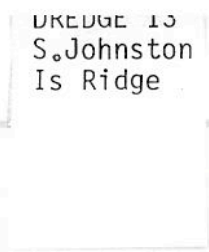

DREDGE 13
S.Johnston
Is Ridge

AMPLE ID	Mn CHEM	Pt & Au	REE	Si Chem	P.Sect.	35mm Pho	Archive	Paleo	XRD				
CD13-1									bulk substrate				
CD13-2													
-3	Bulk												
-4													
-5													
-6	Bulk				✓				phosphorites				
-7													
-8	Bulk layers bot. 5 mm	some	layers	✓						This sample for substrate study			
-9	layers												
-10													
-11													
-12													
-13	Bulk Bottom 5 mm	Bulk	Bulk	✓				✓		This sample for substrate study			
-14													
-15													
-16													
-17													
-18													
-19													
-20													
-21													
-22													
-23													

AMPLE ID	Mn CHEM	Pt & Au	REE	Si Chem	P.Sect.	35mm Pho	Archive	Paleo				
CD13-24												
-25												
-26												
-27	Bulk											
-28												

Sample Description

Cruise I.D: F7-86-HW Sample I.D: Sta: 15-CD13-1 Location: S. Johnston Ridge

Size: 27X24X12 Weight: 3 kg

Mn crust thickness:

Total: min: 18mm max: 50mm ave: 42mm Top & Sides 12mm Bottom

Inner crust: min: — max: — ave: —

Outer crust: min: — max: — ave: —

Surface texture: Smoothed Botryoidal & boulders

Internal structure:

layered:
laminated:
massive: X
porous: in places Siltstone
dendritic:
other:

Mineralogy (XRD):

Associated alteration, phosphorite, or hydrothermal deposits:

Substratum:

Rock type: Tuffaceous siltstone

Description: pale greenish brown crudely bedded

Mineralogy (XRD):

CD 13-1

F7-86-HW
Karin Ridge
Johnston Is

Analyses and subsamples:

analysis:	analyst:

Sample Description

Cruise I.D: F7-86-HW Sample I.D: Sta: 15 CD13-2 Location: S. Johnston Ridge

Size: 19x14x14 Weight: 2.5 kg

Mn crust thickness:

Total: min: 27/6 max: 40/10 ave: 35/7

Inner crust: min: — max: — ave: —

Outer crust: min: — max: — ave: —

Surface texture: Smooth botryoidal, somewhat glossy

Internal structure:

layered:
laminated:
massive: X
porous:
dendritic:
other:

Mineralogy (XRD):

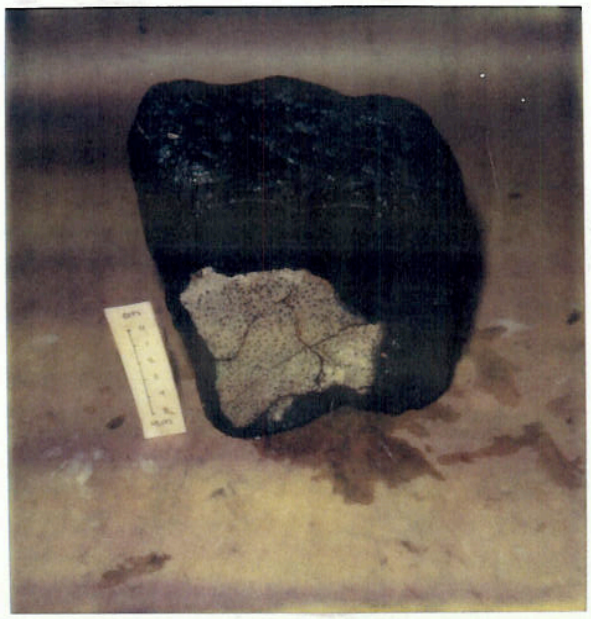
Associated alteration, phosphorite, or hydrothermal deposits:

Substratum:

Rock type: Tuffaceous siltstone

Description: greenish brown w/ phosphorite & Mn discoloration.

Mineralogy (XRD):



CD 13-2

F7-86-HW
Karin Ridge
Johnston Is

Analyses and subsamples:

analysis:	analyst:

SAMPLE DESCRIPTION

Cruise Id: F7-86-HW Size: 22x16x11 cm Location: S. Johnston I. Ridge

Sample Id: CD13-3 Weight: 3.5 kg Depth:

Mn Crust Description

Surface Texture: smoothed botryoidal. Granular in places.

Mn Crust Thickness:

Min: 0.2 cm Max: 4.5 cm Ave: 3.0 cm

Layers (Outer to Inner):

	Min	Max	Ave	Texture
1.				
2.				
3.				
4.				
5.				
6.				

CD13-3

F7-86-HW
Karin Ridge
Johnston Is

Comments and XRD Mineralogy:

Note in photos porous layer in middle of crust filled w/ orange Fe oxides. These orange Fe oxides fill fractures (both layers ?) on thick side.

Substrate Description

Rock Type: Tuffaceous siltstone

Description:

Greenish brown with mn dendrites and coatings along fractures. White mud in vertical space. Lwr left in photo. Upr rt of subs (in photo) has lithic fragments surrounded by white mud

ANALYSES photo 1

(OVER)

Subsample & Type	Thickness of crust sampled ~~Analysis~~	~~Weight~~ Analysis and (weight)
A- bulk crust	20-40mm	"Mn crust chem" (44.6g) + XRD
B- bulk substrate	—	XRD

Described By: Subsampled By:

circled area sampled for chem + XRD

CD13-3
photo of slab on far right in photo 1. This face matches the face on the half pictured in photo 1.
Photo 2

F7-86-HW
Karin Ridge
Johnston Is

CD 13-3

F7-86-HW
Karin Ridge
Johnston IS

Sample Description

Cruise I.D: F7-86-HW Sample I.D: Sta: 15 CD13-4 Location: S. Johnston Ridge

22x19x9

Size: _____ Weight: 2.5 kg

Mn crust thickness:

Total: min: 4mm max: 78mm ave: 35mm

V. irregular

Inner crust: min: — max: — ave: —

Outer crust: min: — max: — ave: —

Surface texture: Smooth to granular

Internal structure: _____

layered: _____
laminated: _____
massive: X
porous: _____
dendritic: _____
other: _____

Mineralogy (XRD): _____

Associated alteration, phosphorite, or hydrothermal deposits: _____

Substratum:

Rock type: Volc. Breccia, phosphorite

Description: Greenish + reddish brown altered Volc. Rx Frags to 0.5 cm in fine-grained matrix - one large area of phosphorite

Mineralogy (XRD): _____

CD 13-4

F7-86-HW
Karin Ridge
Johnston Is

Analyses and subsamples:

analysis:	analyst:

Sample Description

Cruise I.D: F7-86-HW Sample I.D: Sta: 15 CD13-5 Location: S. Johnston Ridge

16 X 13 X 6
Size: _____ Weight: 1.2 kg

Mn crust thickness:

Total: min: 4.5 max: 6.0 ave: 5.0

Inner crust: min: 1.3 (1.0) max: 1.9 (2.5 middle) ave: 1.5 (2.0)

Outer crust: min: 1.3 max: 1.5 ave: 1.5

Surface texture: _____

Internal structure: _____

layered: _____
laminated: _____
massive: inner + outer
porous: middle
dendritic: _____
other: _____

Mineralogy (XRD): _____

Associated alteration, phosphorite, or hydrothermal deposits:

_____

Substratum:

Rock type: Volcanic Breccia

Description: yellowish brown - V. Thin film -

Mineralogy (XRD):

CD13-5

F7-86-HW
Karin Ridge
Johnston Is

Analyses and subsamples:

analysis:	analyst:

Phos Stud

SAMPLE DESCRIPTION

Cruise Id: F7-86-HW Size: 14 x 15 x 6 cm Location: S. Johnston I. Ridge

Sample Id: CD13-6 Weight: 1.46 kg Depth:

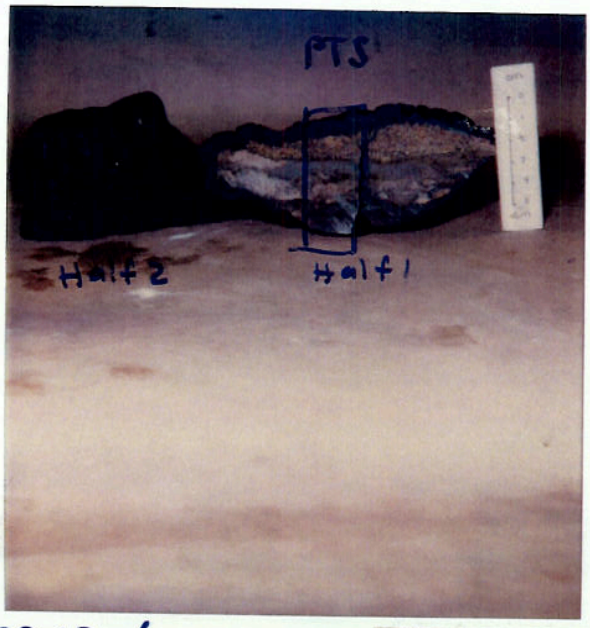
Mn Crust Description

Surface Texture: Botryoidal on top.
Smooth to granular on bottom

Mn Crust Thickness:
Min: 0.5 cm / 0.1 " Max: 0.9 cm / 1.6 " Ave: 0.7 cm (top) / 0.6 " (bottom)

Layers (Outer to Inner):

	Min	Max	Ave	Texture
1.				
2.				
3.				
4.				
5.				
6.				



CD13-6

F7-86-HW
Karin Ridge
Johnston Is

Comments and XRD Mineralogy:
Internal structure - massive

ANALYSES

Subsample & Type	Thickness of crust sampled ~~Analysis~~	~~Weight~~ Analysis (+ weight)
A - bulk crust	5-9 mm	"Mn crust chem" (12.5g);
		XRD
B - phosphorite	—	XRD
CD13-6	—	DPTS
35 MM slide		G. Smith

Substrate Description

Rock Type: phosphorite + hyaloclastic, layered

Description:
Cream to brown phosphorite + yellowish to greenish brown small volcanic clasts in altered volcanic debris.

Described By: d.j. (copied by [illegible]) Subsampled By:

CD13-6
Half 2

samples for chem. from this half

F7-86-HW
Karin Ridge
Johnston Is

Sample Description

Cruise I.D: F7-86-HW Sample I.D: Sta: 15-CD13-7 Location: S. Johnston I Ridge

13x9x6

Size: _____ Weight: 0.8 kg

Mn crust thickness:

Total: min: 2.0 max: 4.0 ave: 3.0

Inner crust: min: — max: — ave: —

Outer crust: min: _____ max: _____ ave: _____

Surface texture: smooth to granular

Internal structure:

layered:
laminated:
massive: X
porous:
dendritic:
other:

Mineralogy (XRD):

Associated alteration, phosphorite, or hydrothermal deposits:

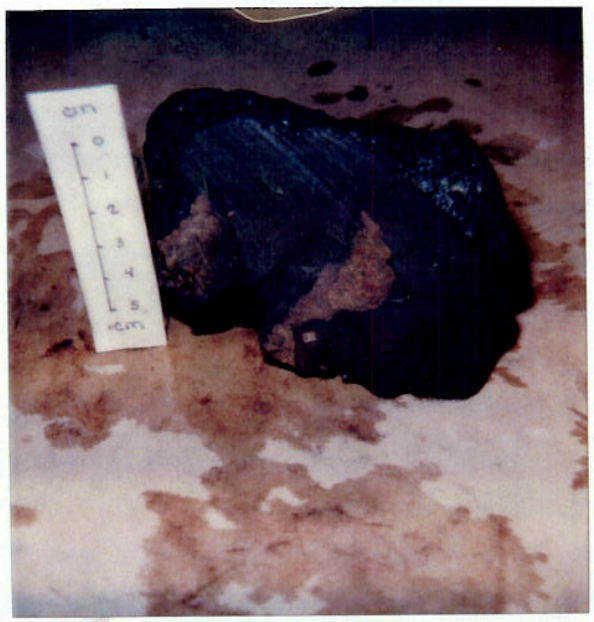
Substratum:

Rock type: Hyaloclastite

Description: brownish, fine-grained vole debris, altered

2 nuclei around which Mn accreted - Mn around clasts in nuclei

Mineralogy (XRD):



CD13-7

F7-86-HW
Karin Ridge
Johnston Is

Analyses and subsamples:

analysis:	analyst:

SAMPLE DESCRIPTION

Cruise Id: F7-86-HW Size: 14X10X7 cm Location: S. Johnston I. Ridge

Sample Id: CD13-8 Weight: 0.75 kg Depth: _____

Mn Crust Description

Surface Texture: Perfectly smooth

Mn Crust Thickness:

Min: 4.4 cm Max: 5.2 cm Ave: 4.7 cm

Layers (Outer to Inner):

	Min	Max	Ave	Texture
1.	0.8 cm	1.1 cm	1.0 cm	massive
2.	1.9	2.5	2.3	porous (w/ oranges re: oxide int'l. w/ ss)
3.	0.4	0.7	0.5	massive } sampled as one layer
4.	0.8	1.2	0.9	" }
5.				
6.				

photo 1

Comments and XRD Mineralogy:

Layers 3. and 4. separated by paper-thin layer of whitish (phosphorite?). Layer has wavy shape. Too difficult to separate layers 3 & 4. Thes identical in texture. Sampled together as one layer

Substrate Description

Rock Type: Hyaloclastite

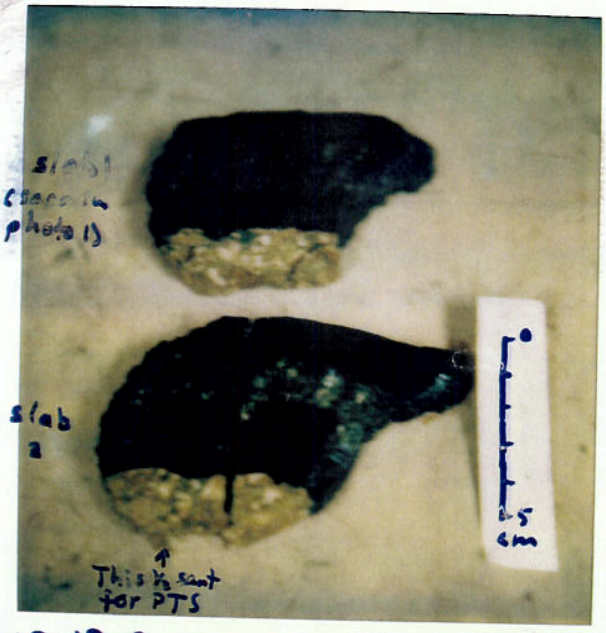
Description:

poorly sorted (comm down to coarse sand size), sub-rounded grayish (mostly in matrix) yellowish & brownish clasts

ANALYSES

Subsample & Type	Thickness of crust sampled ~~Analysis~~	~~Weight~~ Analysis & (weight)
A- layer 1 (outer)	8-11 mm (0-10)"	Mn crust chem, PGE group, Au
B- layer 2 (middle)	19-24 mm (10-35)"	REG (7.0 g REG 328 crust); XRD
C- layers 3,4 (inner)	44-47 mm (35-50) "	Same (11.3 g REG 40.9 g crust); XRD
D- bulk crust	50-52 mm	" (11.3 g REG 242 g crust) "
C- inner most 5mm (for substrate study)	5 mm	" (9.1 g " 30.1 g ") —
E- substrate	—	" (2.4 g " 16.0 g ") XRD
D.S/ob for PTS - ~~did not send~~		silicate chem: 10 majors + PGE
		44 elem. ICP (1.85g); XRD

Described By: Jim Hein, Lisa Gein Subsampled By:



CD 13-8

photo 2

F7-86-HW
~~Karin Ridge~~
Johnston IS

~2 more slabs were cut behind slab 2.
Those + end piece of rt. half of slab 2
sampled for chemistry

Sample Description

Cruise I.D: F7-86-HW Sample I.D: Sta: 15 CD13-9 Location: S. Johnston Ridge

18x14x5 -

Size: _____ Weight: 1.5 kg

Mn crust thickness:

Total: min: 5.4 max: 6.2 ave: 6.0

Inner crust: min: — max: — ave: —

Outer crust: min: _____ max: _____ ave: _____

Surface texture: Botryoidal all round

Internal structure: Slab of pure oxide -

layered: X May have have an
laminated: X old crust as a
massive: X w/in layers Nucleus -
porous:
dendritic:
other:

Mineralogy (XRD):

Associated alteration, phosphorite, or hydrothermal deposits:

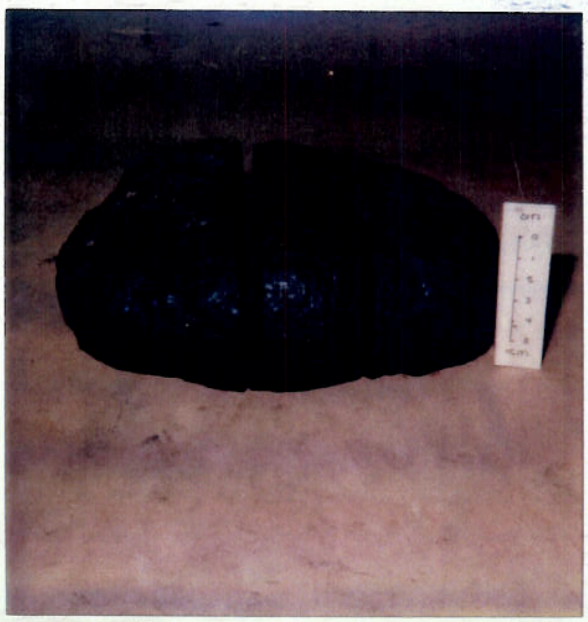
Thin stringer of phosphorite

Substratum:

Rock type: NONE

Description:

Mineralogy (XRD):



CD 13-9

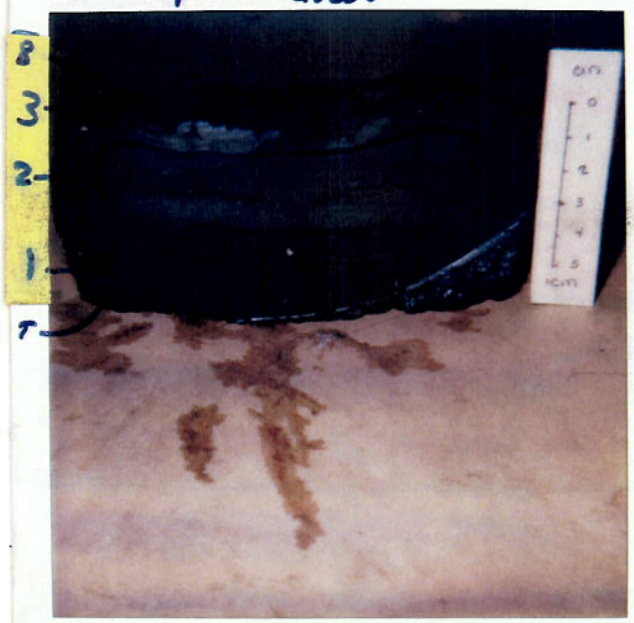
picture is upside down

F7-86-HW
~~Karin Ridge~~
Johnston IS

Analyses and subsamples:

~~analysis~~ sample, (thickness sent):	analysis (wt sent):
A = upr crust (25-28mm)	Mn crust chem (70.19); XX
B = nucleus (20-29 mm)	" " " (61.8g); "

upside down



CD 13-9
middle slab

T = Top surface
1 = Top (upr) crust
2 = nucleus
3 = lwr crust
B = bottom surface

F7-86-HW
Karin Ridge
Johnston Is

Layers (outer to inner)

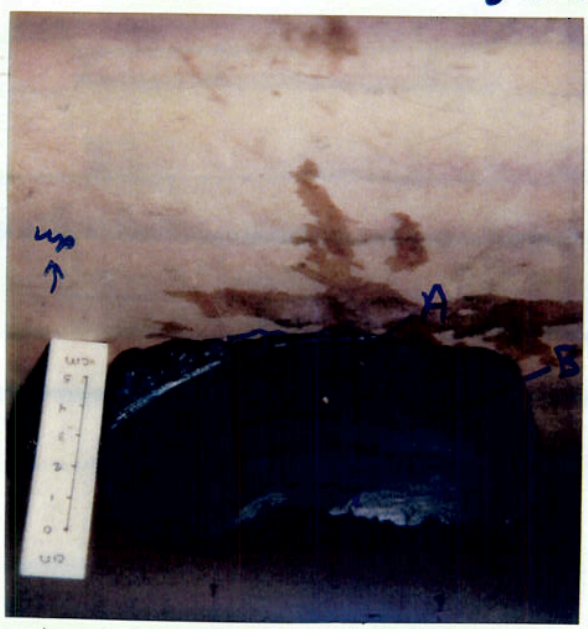
	Min	Max	Ave.	Texture
3.	3 mm	9 mm	7 mm	massive
2.	20 "	29 "	24 "	laminated w/ phosph. [illegible] layers (nucleus)
1.	26 "	32 "	28 "	porous w/ orange [illegible] some phosphate [illegible] (bottom)

* nucleus: lwr half laminated (at least 6 layers)
total thickness 10-13 mm. ave 11 mm.
upper half massive. 5-7 mm thick.
bottom boundary is wavy.

There is weathering product (orange) betw. nucleus layers & betw nucleus & adjacent layers.

CD 13-9
middle slab

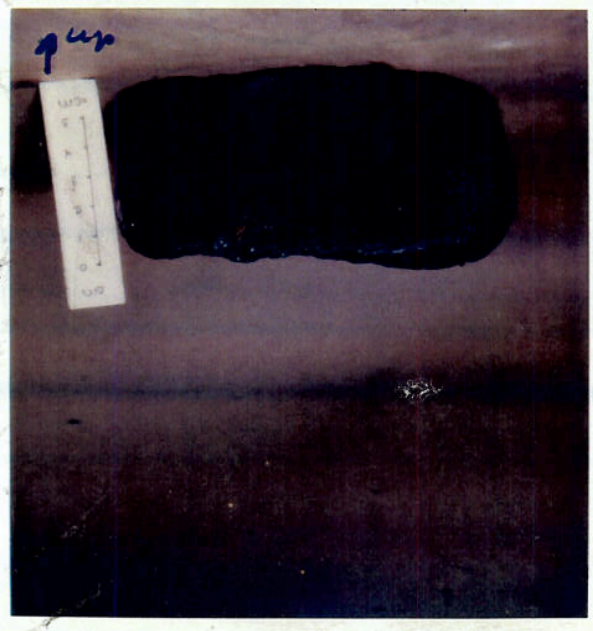
F7-86-HW
Karin Ridge
Johnston Is



blocked area sent for chemistry (+XRD)

CD 13-9
back of middle slab w/ phosphorite (?) clast + string in top crust + nucleus

F7-86-HW
Karin Ridg
Johnston I



Sample Description

Cruise I.D: F7-86-HW Sample I.D: Sta: 15 CD 13-10 Location: S. Johnston Ridge

19.5 x 16 x 4.5

Size: _____ Weight: 1.2 kg

Mn crust thickness:

Total: min: 3.0 max: 4.0 ave: 3.5

Inner crust: min: _____ max: _____ ave: _____

Outer crust: min: _____ max: _____ ave: _____

OVER →

Surface texture: botryoidal to smoothed Botryoidal

Internal structure: _____

layered: 5 (+) ?

laminated: 1 laminated

massive: X w/in layers

porous: _____

dendritic: _____

other: _____

Mineralogy (XRD): _____

Associated alteration, phosphorite, or hydrothermal deposits: _____

Substratum:

Rock type: NONE

Description: _____

Mineralogy (XRD): _____

CD13-10

F7-86-HW
~~Karin Ridge~~
Johnston Is

Analyses and subsamples:

analysis:	analyst:

Layers (outer to inner):

	min	max	ave	texture
1.	0.6 (cm)	1.4	1.2	massive
2.	0.4	0.5	0.5	"
3.	0.9	1.2	1.1	"
4.	0.8	1.0	0.9	laminated (≥5 layers)
5.	difficult to key; broken along bottom		~0.8	massive

Sample Description

Cruise I.D: F7-86-HW Sample I.D: Sta: 15 CD13 - 11 Location: S. Johnston Ridge

18x14x7

Size: _____ Weight: 3 kg

Mn crust thickness:

Total: min: 2.9 max: 4.5 ave: 3.5 top
1.2 1.7 1.5 bottom

Inner crust: min: _____ max: _____ ave: _____

Outer crust: min: _____ max: _____ ave: _____

Surface texture: Botryoidal To Smoothed Bot.

Internal structure:

layered: 5 +
laminated: 1
massive: all u/in layers
porous:
dendritic:
other:

I don't see 5+ layers. To massive on left side. Laminated at mid-level on right side.

Mineralogy (XRD):

Associated alteration, phosphorite, or hydrothermal deposits:

Substratum:

Rock type: Phosphorite + volc. breccia

Description:

Breccia consists of orange + green clasts in mn matrix. Clasts angular to subrounded, med. sand size to 4 mm diam. Cream-colored phosphorite tops the breccia. Phos. has a few brown clasts in it. A bone + tori gnatos phos. volc. clasts. 3 phos. nuclei + stringers intermixed w/ innermost Mn layer.

