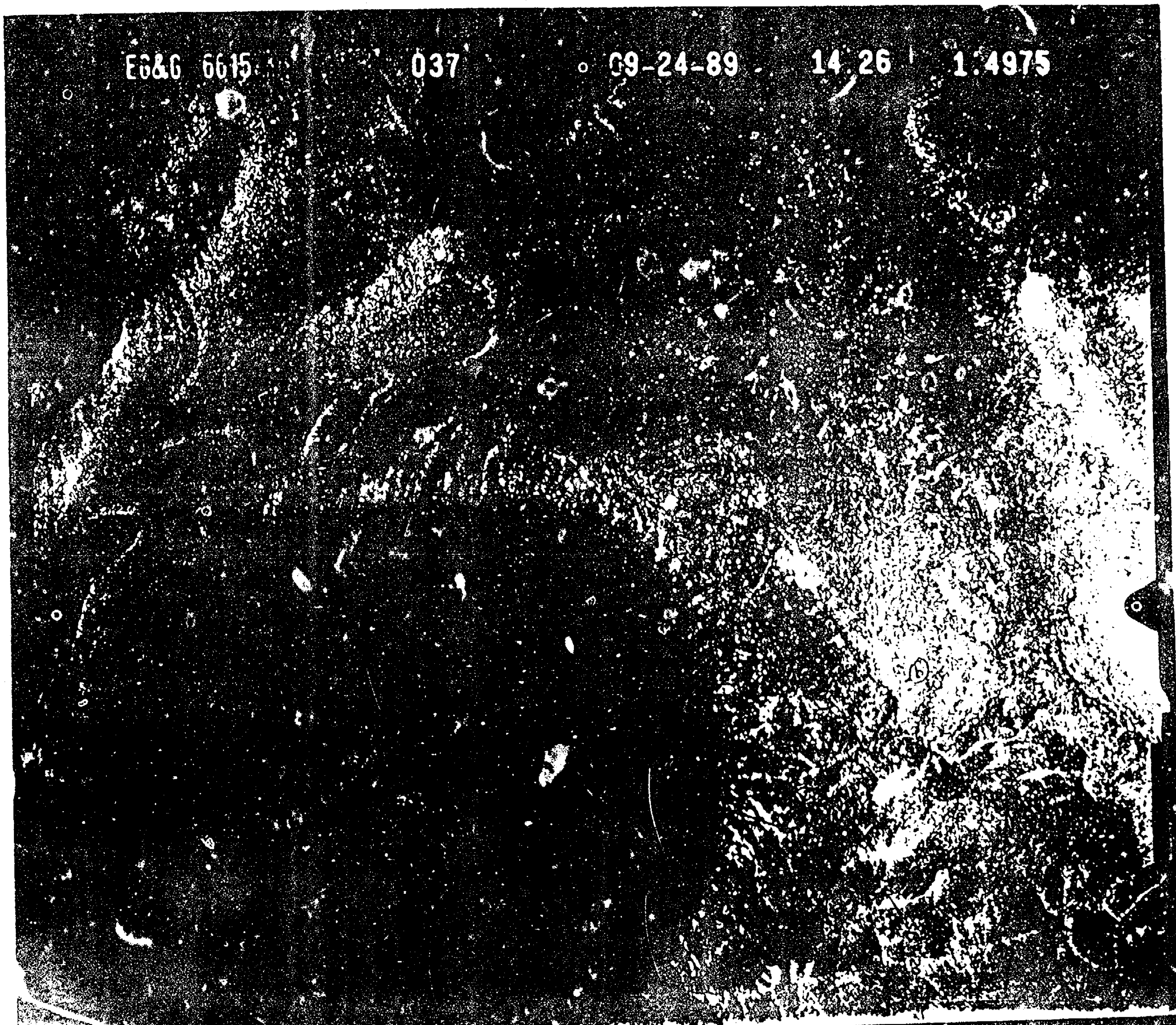
NA: sand/loess	Lathrop Wells	NA	82-85	25-Apr-93	QA	Could not penetrate sand/loess cover.	NA	Lathrop Wells VC-Area 25 #14-BMC	TP-31	NA
trenching tephra units: Qs2a, Qs2	Lathrop Wells	YPC	82-85	25-Apr-93	QA	Described non-oxidized (black) Qs2a fall sheet deposits overlying Qs2a fall sheet deposits overlying Qs2 mounds at northeast cone base; measured	TP-32-1-BMC	Lathrop Wells VC-Area 25 #3-BMC	TP-32	2-42 to 2-48
lava units, Ql3	Lathrop Wells	YPC	82-85	25-Apr-93	QA	Excavated trench at the toe of Ql3 lava to look for pyroclastic surge deposits, deposits not identified in the trench.	NA	Lathrop Wells VC-Area 25 #3-BMC	TP-33	2-49 to 2-54
NA: sand/loess	Lathrop Wells	NA	82-85	25-Apr-93	QA	Unable to penetrate sand/loess cover.	NA	Lathrop Wells VC-Area 25 #3-BMC	TP-34	NA
lava units, Ql3	Lathrop Wells	YPC	82-85	25-Apr-93	QA	Excavated trench at the toe of Ql3 lava to look for pyroclastic surge deposits, deposits not identified in the trench	NA	Lathrop Wells VC-Area 25 #3-BMC	TP-35	2-49 to 2-54
10 Ma basalt dike of Solitario Canyon	Yucca Mtn Dike	BSE	86-87	2-Jun-94	QA	Working along the Solitario Canyon fault with the USGS. Ground magnetic traverses across exposures of the 10 Ma basalt dike of Solitario Canyon.	NA	EG&G 7488-13-BMC	NA	2-11 to 2-12, 7-10 to 7-11
Trench 10, 10 Ma basalt dike of Solitario Canyon	Yucca Mtn Dike	BSE	86-87	2-Jun-94	QA	Described dike in Trench 10 and continued ground magnetic traverses	NA	EG&G 7488-13-BMC	NA	2-11 to 2-12, 7-10 to 7-11
lava and tephra units, Little Cones	Little Cones and 3.7 Ma basalt	YPC	88-89	3-Jun-94	QA	Continuing work with ground magnetic traverses in Crater Flat at Little Cones. Also examined new trenches cut in the vicinity of drill hole H-6	NA	USGS-NTS-515-BMC	NA	2-19 to 2-20, 2-21 to 2-27, 3-32 to 3-33; 7-31
lava and tephra units, Little Cones	Little Cones and 3.7 Ma basalt	YPC	88-89	3-Jun-94	QA	Continuing work with ground magnetic traverses in Crater Flat at Little Cones. Also examined new trenches cut in the vicinity of drill hole H-6.	NA	EG&G 7488-9-BMC	NA	2-19 to 2-20, 2-21 to 2-27; 3-32 to 3-33; 7-31
NA: sand/loess	Lathrop Wells	NA	90	8-Jun-94	QA	Trenches TP-21 and TP-22 dug on 26-Aug-93 were not previously described in the notebook. Both trenches contained thick deposits of eolian sand (no tephra exposed) and were backfilled without being described.	NA	Lathrop Wells VC-Area 25 #30-BMC	TP-21, TP-22	NA
lava and tephra units	3.7 Ma basalt	YPC	91-93	16-Jun-94	QA	Mapping the 3.7 Ma basalt. Working along the main North-South vent alignment.	NA	EG&G 7488-68-BMC-1	NA	2-19 to 2-20; 7-31
lava and tephra units	3.7 Ma basalt	YPC	91-93	16-Jun-94	QA	Mapping the 3.7 Ma basalt. Working along the main North-South vent alignment.	CF 6-17-94-1-BMC	EG&G 7488-47-BMC	NA	2-19 to 2-20; 7-31
lava and tephra units	Little Cones	YPC	93-99	16-Jul-94	QA	Lithic fragment counts at southern little cones in quarry exposure, west cone wall.	NA	WILD 15/4UAG-8567 BMC	LC-1	2-21 to 2-24
lava and tephra units	Little Cones	YPC	93-99	16-Jul-94	QA	Trenching and sampling at the Little Cones Center in Crater Flat.	NA	WILD 15/4UAG-8567 BMC	LC-2	2-21 to 2-24
lava and tephra units	Little Cones	YPC	93-99	16-Jul-94	QA	Trenching and sampling at the Little Cones Center in Crater Flat.	NA	WILD 15/4UAG-8567 BMC	LC-3	2-21 to 2-24

Volcanic Unit	Volcanic Center	Basalt Cycle	Page(s)	Date work performed	QA Status	Comments	Sample Number	Photo or Map Number	Trench Number	Status Report Reference Pages
lava and tephra units	Little Cones	YPC	93-99	16-Jul-94	QA	Trenching and sampling at the Little Cones Center in Crater Flat.	NA	WILD 15/4UAG-8567 BMC	LC-4	2-21 to 2-24
lava and tephra units	Little Cones	YPC	93-99	16-Jul-94	QA	Trenching and sampling at the Little Cones Center in Crater Flat.	NA	WILD 15/4UAG-8567 BMC	LC-5	2-21 to 2-24
lava and tephra units	Little Cones	YPC	93-99	16-Jul-94	QA	Collected bomb sample at the summit of the northern scoria cone of Little Cones.	LC 7-13-94-1-BMC	WILD 15/4UAG-8567 BMC	NA	2-21 to 2-24




EG&G 6615 037 09-24-89 14 26 1.4975


EG&G 6615
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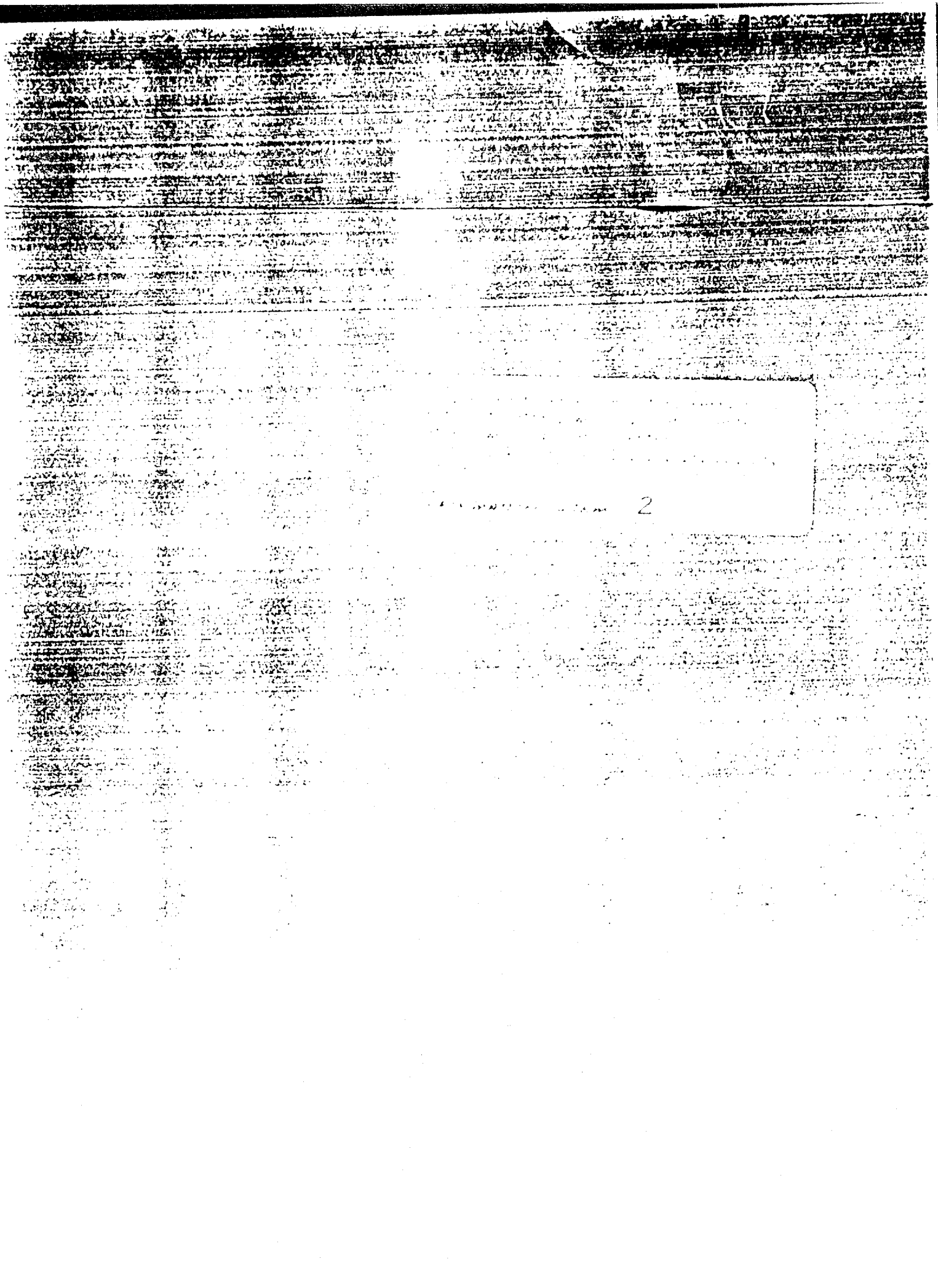


8-18-87
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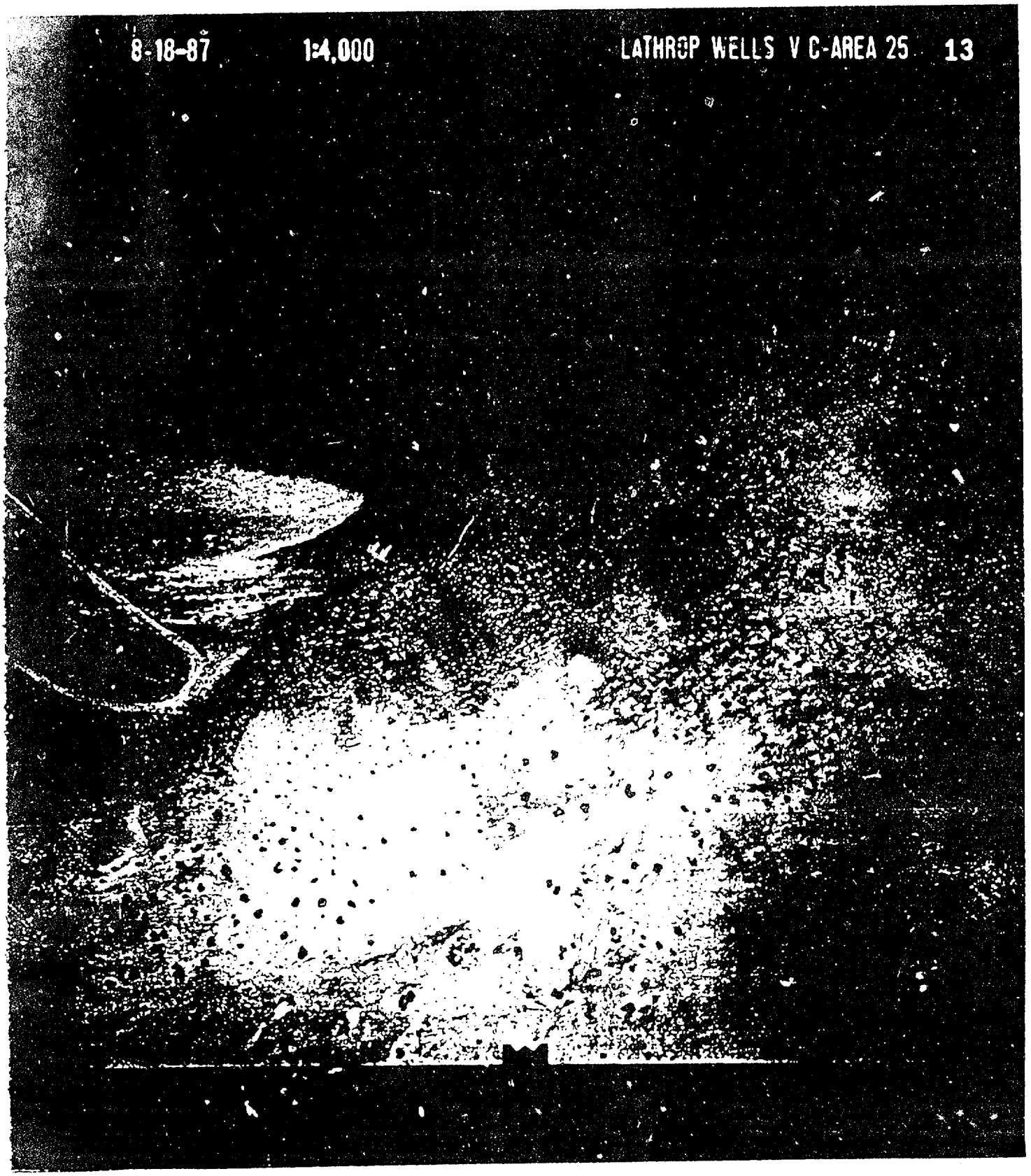
LATHROP WELLS V C-AREA 25 10


8-18-87
1:4,000
LATHROP WELLS, NC-AREA 25
12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13


8-18-87
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WELLS V C-AREA 25
22


8-18-87
1:4,000
LATHROP WELLS V C-AREA 25
28


9-18-87
14,000
LATHROP WELLS V C-AREA 25 29

Information Item 13

Two copies of an example of the scientific note book entries from pages 13 through 19, inclusive from B. C. Cosse's Volcanism Notebook #1, EWS-EES-13-11-11-89-08 for the period of 11-27-89 through 12-3-89 documenting cone volume and lava volume calculations for Sleepout Butte, Little Black Peak Cone, and Tantrap Wells Cone

Plotted and compiled geologic mapping of the Hidden with photo interpretation of several units -

① Lava units on east and northeast flank of the cone.

② feeder dikes -

Spotted one area that will need to be field check where I could not obtain closure of contacts.

The Sleeping Butte photos are somewhat difficult to work with. The cone expansion are on four separate photos and there is significant scale distortion on the edges of photos. For consistancy, I have used photo EC# 6615-037-BMC as the major photo for map compilation of the scoria cone. Lava flow units were plotted primarily on EC# 6615-026-BMC

Bruce Crowe 8-15-90

Continued Work under same Activity as the Preceding Entry under DP 606, RI

Working again on the Sleeping Butte aerial photos, I added the vent oxidization zone to photo EC# 6615-37-BMC and compiled contacts on the smaller scale photos EC# 6615-026-BMC. This map was used to transfer the geology to the Springerville and Thirsty Canyon 15 minute quadrangle for a general location map. At the end of todays work I have made copies of the photos used in the Sleeping mapping and the final map I placed these copies in the volcanism resident file.