Mineralogy (XRD):

CD13-11

F7-86-HW
Karin Ridge
Johnston Is

Analyses and subsamples:

analysis:	analyst:

Sample Description

Cruise I.D: F7-86-HW
21-41147
Sample I.D: Sta: 15 CD13-12
Location: S. Johnston Ridge
Size: _____ Weight: 3.5 kg

Mn crust thickness:

Total: min: 1.3 max: 2.3 ave: 2.1

Inner crust: min: ____ max: ____ ave: 0.8

Outer crust: min: ____ max: ____ ave: 1.3

Surface texture: Botryoidal to smoothed Bot.

Internal structure:

layered: 2
laminated:
massive: both
porous:
dendritic:
other:

Mineralogy (XRD):

Associated alteration, phosphorite, or hydrothermal deposits:

Substratum:

Rock type: Siltstone or Tuff

Description: Greenish-gray Tuffaceous Siltst. or Tuff with pebbles w/ Mn fragments - Crudely layered -

Mineralogy (XRD):

CD13-12

F7-86-HW
Karin Ridge
Johnston Is

Analyses and subsamples:

analysis:	analyst:

Sample Description

Cruise I.D: F7-86-HW Sample I.D: Sta: 15 CD13-13 Location: S. Johnston Ridge

28 x 21 x 7

Size: _____ Weight: 4 kg

Mn crust thickness:

Total: min: 0.8 cm max: 24 cm ave: 1.6 cm

Inner crust: min: — max: — ave: —

Outer crust: min: — max: — ave: —

Surface texture: Botryoidal

Internal structure:

layered:
laminated:
massive: X
porous:
dendritic:
other:

Mineralogy (XRD):

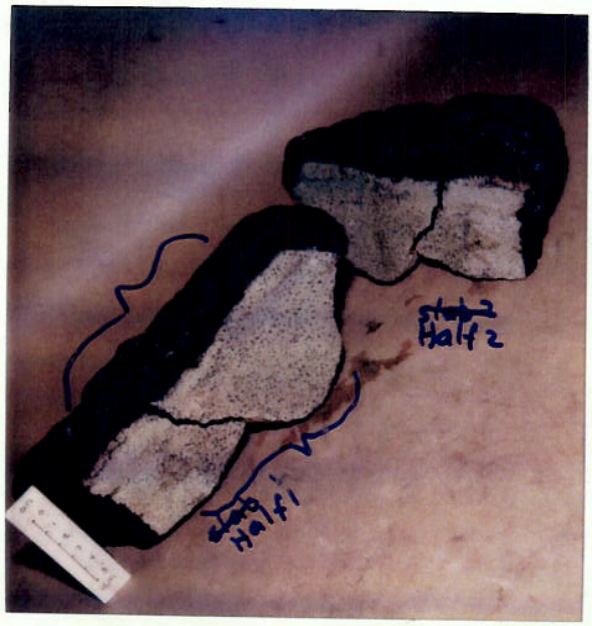
Associated alteration, phosphorite, or hydrothermal deposits:

Substratum:

Rock type: Tuffaceous siltstone

Description: greenish-gray Tuff peppered w/ black Mn flecks(?)

Mineralogy (XRD):



CD13-13

Cut 2 slabs from half 1. Subsampled bracketed area for crust chem, silicate chem, paleo

F7-86-HW
Karin Ridg
Johnston I

Analyses and subsamples:

subsample & type (+ thickness) ~~analysis~~:	analysis & (wt. sent) ~~analyst~~:
A - bulk crust (10-23 mm)	"Mn crust chem" + Pt gro + Au (38.6g); REE (10.1g)
B - Crust - inner 5 mm for substrate study	"Mn crust chem" (11.8g)
C - bulk substrate	silicate chem. (16.7g) (10 major + FeO + 44-elem IC
	Paleo - to Paula Q. (44.4

A little sediment is imbedded in top of crust. Green patina from weathering along occasional fractures in crust

Lisa Gein

Sample Description

Cruise I.D: F7-86-HW Sample I.D: Sta: 15 CD13-14 Location: S. Johnston Ridge

Size: 27x20x16 Weight: 3 kg

Mn crust thickness:

Total: min: 0.8 max: 2.0 ave: 1.5 top sides
1.0 3.5 2.0 bottom

Inner crust: min: max: ave:

Outer crust: min: max: ave:

Surface texture: Bulbous & smooth microbotryn

Internal structure:

layered:
laminated:
massive: X bottom, part of rt. side
porous: X top sides a little on bottom
dendritic:
other:

Mineralogy (XRD):

Associated alteration, phosphorite, or hydrothermal deposits:

Substratum:

Rock type: Tuffaceous siltstone

Description: greenish-gray tuff peppered w/ Mn chips.

Mineralogy (XRD):

CD13-14

F7-86-HW
Karin Ridge
Johnston Is

Analyses and subsamples:

analysis:	analyst:

Sample Description

Cruise I.D: F7-86-HW Sample I.D: Sta: 15 CD13-15 Location: S Johnston I Karin Ridge

Size: 18x16x5.5 Weight: 1 kg

Mn crust thickness:

Total: min: 3.8 max: 5.3 ave: 5.0

Inner crust: min: 1.2 max: 1.8 ave: 1.6
middle 2.0 2.5 2.2

Outer crust: min: 1.1 max: 1.2 ave: 1.2

Surface texture: Smooth Ridged

Internal structure:

layered: ?
laminated: inner (>6)
massive: outer inner(w/ laminations)
porous: middle
dendritic:
other:

Mineralogy (XRD):

Associated alteration, phosphorite, or hydrothermal deposits:

Substratum:

Rock type: MnUS

Description:

Mineralogy (XRD):

CD 13-15

F7-86-HW
Karin Ridge
Johnston Is

Analyses and subsamples:

analysis:	analyst:

Sample Description

Cruise I.D: F7-86-HW Sample I.D: Sta: 15 CD13-16 Location: S. Johnston I. Karin Ridge

15 x 13 x 3.5

Size: _____ Weight: 0.5 kg

Mn crust thickness:

Total: min: 2.5 max: 3.5 ave: 3.0

Inner crust: min: ____ max: ____ ave: ____

Outer crust: min: ____ max: ____ ave: ____ OUTER →

Surface texture: Botryoidal

Internal structure: _____

layered: 5-(+)

laminated: X some layers

massive: X within layers & zone

porous: _____

dendritic: _____

other: _____

CD 13-16

F7-86-HW
Karin Ridge
Johnston Is

Mineralogy (XRD): _____

Associated alteration, phosphorite, or hydrothermal deposits: _____

Substratum:

Rock type: NONE

Description: many encrusting layers -

Mineralogy (XRD): _____

Analyses and subsamples:

analysis:	analyst:

Layers (outer to inner):

	min	max	ave	texture
1.	0.7 cm	1.4	0.9	massive
2.	0.7	0.7	0.7	"
3	"	"	"	laminated (≥6 layers)
4.	0.3	0.5	0.4	laminated (≤2)
5.	0.3	0.5	0.4	massive

Sample Description

Cruise I.D: F7-86-HW Sample I.D: Sta: 15 CD13-17 Location: S. Johnston I. Karin Ridge

25 x 16 x 3.5
Size: _____ Weight: 1.3 kg

Mn crust thickness:

Total: min: 3.0 max: 4.0 ave: 3.3

Inner crust: min: ____ max: ____ ave: ____

Outer crust: min: ____ max: ____ ave: ____

Over →

Surface texture: Botryoidal; granular in places

Internal structure: _____

layered: 4 (+)
laminated: w/in some
massive: w/in others
porous: _____
dendritic: _____
other: _____

Mineralogy (XRD): _____

Associated alteration, phosphorite, or hydrothermal deposits: _____

Substratum:

Rock type: NONE

Description: _____

Mineralogy (XRD): _____

CD13-17

F7-86-HW
Karin Ridge
Johnston Is

Analyses and subsamples:

analysis:	analyst:

Layers (outer to inner):

	min	max	ave	texture
1.	0.5 cm	0.8	0.6	massive
2.	0.5	0.7	0.6	"
3.	0.9	1.1	1.0	laminated (≥7 layers)
4.	0.5	0.6	0.6	massive. volc. breccia in lwr left corner. (3x16 mm) Phos. matrix, w/some mm. Rt. side has tan sediment separating this layer from layer above. A few small patches phos.(?) along bottom of layer
5.	0.2	0.5	0.3	massive

Sample Description

Cruise I.D: F7-86-HW Sample I.D: Sta: 15 CD13-18 Location: S Johnston Is, Karin Ridge

Size: 14x12x12 Weight: 1.2 kg

Mn crust thickness:

Total: min: 1.0 max: 5.0 ave: 2.0

Inner crust: min: — max: — ave: —

Outer crust: min: max: ave:

Surface texture: smooth

Internal structure:

layered:
laminated:
massive: X
porous:
dendritic:
other:

Mineralogy (XRD):

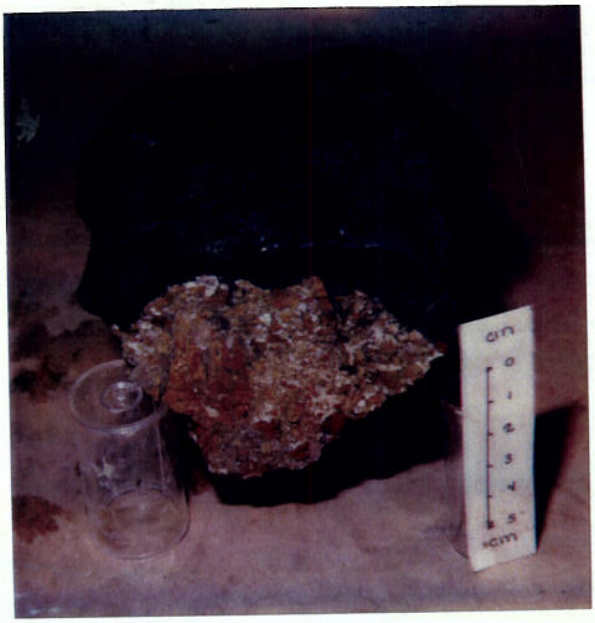
Associated alteration, phosphorite, or hydrothermal deposits:

Substratum:

Rock type: Volcanic Breccia

Description: Ochre to reddish brown altered basalt clasts in phosphorite + calcite(?) cement

Mineralogy (XRD):



CD 13-18

F7-86-HW
KarinRidge
Johnston Is

Analyses and subsamples:

analysis:	analyst:

Sample Description

Cruise I.D: F7-86-HW Sample I.D: Sta: 15 CD13-19 Location: S. Johnston I Ridge

14x12x5

Size: _____ Weight: 0.7 kg

Mn crust thickness:

Total: min: 2.5 max: 5.0 ave: 4x0

Inner crust: min: _____ max: _____ ave: _____

Outer crust: min: _____ max: _____ ave: _____ OVER

Surface texture: Botryoidal - many encrusting forams

Internal structure:

layered: 4 (+)

laminated: 1

massive: 3+

porous:

dendritic:

other:

CD13-19 slab 1

~~cut slab for PTS (w/ containing clast)~~

F7-86-HW
Karin Ridge
Johnston Is

Mineralogy (XRD):

Associated alteration, phosphorite, or hydrothermal deposits:

slab1: Clast near bottom of crust, consisting of phosphorite (?) (upper ½), and breccia (lower ½).

slab2: more clasts - phosphorites + breccias

Substratum:

Rock type: NONE

Description:

Mineralogy (XRD):

Analyses and subsamples:

~~analysis~~ sample:	~~analyst~~ analysis:

described by James Hein & Lisa Grein
subsampled by Lisa Grein

slab 1

Layers (cm)

	min	max	ave	Texture
1.	1.0	2.0	1.5	porous. Orange infilling. a=pore w/ white (phosphate?) in filling.
2.	0.9	1.0	1.0	massive
3.	0.7	1.1	1.0	laminated, fractured at least 6 layers
4.	0.5	2.0	1.2	massive w/ clast. b= hole; c = med. brown dk brown phosphorite; d= breccia; e phosphorite stringers; f=fracture

Sent slab 2 for PTS. area of crust including clasts. This slab fell apart when cut. Taped together.