Bruce Crowe 8-16-90

Continued work under the same activity as the Preceding Entry under DP606, RI

Made some final changes to the Sleeping Butte aerial photographs based on mapping and field checking of my compiled maps on August 29, 1990. Changes were made based on stereoscopic examination of Photos EC# 6615-38-BMC and 26-BMC. Copies of these photos have been placed in the volcanism resident file. No changes were made to any of the other photographs. This completes the compilation of the Sleeping Butte geologic maps. Copies were submitted to STAC Graphics for drafting. Copies of the maps were placed in the volcanism resident files.

Bruce Crowe 8-22-90

Working on Activity 8.3.1.8.5.1.3 Field Geologic Studies. Obtaining information on the Sleeping Butte center from the Thirsty Canyon and Springdale 15' topographic quadrangles Under DP-606, RI

Bruce Crowe, P.I.

Cone Spacing 2.6 km - center to center of Crater

EXAMPLE

0.51 BMC 8-22-90

MB 5/14/93. Cone width 0.8 Km } Little Black Peak
0.75 Km } Hidden Cone
0.62 BMC 8-22-90

Height = 250 feet Little Black Peak 70.1 BMC 2/7/91 = 76.2 meters
(400 feet Hidden Cone - but note that = 122 meters
360
BMC 8-22-90
Hidden cone deeper topography 110 BMC 8-22-90

Note that these numbers are ≠ than numbers I published in my 1983 paper but my new mapping is more correct.

Bruce Crowe

8-22-90

Starting to compile revised volume data for Quaternary volcanic centers of the Mecca Mountain region. This work is developmental under Activity 8.3.1.8.1.1.4 Probability Calculations and Assessment, Bruce Crowe PE – This work is following QP 3.5 Rev 2 12/2/93 Procedure for Documenting Scientific Investigations. Results are not QA qualified, but are for background information.

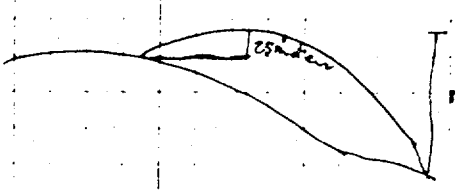
I am taking volumes (areas first) off a map compiled on the Thirsty Canyon and Springdale Quadrangles (15') of the Sleeping Butte centers, This will be used for a first cut revision of the Sleeping Butte volume data

Hidden Cone: Lava flow length = 1.3 Km = 1300 M } Area = $1.8 \times 10^5 m^3$
Approx ave width = 140M
Estimated flow thickness = 8M
Lava volume = $1.46 \times 10^6 m^3$
Note: calculated a volume of 8.1×10^6 in my 1983 paper because we had mapped part of the Miocene section with Hidden Cone
Density correction = ~~.05 conductor~~ .05% reduction BMC 2/7/91
= ~~1.4 x 10^6 m^3~~
$1.4 \times 10^6 m^3$ BMC 2-7-91.

cone = 110m north side
25m south side
basal diameter = 620 meters

Use simple Ave value of 67m for height

$V = .2618 d^2 h$ $d^2 = 3.8 \times 10^5$



$= 6.7 \times 10^6 m^3$
20% volume reduction
$= 5.4 \times 10^6 m^3$

1983 paper = 5.8×10^6

Hidden Cone Volume = $6.8 \times 10^6 m^3$

1 16 Little Black Peak Cone

Basal Diameter = 500 m 1 foot = .3048 m
Height = 70 meters

$V = .2618 d^2 h$

$= 7.58 \times 10^6$

20% density reduction = $3.7 \times 10^6 m^3$

Scoria mounds = basal diameter = ~~280 m~~ 210 m BMC 2/7/91
Height = 25 m

$V = 2.9 \times 10^5 m^3$

20% density correction = 2.3×10^5

2's two for 2 mounds = 4.6×10^5

Σ cone volume = 4.2×10^6

83 pyro = 27×10^6 (scoria mounds were not included)

Lava Volume

Western Flow = 1100 m length
avg width 170 m
$1.87 \times 10^5 m^2$
Avg thick = 12 m
2.24×10^6
5% volume reduction
$2.1 \times 10^6 m^3$ Western Flow

Eastern Flow = 400 m length
avg width = 110 m
thick = 8 m

Volume = 3.5×10^5
10^6 BMC 2/7/91

Lava Volume = $2.5 \times 10^6 m^3$
Cone = $4.2 \times 10^6 m^3$
~~$6.8 \times 10^6 m^3$~~ Little Black Peak
$6.7 \times 10^6 m^3$ BMC 2/7/91

Need to correct for Fall Sheet volume - will use a 4 to 1 ratio
Hidden Cone = $6.8 \times 10^6 \times 4 = 2.7 \times 10^7$ $\Sigma = 3.4 \times 10^7 m^3$
Little Black Peak = $4.2 \times 10^6 \times 4 = 1.7 \times 10^7$ $\Sigma = 2.1 \times 10^7 m^3$

Flows + Cone + Fall Sheet

Hidden = $3.4 \times 10^7 + 1.4 \times 10^6 = 3.5 \times 10^7 m^3$
Little Black Peak = $2.1 \times 10^7 + 2.5 \times 10^6 = 2.4 \times 10^7 m^3$

Total For Cones = $5.9 \times 10^7 m^3$

EXAMPLE

Recalculating Lathrop Volume using Crowe et all 1988 maps and The Big Dune Quadrangle ($7\frac{1}{2}'$)

Lathrop Wells Cone BMC 9-14-90 Basal Diameter 750 meters
(avg value because of elliptical shape of cone)
120 meters

$V = .2618 d^2 h$
$= 1.77 \times 10^7 m^3$
20% volume reduction
$= 1.42 \times 10^7 m^3$ Lathrop Wells main cone (4:1 ratio)

Qs5 quarry cones = long. BMC 5-15-93
3.85 m long 303 basal diameter
2.20 m wide
43m height 1.0×10^6
20% volume reduction
8.0×10^5 (2:1 ratio)

Rift Q15 =
2700 m long $= 1.9 \times 10^7$ 20% volume
280 m width $= 1.5 \times 10^7 m^3$ (2:1 ratio)
avg height - 25m
3 BMC 2/7/91

Rift Q14 = 0.30 BMC 2/7/91
720 m long $= 2.45 \times 10^6 m^3$ (volume draft cones)
170 m wide $= 2.0 \times 10^6$ (2:1 ratio)
20m height

Rift Q13 = 730 long $= 2.77 \times 10^6 m^3 \times 0.80$
190 wide $= 2.2 \times 10^6 m^3$ (2:1 ratio)
20 m height

Pyroclastic Component $1.4 \times 10^7 + 5.6 \times 10^7 = 7.0 \times 10^7$
$8.0 \times 10^5 + 3.2 \times 10^6 = .4 \times 10^7$ BMC 9/14/90
$1.5 \times 10^7 + 3.0 \times 10^7$ BMC 2/7/91 $= 4.5 \times 10^7$
$2.0 \times 10^6 + 4.0 \times 10^6 = .6 \times 10^7$
$2.2 \times 10^6 + 4.4 \times 10^6 = .7 \times 10^7$
$1.3 \times 10^8 m^3$ pyroclastic component

Note higher because I did not consider other pyro components in 1983 calculation.

EXAMPLE

Lava Flow volumes:

Q15 380 m length
100 width
12 m
$4.56 \times 10^5 m^3$ (arched flow)
length BMC 2/7/91

320 length
270 width
12 height
$1.0 \times 10^6 m^3$

500 length
280 width
12 height
$1.7 \times 10^6 m^3$
BMC 2/7/91

Σ $.46 \times 10^6 m^3$
$1.0 \times 10^6 m^3$
$1.7 \times 10^6 m^3$
$2.2 \times 10^6 m^3 \times 0.95 = 2.1 \times 10^6 m^3$

Q14/Q13 units

300 m
70 m
12 m
$2.52 \times 10^5 m^3$

200 m
100 m
12 m
2.4×10^5

1772 m
490 m
12 m
$1.0 \times 10^7 m^3$

Σ $.03 \times 10^7$
$.03 \times 10^7$
1.0×10^7
$1.1 \times 10^7 m^3 \times 0.95 = 1.0 \times 10^7 m^3$

Total Volume Lathrop

Pyroclastics 1.3×10^8
$.1 \times 10^8$
$1.4 \times 10^8 m^3$ Total Volume

Rate of Recurrence of Volcanic Events

Stochastic Model:

Several Approaches

1. The formation of every crater is treated as a volcanic event
2. Clusters are treated as individual volcanic events
3. Each vent represents a separate event

BMC 2/9/91

EXAMPLE

Cases 1:

Number of Centers
Quaternary = 7. Rate = $\frac{7 \text{ events}}{1.8\times10^{6} \text{ yrs}}$ = 3.9×10^{-6} events yr^{-1}

Volcanic Cycle = Last 3.7 Ma
7 Quaternary events + Background (no events)
+ 3.7 Ma (4 events)
$\frac{12 \text{ events}}{3.7\times10^{6} \text{ yrs}}$ = 3.2×10^{-6} events yr^{-1}
3.7 BMC 2/7/91

Cluster Approach (Note that the disruption parameter needs to be treated differently for a clustered event)
Parameters required
= cluster length
= center spacing

4 clusters in 3.7 Ma = $\frac{4}{3.7\times10^{6}}$ = 1.1×10^{-6} clusters $/yr^{-1}$

3 clusters in 1.8 Ma = $\frac{3}{1.8\times10^{6}}$ = 1.7×10^{-6} clusters $/yr^{-1}$

Counting Vents

3.7 = 4		$\frac{27}{3.7\times10^{6}}$	= 7.3×10^{-6} yr^{-1}
1.2 = 2	Little		
6	Red Cone		
3	Black Cone	$\frac{21}{1.8\times10^{6}}$	= 1.2×10^{-5} yr^{-1}
1	Northern most T		
BB = 2			
Sleep = 4			
Lithop = 5			
27 vents			

Recurrence Rate calculations using Magma Volumes: Need revisions to 1.2 and 3.7 mapping before I can start.

Bruce Crowe Sept 19, 1990

December 6, 1990. Working on computer code to establish cone spacing, and number of intersections of volcanic fields with a random distribution of vents. Work is for Activity 8.3.1.8.1.4, Probability Calculations and Assessments, B. Crowe P. I. Am following QP 35.2 and code is developmental at this stage. There is no need to address data errors or uncertainty at this stage of code development.

~~Interim~~ BMC 2/14/91

EXAMPLE

Plotted and compiled geologic mapping of the Hidden with photo interpretation of several units -
① Lava units on east and northeast flanks of the cone
② feeder dikes -
Spotted one area that will need to be field checked where I could not obtain closure of contacts.

The Sleeping Butte photos are somewhat difficult to work with. The cone exposures are on four separate photos and there is significant scale distortion on the edges of photo. For consistency, I have used photo EC# 6-037-BMC as the major photo for map compilation of the scoria cone. Lava flow units were plotted primarily on EC# 6-026-BMC.

Bruce Crowe 8-15-90

Continued work under same activity as the Preceding Entry under DP606, R1

Working again on the Sleeping Butte aerial photos, I added the vent oxidization zone to photo EC# 6-37-BMC and compiled contacts on the smaller scale photos EC# 6-02-BMC. This map was used to transfer the geology to the Springerville and Thirsty Canyon 15 minute quadrangle for a general location map. At the end of today's work I have made copies of the photos used in the Sleeping mapping and the final map I placed these copies in the volcanism resident file.

Bruce Crowe 8-16-90

Continued work under the same activity as the Preceding Entry under DP606, R1

Made some final changes to the Sleeping Butte aerial photographs based on mapping and field checking of my compiled maps on August 20, 1990. Changes were made based on stereoscopic examination of Photos EC# 6615 #'s 38-BMC and 26-BMC. Copies of these photos have been placed in the volcanism resident file. No changes were made to any of the other photographs. This completes the compilation of the Sleeping Butte geologic maps. Copies were submitted to SMC Graphics for drafting. Copies of the maps were placed in the volcanism resident files.

Bruce Crowe 8-22-90

Working on Activity 8.3.1.8.5.1.3 Field Geologic Studies. Obtaining information on the Sleeping Butte center from the Thirsty Canyon and Springdale 15' topographic quadrangles. Under DP-606, R1
Bruce Crowe, P.I.

Cone Spacing 2.6 km - center to center of Craters

0.51 BAC 8-22-90
Cone width 0.?km – Little Black Peak
0.?km Hidden Cone
0.62 BAC 8-22-90
Height = 230 feet Little Black Peak = 70 meters
(400 feet) 360 Hidden Cone – but onto Hot = 122 meters
BAC 8-22-90 Hill – cone drapes topography 110 BAC 8-22-90

Note that these numbers are > than numbers I published in my 1983 paper but my new mapping is more correct.

Bruce Crowe

8-22-90

Starting to compile revised volume data for Quaternary volcanic centers of the Yucca Mountain region. This work is developmental under Activity 8.3.1.8.1.1.4 Probability Calculations and Assessment, Bruce Crowe PI – This work is following QP 3.5 Procedure for Documenting Scientific Investigations. Results are NOT QA qualified but are for background information.

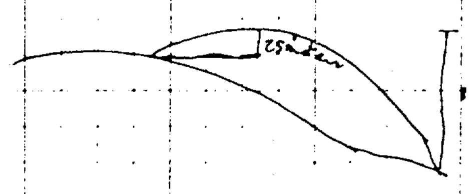
I am taking volumes (areas first) off a map compiled on the Thirsty Canyon and Springdale Quadrangles (15') of the Sleeping Butte centers. This will be used for a first cut revision of the Sleeping Butte volume data.

Hidden Cone: Lava flow length = 1.3 km ~ 1300 m } Area = $1.8 \times 10^5 m^3$
Approx ave width = 140 m
Estimated flow thickness = 8 m
Lava volume = $1.46 \times 10^6 m^3$
Note: calculated a volume of 8.1×10^6 in my 1983 paper because we had mapped part of the Miocene section with Hidden cone.
Density correction = .05% reduction BAC 2/7/91
= ~~$1.4 \times 10^6 m^3$~~
$1.4 \times 10^6 m^3$ BAC 2-7-91

cone = 110 m north side
25 m south side
basal diameter = 620 meters

Use simple ave value of 67 m for height

$V = .2618 d^2 h$ $d^2 = 3.8 \times 10^5$



$= 6.7 \times 10^6 m^3$
20% volume reduction
$= 5.4 \times 10^6 m^3$

1983 paper = 5.8×10^6

Hidden Cone Volume = $6.8 \times 10^6 m^3$

1 16 Little Black Peak Cone

Basal diameter = 500 m 1 foot = .3048 m
Height = 70 meters

$V = .2618 d^2 h$

$= 4.58 \times 10^6$

20% density reduction = $3.7 \times 10^6 m^3$

Scoria mounds = ~~basal diameter = 280 m~~ 210 m BMC 2/7/91
Height = 25 m
$V = 2.9 \times 10^5 m^3$
20% density correction = 2.3×10^5
2's true for 2 mounds = 4.6×10^5
Σ cone volume = 4.2×10^6
83 ppm = 2.7×10^6 (scoria mounds were not included)

Lava Volume

Western Flow = 11900 m length
avg width 170 m
$1.87 \times 10^5 m^2$
Avg thick = 12 m
2.24×10^6
5% volume reduction
$2.1 \times 10^6 m^3$ Western Flow

Eastern Flow = 400 m length
avg width = 110 m
thick = 8 m

Volume = 3.5×10^5
10^6 BMC 2/7/91
Lava Volume = $2.5 \times 10^6 m^3$
Cone = $4.2 \times 10^6 m^3$
~~$6.8 \times 10^6 m^3$~~ Little Black Peak
$6.7 \times 10^6 m^3$ BMC 2/7/91

Need to correct for Fault Shear volume - will use a 4 to 1 ratio
Hidden + Cone = $6.8 \times 10^6 + 2.7 \times 10^7$ Σ = $3.4 \times 10^7 m^3$
Little Black Peak = $4.2 \times 10^6 + 1.7 \times 10^7$ Σ = $2.1 \times 10^7 m^3$

Flows + Cone + Fault Shear

Hidden = $3.4 \times 10^7 + 1.4 \times 10^6 = 3.5 \times 10^7 m^3$
Little Black Peak = $2.1 \times 10^7 + 2.5 \times 10^6 = 2.4 \times 10^7 m^3$

Total For Cones = $5.7 \times 10^7 m^3$

EXAMPLE

Recalculating Lathrop Volume using Cone of all 1985 maps and The Big Dune Quadrangle (7½')

Lathrop Wells Cone — conc 9-14-90
Basal Diameter 750 meters
(avg value because of elliptical shape of cone)
120 meters

$V = .261 d^2 h$
$= 1.77 \times 10^7 m^3$
20% volume reduction
$= 1.42 \times 10^7 m^3$ Lathrop Wells main cone (4:1 ratio)

Qs5 guano cones = long, BMC 5-15-93
385 m long
220 m wide
43 m height
303 basal diameter
1.0×10^6
-0% volume reduction
8.0×10^5 (2:1 ratio)

Rift Q15 =
2700 m long
280 m width
avg height - 25M
3 BMC 7/7/91
$= 1.9 \times 10^7$ 20% volume
$= 1.5 \times 10^7 m^3$ (2:1 ratio)

Rift Q14 =
720 m long
170 m wide
20 m height
$= 2.45 \times 10^6 m^3$ × 0.90 BMC 2/7/91 (volume decrease, cones)
$= 2.0 \times 10^6$ (2:1 ratio)

Rift Q13 = 730 long
190 wide
20 m height
$= 2.77 \times 10^6 m^3 \times 0.80$
$= 2.2 \times 10^6 m^3$ (2:1 ratio)

Pyroclastic component
$1.4 \times 10^7 + 5.6 \times 10^7 = 7.0 \times 10^7$
$8.0 \times 10^5 + 3.2 \times 10^6 = 4.0 \times 10^6$ conc 9/14/90
$1.5 \times 10^7 + 3.0$ BMC 2/7/91 $= 4.5 \times 10^7$
$2.0 \times 10^6 + 4.0 \times 10^6 = .6 \times 10^7$
$2.2 \times 10^6 + 4.4 \times 10^6 = .7 \times 10^7$
$1.3 \times 10^8 m^3$ pyroclastic component

Note: higher because I did not consider other pyro components in 1983 calculations

EXAMPLE

18 Lava Flow volumes:

Cer.