Sample Description

Cruise I.D: F7-86-HW

Sample I.D: Sta: 15 CD13-20

Location: S Johnston I Ridge

17X10X12

Size: _____ Weight: 1 kg

Mn crust thickness:

Total: min: 1.8 max: 3.0 ave: 2.5

Inner crust: min: 1.0 max: 1.9 ave: 1.5

Outer crust: min: 0.9 max: 1.5 ave: 1.2

Surface texture: smooth

Internal structure:

layered: _____

laminated: _____

massive: x (outer)

porous: x (inner) w/ sed. matrix Fe-oxide infilling

dendritic: _____

other: _____

Mineralogy (XRD): _____

Associated alteration, phosphorite, or hydrothermal deposits: _____

Substratum:

Rock type: Volcanic Breccia

Description: altered Vole R* clasts in iron oxide, phyllosilicate, calcite (?) cement

Mineralogy (XRD): _____

Analyses and subsamples:

analysis:	analyst:

Sample Description

Cruise I.D: F7-86-HW Sample I.D: Sta: 15 CD13-21 Location: S. Johnston I. Ridge

Size: 19x18x9 Weight: 1.5 kg

Mn crust thickness:

Total: min: 3.5 max: 5.3 ave: 4.5

Inner crust: min: max: ave:

Outer crust: min: max: ave:

OVER →

Surface texture:

Internal structure:

layered: 3 (+)
laminated: 1
massive: 2
porous: 1
dendritic:
other:

Mineralogy (XRD):

Associated alteration, phosphorite, or hydrothermal deposits:

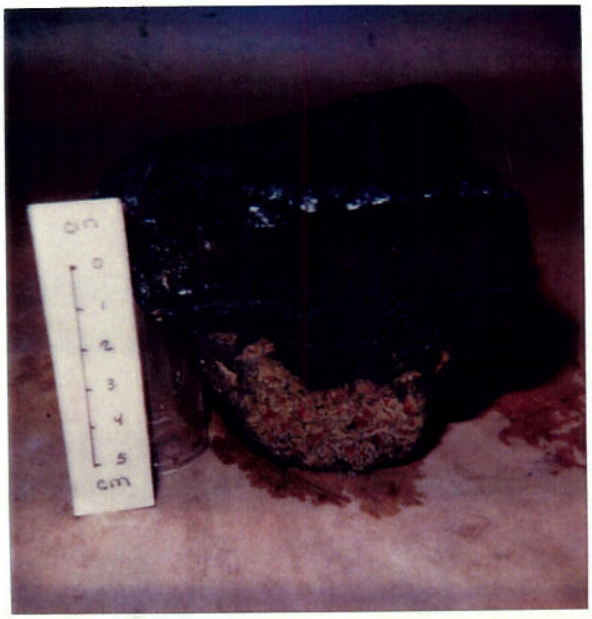
Substratum:

Rock type: Basalt (or large clast from a Breccia)

Description: gray vesicular Basalt

doesn't match photo

Mineralogy (XRD):



CD 13-21

F7-86-HW
Karin Ridge
Johnston Is

Analyses and subsamples:

analysis:	analyst:

Largest (center to rim):

	min	max	ave	texture
1.	0.7 cm	1.2	1.0	massive
2.	1.4	1.5	1.5	porous w/ orange Fe-oxide infillings
3.	0.4	0.5	0.5	laminated, massive w/ laminations
4.	0.8	1.0	0.9	laminated, (25 layers) massive w/ laminations
5.	0.4	1.5	1.1	massive, fractures filled w/ sediment stringers (white, yellowish)

Sample Description

Cruise I.D: F7-86-HW Sample I.D: Sta: 15 CD 13-22 Location: S. Johnston Ridge

Size: _____ Weight: _____

Mn crust thickness:

Total: min: 2.8 max: 4.3 ave: 3.5

Inner crust: min: 1.5 max: 2.3 ave: 1.7 laminated (>10 layers)
middle 0.5 0.8 0.7 massives

Outer crust: min: 0.8 max: 1.4 ave: 1.1 porous

Surface texture: Smoothed botryoidal

Internal structure: Many layers separated by thin parting of clay or phosphorite

I see 3 layers -Lisa

layered: 4 (+)
laminated: 1
massive: 3
porous: _____
dendritic: _____
other: _____

Mineralogy (XRD): _____

Associated alteration, phosphorite, or hydrothermal deposits: _____

Substratum:

Rock type: NONE

Description: _____

Mineralogy (XRD): _____

Analyses and subsamples:

analysis:	analyst:

Sample Description

Cruise I.D: F7-86-HW Sample I.D: Sta: 15 CD13-23 Location: S. Johnston I. Ridge

Size: 13x8x6 Weight: 0.4 kg

Mn crust thickness:

Total: min: 4.3 max: 4.9 ave: 4.6

Inner crust: min: ____ max: ____ ave: ____

Outer crust: min: ____ max: ____ ave: ____

OUTER →

Surface texture: smooth

Internal structure:

layered: 4 (L)
laminated: 1 ← disagree (LG)
massive: 3
porous: 1
dendritic: ____
other: ____

Mineralogy (XRD): ____

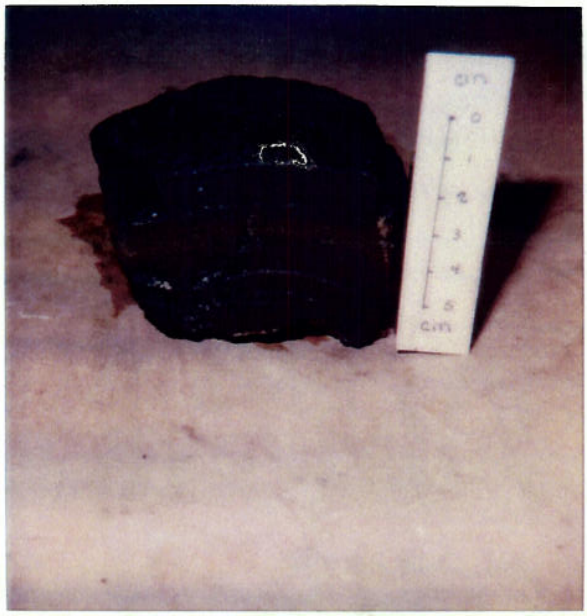
Associated alteration, phosphorite, or hydrothermal deposits: ____

Substratum:

Rock type: Volcanic Breccia

Description: yellowish-green-brown thin layer

Mineralogy (XRD): ____



CD13-23

F7-86-HW
Karin Ridge
Johnston Is

Analyses and subsamples:

analysis:	analyst:

Layers (outer to inner):

	min	max	ave.	texture
1.	1.0	1.1	1.1	massive
2.	1.9	2.0	2.0	porous - w/ orange Fe-oxide + sediment infillings
3.	0.8	0.9	0.8	massive
4.	0.97 ↑ some spalled off	1.1	1.0	massive

Sample Description

Cruise I.D: F7-86-HW Sample I.D: Sta: 15 CD13-24 Location: S. Johnston I. Ridge

Size: 12 x 9 x 6 Weight: 0.2 kg

Mn crust thickness:

Total: min: 4.8 max: 5.2 ave: 5.0

Inner crust: min: max: ave:

OVER →

Outer crust: min: max: ave:

Surface texture: smooth rippled

Internal structure:

layered: 3 (+)
laminated:
massive: 3
porous:
dendritic:
other:

Mineralogy (XRD):

Associated alteration, phosphorite, or hydrothermal deposits:

Substratum: NONE

Rock type:

Description: small patch on underside of crust is orange to yellow volc. SS (?) or breccia (?)