Q15 380 m length
100 width
12 m
4.56 x 10^5 m^3 (conduit flow)
length BMC 2/7/91
320 length
270 width
14 height
1.0 x 10^6 m^3

500 length
280 width
12 height
1.7 x 10^6 m^3
BMC 2/7/91

Σ .46 x 10^6 m^3
1.0 x 10^6 m^3
1.7 x 10^6 m^3
2.2 x 10^6 m^3 x 0.95 = 2.1 x 10^6 m^3

C.

Q14/Q13 vents

300 m
70 m
12 m
2.52 x 10^5 m^3

200 m
100 m
12 m
2.4 x 10^5

1772 m
490 m
12 m
1.0 x 10^7 m^3

Coon

Σ .03 x 10^7
.03 x 10^7
1.0 x 10^7
1.1 x 10^7 m^3 x 0.95 = 1.0 x 10^7 m^3

Total Volume Lathrop

Pyroclastics 1.3 x 10^7
.1 x 10^8
1.4 x 10^8 m^3 Total Volume

EXAMPLE

Rate of Recurrence of Volcanic Events

Recurrence

Stochastic Models:

Several Approaches

1. The formation of every vent is treated as a volcanic event
2. Clusters are treated as individual volcanic events
3. Each vent represents a separate event

BMC 2/9/91

Caveats:

Number of Centers
Quaternary = 7 Rate = $\frac{7 \text{ vents}}{1.8\times10^{6}\ \text{yrs}}$ = 3.9×10^{-6} vents yr^{-1}

Volcanic Cycle = last 3.7 Ma
7 Quaternary vents + Buckboard (on vents)
+ 3.7 Ma (4 vents).
$\frac{12 \text{ vents}}{3.7\times10^{6}\ \text{yrs}}$ = 3.2×10^{-6} vents yr^{-1}
3.7 BMC 2/7/91

Cluster Approach (Note that the disruption parameter needs to be treated differently for a clustered event)
Parameters required
= cluster length
= vents spacing

4 clusters in 3.7 Ma = $\frac{4}{3.7\times10^{6}}$ = 1.1×10^{-6} clusters/yr^{-1}

7 clusters in 1.8 Ma = $\frac{7}{1.8\times10^{6}}$ = 1.7×10^{-6} clusters/yr^{-1}

Lavas by Vents

3.7 = 4		$\frac{27}{3.7\times10^{6}}$	= 7.3×10^{-6} yr^{-1}
1.2 = 2	Little		
6	Red Cone		
3	Black Cone	$\frac{21}{1.8\times10^{6}}$	= 1.2×10^{-8} yr^{-1}
1	Northern most		
BB = 2			
Sleep = 4			
Lithop = 5			
27 vents			

Recurrence Rate calculations using Magma Volumes: Need revisions to the 1.2 and 3.7 mapping before I can start.

Bruce Crowe Sept 18, 1990

December 6, 1990. Working on computer code to establish conc spacing, and number of intersections of volcanic fields with a random distribution of vents. Work is for Activity 8.3.1.8.1.4 Probability Calculations and Assessments, B. Crowe P. Ig. Am following QA 35.8nd code is developmental at this stage. There is no need to address data errors or uncertainty at this stage of code development.

Tolerg BMC 2/14/91

EXAMPLE

YUCCA
MOUNTAIN
PROJECT

Studies

Overview of TDM System

Presented to:

Advisory Committee on Nuclear Waste

Presented by:
Claudia M. Newbury
Yucca Mountain Site Characterization Project Office

May 11, 1995

U.S. Department of Energy
Office of Civilian Radioactive
Waste Management

Technical Data Management Background

Purpose

To provide a system by which technical data is made available to project participants and oversight groups thereby ensuring consistency of analysis inputs as well as traceability of developed data

Objective

Compile, manage and maintain the Project's acquired and developed technical data in support of the Site Suitability Evaluation, the License Application, and the Environmental Impact Assessment

Technical Data Management Background

(Continued)

Scope

Compile, manage and maintain technical data acquired and/or developed through:

- Site characterization activities
- Design and development activities
- Performance assessment activities
- Environmental and socioeconomic study activities

Acronyms

ATDT- Automated Technical Data Tracking system- A method of tracking and reporting all data collected and used in support of Site Characterization (does not contain actual data)

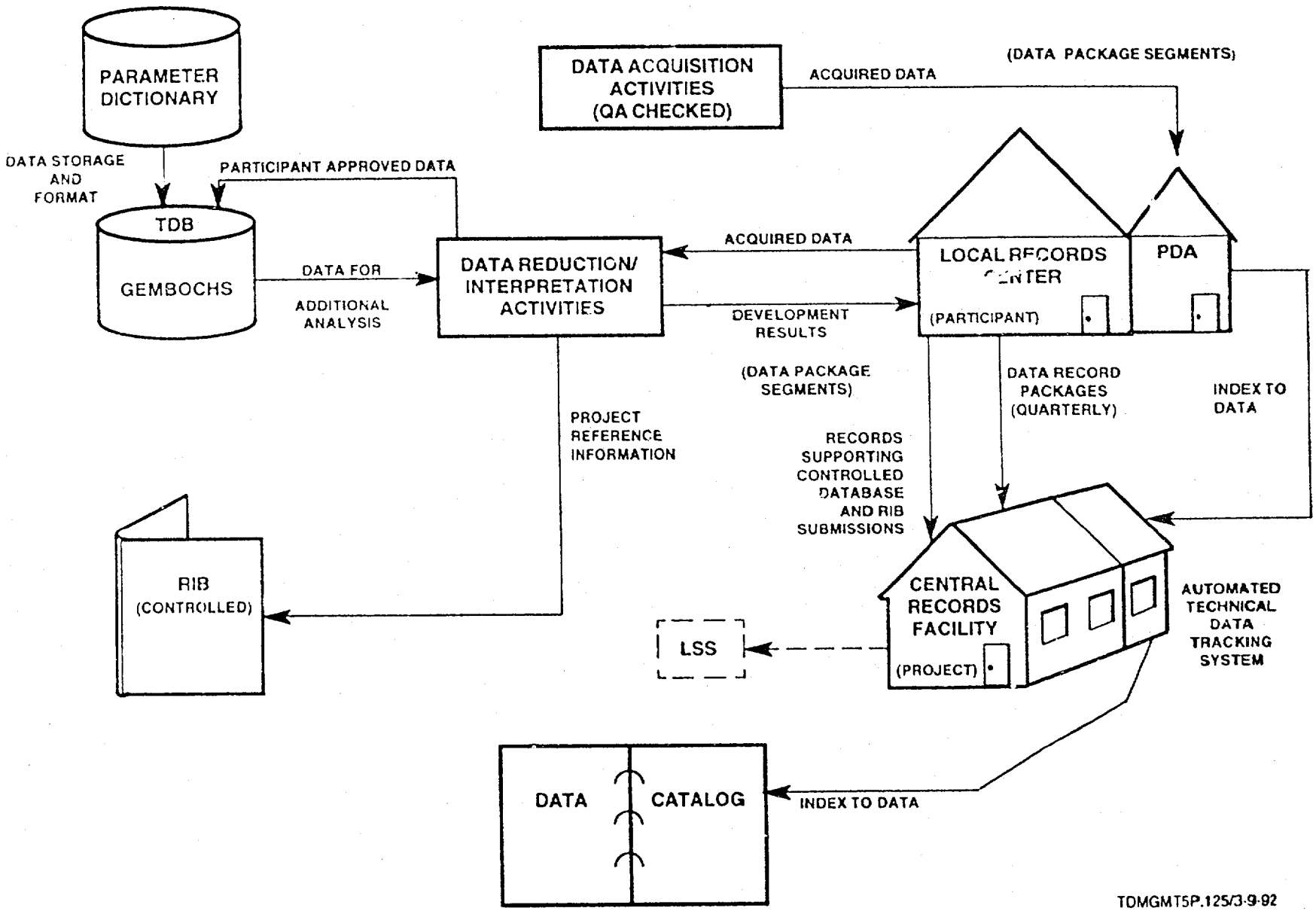
TDIF- Technical Data Information Form-Input form for ATDT

Acronyms

RIB- Reference Information Base - a book containing narrative and graphic material explaining the derivation of selected values or ranges of values for use in design and performance assessment

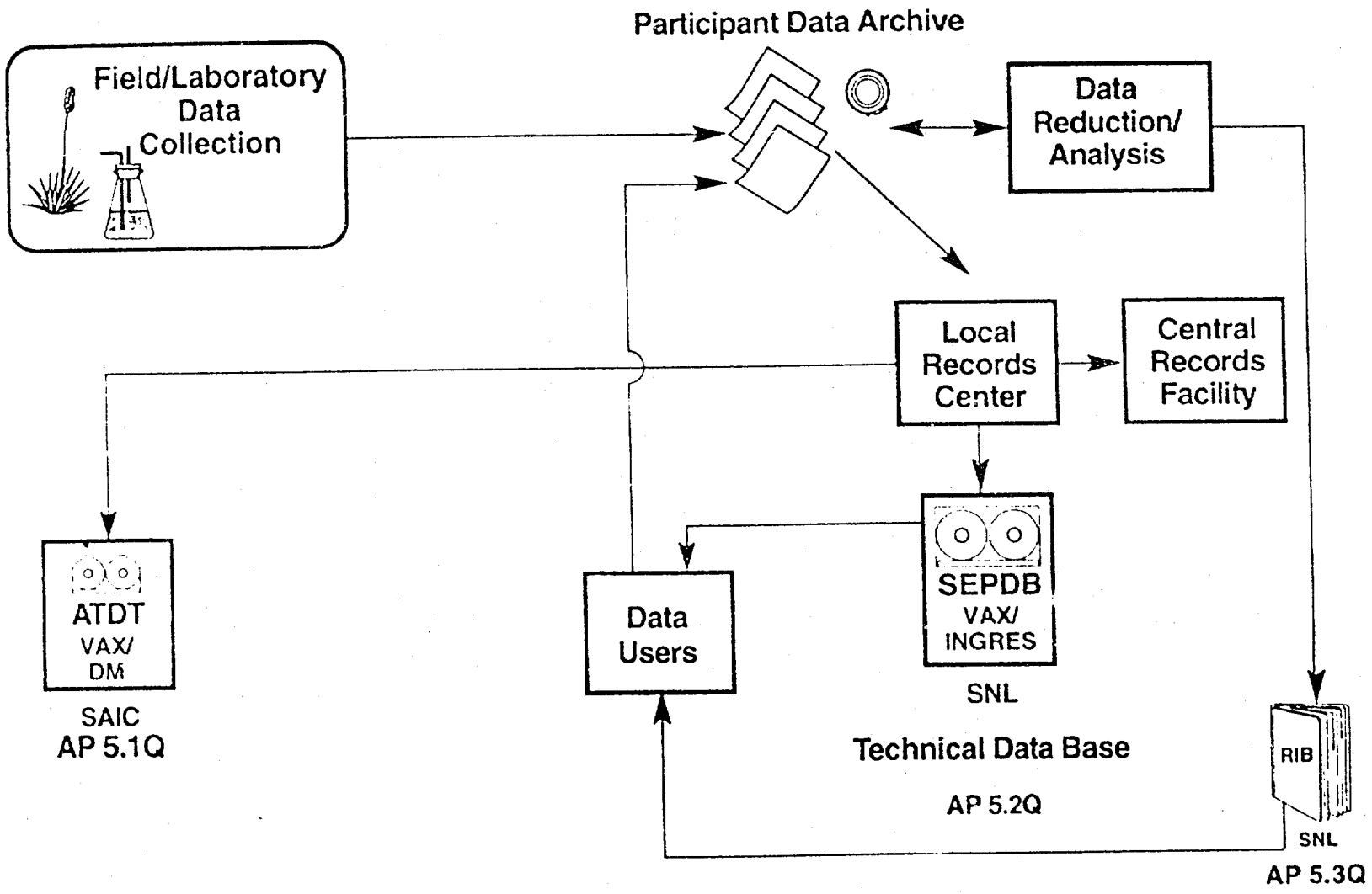
TDB- Technical Data Base - The Project level collection of spatial (map-like) and tabular data which have been evaluated by investigators in support of specific requirements listed in the Site Characterization Planning Basis

System Overview



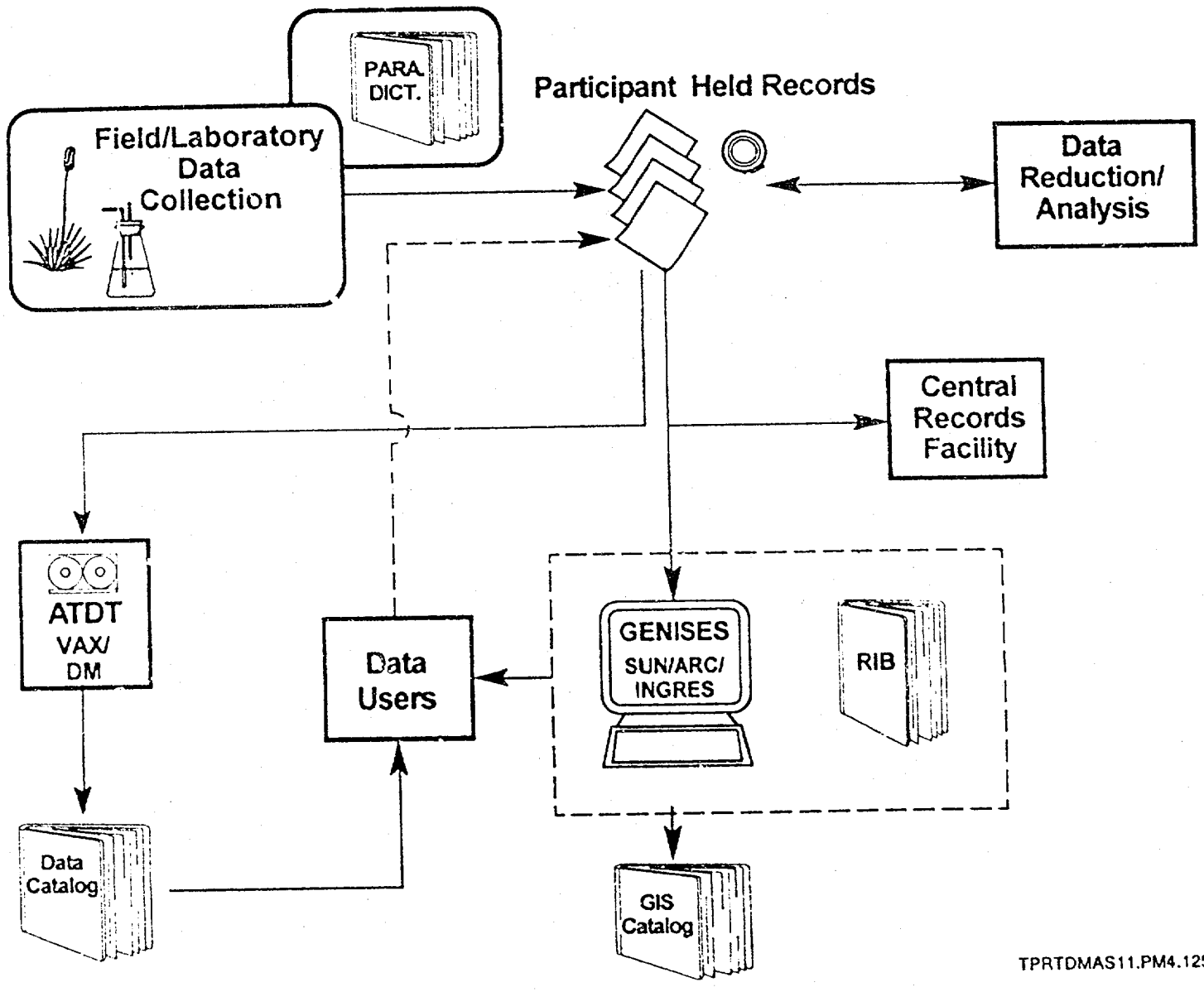
TDMGMT5P.125/3-9-92

Technical Data Management 1990



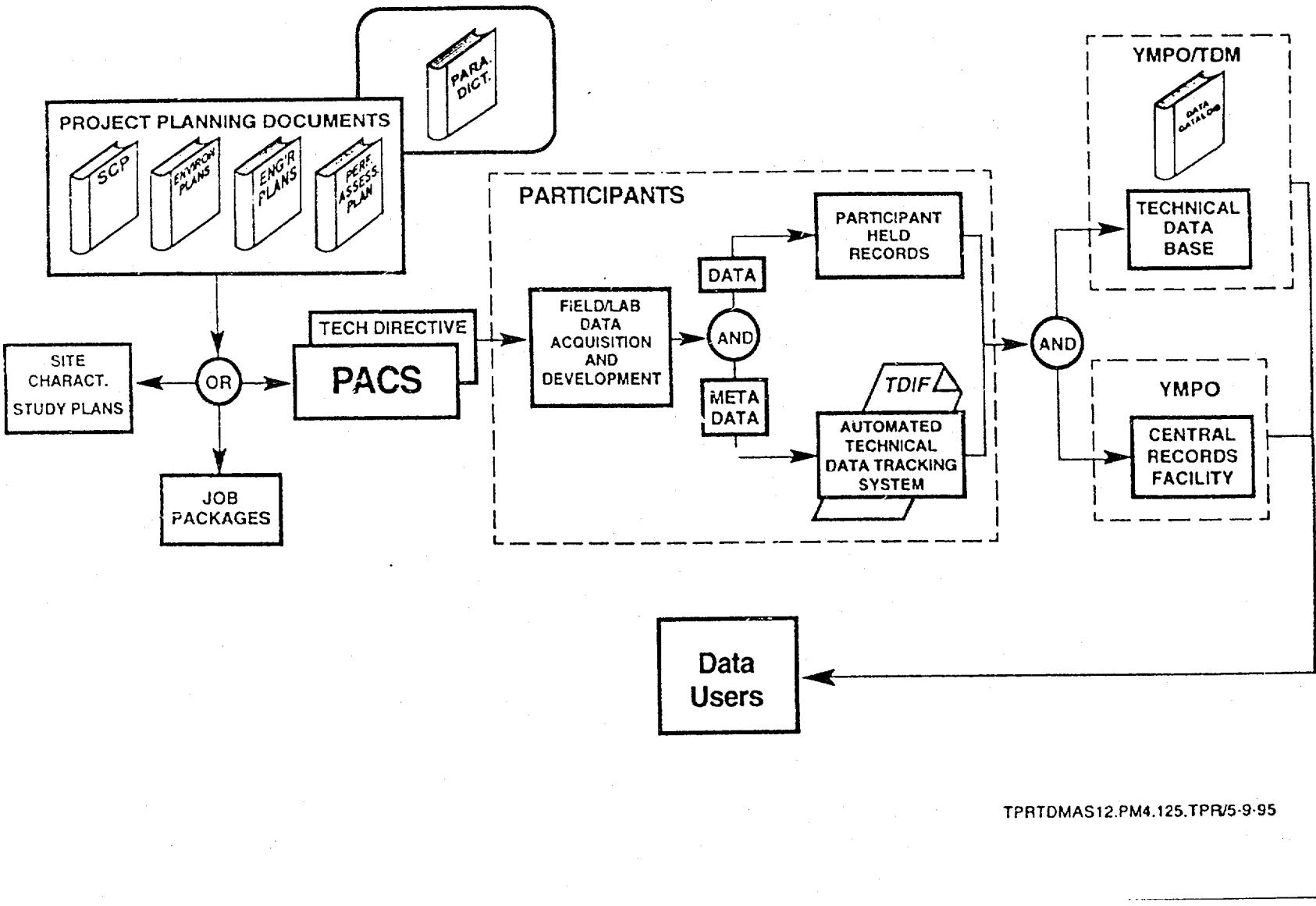
TPRTDMAS8.PM4.125 TPR/5-9-95

Technical Data Management 1995



TPRTDMAS11.PM4.125.TPR/5-9-95

Technical Data Management
Technical Data Flow



TPRTDMAS12.PM4.125.TPR/5-9-95

Automated Technical Data Tracking System

The ATDT system stores the information (meta-data) entered on the TDIF

- Provides descriptions of technical data acquisitions and developments
- Identifies data sources used for data development
- Identifies technical data submitted to the Project Technical Data Base and Records
- Tracks the transfer of technical data between participants and the Project TDB
- Tracks the transfer of all technical data used from the Project TDB for quality affecting activities
- Provides information for producing the Quarterly Data Catalog

Data Tracking Number (DTN)

- The Data Tracking Number is a unique identifier assigned to a technical data set

- Assigned by each participant organization using a standard format. However, alpha-numeric descriptions differ between participants

- The DTN for a data set is entered into:
  - ATDT
  - IRIS (Interim Records Information System)
  - Project TDB

Technical Database

- YMP TDB stores, manages, and retrieves YMP technical data submitted by Project participants
- Tabular data are maintained in the Ingres RDBMS, and are linked with vector and raster (gridded and image) spatial data in the ARC/INFO GIS
- The TDB complies with Executive Order 12906 and the FGDC's metadata standards
- A variety of methods ensure data access

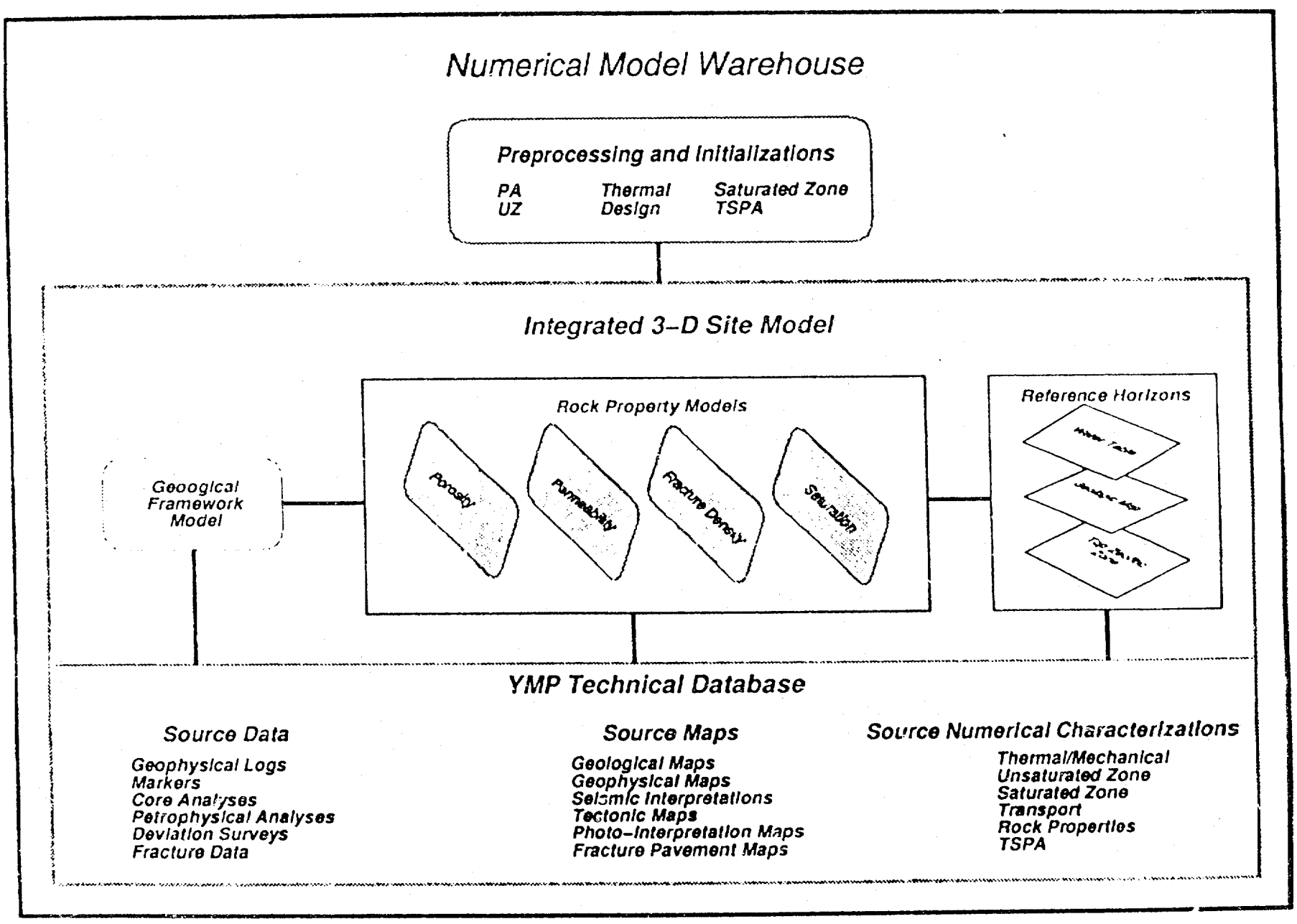


Figure 2.12 Integrated 3-D Site Model and Numerical Model Warehouse

Data Submittal

Data provided by YMP area studies

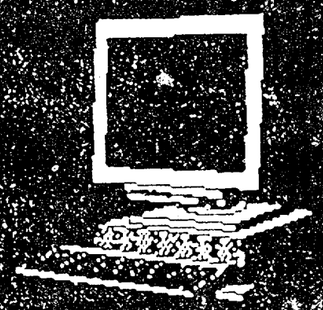
Production

Data are reviewed, reformatted, processed into temporal and data applied and

Baseline

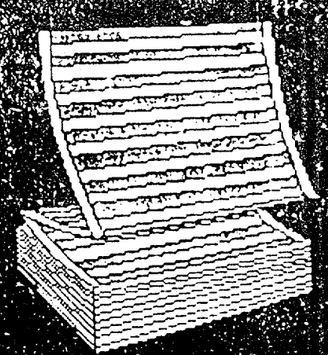
Approved data is normalized into baseline files. These files are separated into logical area by their theme. Unique files also provided.

- GEOLOGY
- HYDROLOGY
- SOCIOECONOMICS
- GEOCHEMISTRY
- DESIGN



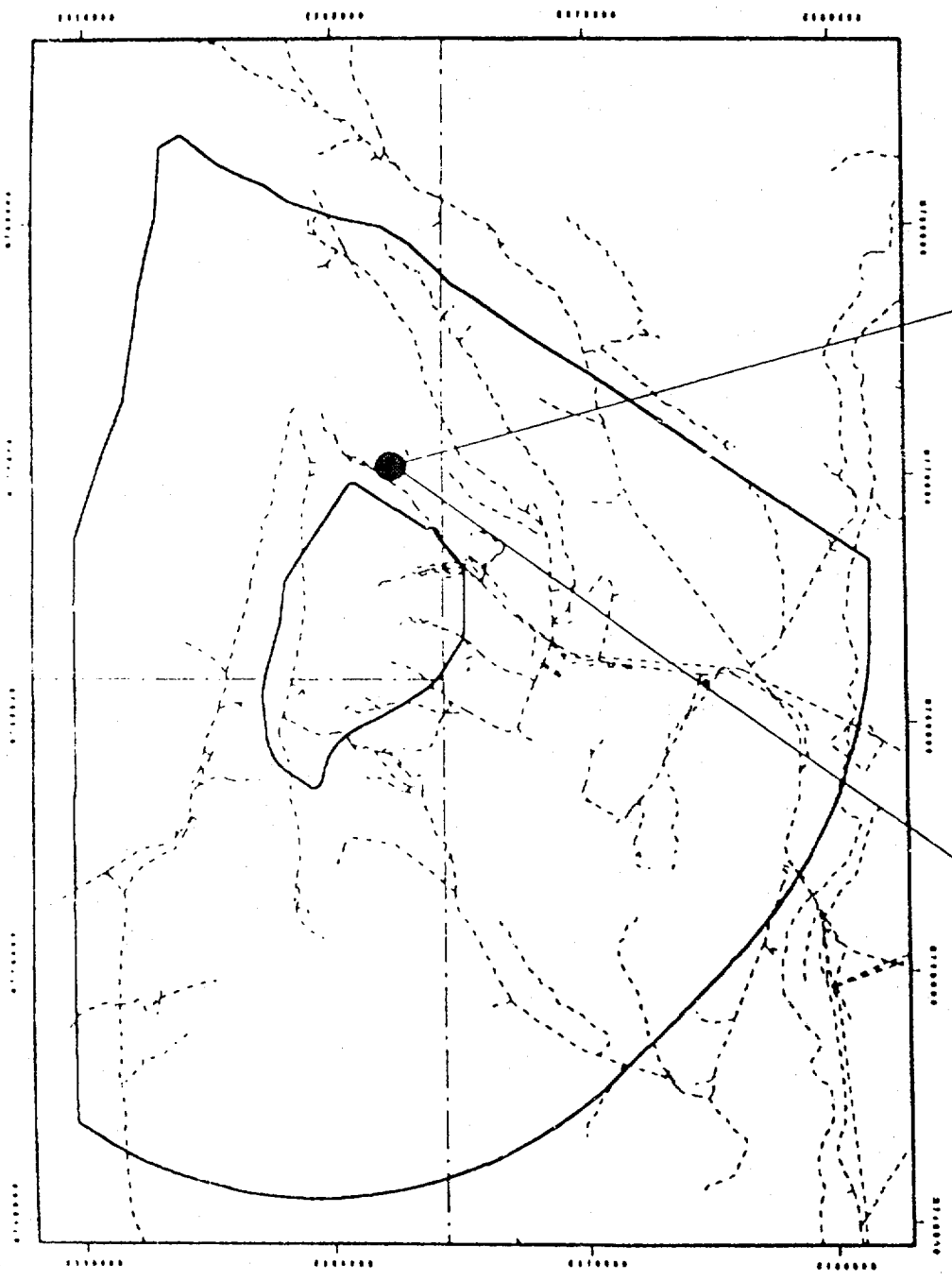
On-line Access

CD-ROM Media



Hardcopy Reports & Analysis

YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT



GIS ATTRIBUTE LINKS

DRILL LOG ATTRIBUTE TABLE

COVERAGE: EXISTING DRILLHOLES

ACTIVITY ID:	USW H-1
ACTIVITY TYPE:	HYDROLOGIC HOLE
STUDY TYPE:	SATURATED ZONE
X-COORD:	562,387.90000
Y-COORD:	770,254.32000
GROUND ELEV:	4274.4
TOTAL DEPTH:	6000
DATE COMPLETED:	1/25/81
USER:	USGS
SOURCE:	H&N AS-BUILT

ATTRIBUTE TABLE

COVERAGE: EXISTING DRILLHOLES

- BULK DENSITY
- GRAIN DENSITY
- TRANSMISSIVITY
- MATRIX POTENTIAL
- STORAGE COEFFICIENT
- DATES OF MEASUREMENTS
- HYDRAULIC CONDUCTIVITY
- NATURAL-STATE POREWATER
- WATER ELEVATIONS AND DEPTH
- THERMAL/MECHANICAL STRATIGRAPHIC UNITS
- TEST CONDITIONS
- LITHOLOGY
- POROSITY
- PORE SATURATION
- PUMPING CONDITIONS

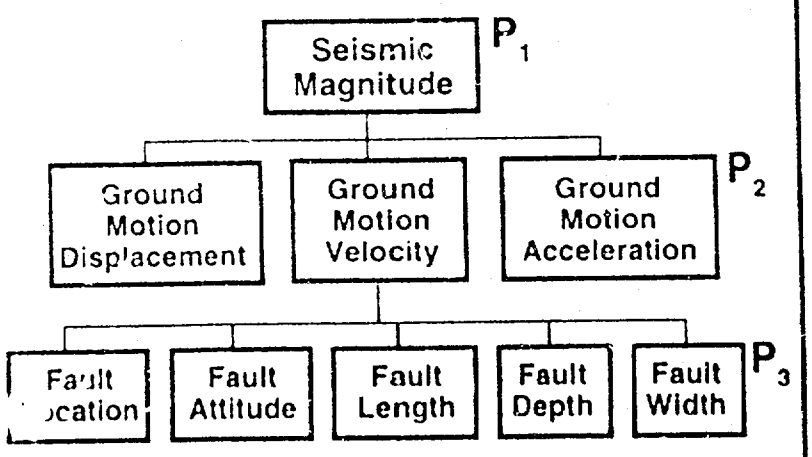
Reference Information Base (RIB)

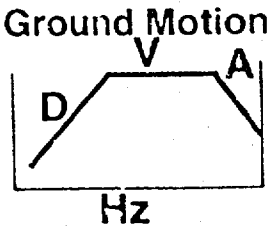
RIB- A controlled source of Project-approved information presented in an interpreted summary format compiled from validated data

RIB Contents and Format

- Three chapters
  - Site characteristics
  - Engineered systems materials data
  - Waste inventory information
- Information hierarchy
  - Chapter
  - Section
  - Item
  - Parameter
- Presentation format
  - Technical parameters
  - Descriptive summary
  - Statistics
  - Quality assurance
  - Reference sources
  - Support information: tables/figures/graphs/equations

Reference Information Base (RIB) Example



TDB*	RIB
Seismic Magnitude (P_1) F_1 = 5.1 F_2 = 2.7 F_3 = 3.2 Etc.	Seismic Magnitude (P_1) = 5.1
Ground Motion (P_2) F_1 =(D_1=2",V_1=5FPS,A_1=0.2g) F_2 =(D_2=0.5",V_2=1FPS,A_2=0.05g) F_3 =(D_3=1",V_3=3FPS,A_3=0.1g) Etc.	Ground Motion (P_2) 
Fault Data (P_3) F_1 = (F_a, F_L,F_D, F_W) F_2 = (F_a, F_L,F_D, F_W) F_3 = (F_a, F_L,F_D, F_W) Etc.	

Data Access and Distribution

- On-line ATDT & TDPD (data accessing tools)
- CD-ROM
- On-line data distribution system
- Numerical model warehouse; Internet via WWW access
- ArcView2 prepared datasets with customized user interface
- Magnetic media data transfers
- YMP Quarterly Data Catalogs
- YMP Annual Site Atlas
- Tabular reports and sutomized map products

TDMSCN1P30.DOE/5-9-95

Technical Data Management Summary

Acquiring, developing, compiling and disseminating Yucca Mountain technical data in a disciplined, and structured manner, provides the basis for a comprehensive and unbiased evaluation of the site's suitability to store high level radioactive waste

Technical Data:

The scientific and engineering information collected or used in the course of site characterization, design and analysis

Technical data are:

- Measurements
- Observations
- Analyses

Technical Data:

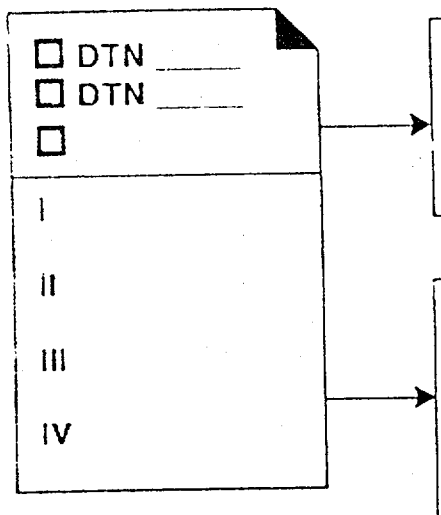
- Used iteratively to develop the technical (scientific) basis for the License Application
- Must be traceable
- Must be transferable

TDM Must:

- Tell everyone what is available
- Distribute all or part of the numbers
- Provide a controlled, agreed upon value for design
- Provide traceability

Technical Data Information Form (TDIF)

The TDIF is a form which provides reference information (meta-data) about technical data



Box 1: For acquired data
Box 2: For developed data
Box 1: For transfer of data

Part I: Identifies the technical data
Part II: Describes mthod (dates, locations, etc.) of acquisition/development of technical data
Part III: Identifies the data sources for developed data
Part IV: Data transfer and TDB submittal information