Mineralogy (XRD):

CD 13-24

F7-86-HW
Karin Ridge
Johnston Is

Analyses and subsamples:

analysis:	analyst:

Layers (outer to inner):

	min	max	ave	texture
1.	1.1	1.5	1.3	massive
2.	2.1	2.2	2.2	porous - (filled w/orange Fe. oxides & tan mud)
3.	0.5	0.6	0.6	massive
4.	* ~0.3	* ~0.3	* ~0.3	* hard to tell, from breakage massive
5.			* ~0.4	* hard to tell due to breakage massive

NOTES: Thin (<½ mm) layers of phos. (?) separate layers 2, 3, 4, 5.

Sample Description

Cruise I.D: F7-86-HW Sample I.D: Sta: 15 CD13-25 Location: S. Johnston Is Karin Ridge

Size: _____ Weight: 0.3 kg

Mn crust thickness:

	min	max	ave	
Total:	3.2	5.3	4.4	0.8-1.1 side + bottom
Inner crust:	0.9	2.1	1.8	massive
middle	0.9	1.3	1.1	porous
Outer crust:	1.0	1.4	1.2	massive

Surface texture: Perfectly smooth

Internal structure:

layered: 3 (+)
laminated:
massive: Y
porous: X
dendritic:
other:

Mineralogy (XRD):

Associated alteration, phosphorite, or hydrothermal deposits:

Substratum:

Rock type: volc. breccia & phosphorite? ↑ or s:?

Description: white phosphorite (?) nodules and encrustation of crust & brownish volc. breccia (?) w/ Mn around some clasts, or volc. ss w/ some clasts in it.

Mineralogy (XRD):

Analyses and subsamples:

analysis:	analyst:

Sample Description

Cruise I.D: F7-86-HW Sample I.D: Sta: 15 CD13-26 Location: S. Johnston I. Karin Ridge

12 x 10 x 8

Size: _____ Weight: 0.5

Mn crust thickness:

Total: min: 3.0 / 1.0 max: 5.0 / 1.4 ave: 4.0 / 1.2 Top / Bottom

Inner crust: min: — max: — ave: —

Outer crust: min: — max: — ave: —

Surface texture: irregular w/ imbedded phosphorite or Basalt pebbles

Internal structure:

layered:
laminated:
massive: X
porous:
dendritic:
other:

Mineralogy (XRD):

Associated alteration, phosphorite, or hydrothermal deposits:

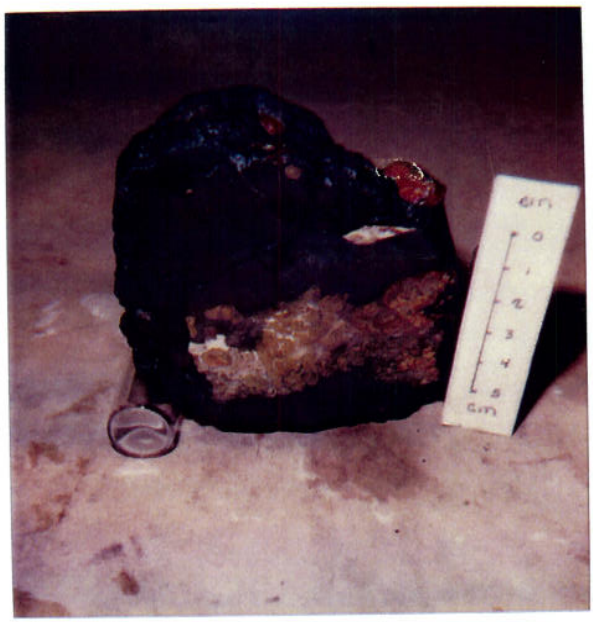
phosph. stringers in crust 1/4 - 1

Substratum:

Rock type: Vole. Breccia

Description: Cream colored phosphorite cemented yellow-brown altered Volc. Rx. clasts of various pebble size

Mineralogy (XRD):



CD13-26

F7-86-HW
Karin Ridge
Johnston Is

Analyses and subsamples:

analysis:	analyst:
Y2 to Bu minors	

Sample Description

Cruise I.D: F7-86-HW **Sample I.D: Sta:** 15 CD13-27 **Location:** S. Johnston I Ridge

Size: Various **Weight:** Various

Cut 10 nodules of various sizes: (See photo on back)

Mn crust thickness: A bag of 33 nodules from 1 to 8½ mm diameter

Total: min: max: ave:

Inner crust: min: max: ave:

Outer crust: min: max: ave:

CD13-27

F7-86-HW
Karin Ridge
Johnston Is
photo 1

Surface texture: botryoidal to smoothed botry. #5 - smooth. (More like a crust frag. than nodule.)

Internal structure:

layered: 4 (#1, 3, 5, 6, maybe 7?)
laminated: 1 (#5)
massive: X all
porous: X some layers w/ some layered nodules
dendritic:
other:

Mineralogy (XRD):

Associated alteration, phosphorite, or hydrothermal deposits:

Substratum:

Rock type: Tuffaceous siltstone or volc. breccia or Tuff -

Description:

Volcanic breccia (#1, 6, 7, 9, 10): greenish, orangish, brownish clasts, angular to subrounded small pebble to med. sand sized. 7+9 are cement supported in phos. or zeol. (phillipsite?) matrix. Mn specks + dendrites, esp. 6+10. Mn + phos. (?) matrix in #1. Lt. Brown phos. (?) clast in #1.

Tuff or siltst. (2, 4, 8): Lt. green or yellowish-green. Mn specks + dendrites in #2, almost cover #4. Crude bedding in #4.

Mineralogy (XRD):

No matrix (#3, 5). #2 - Possible Mn nucleus. 3 layers, incl. nucleus. #5 layered (3) like a crust. Layers 1, 3 are porous. Layer 2 is laminated w/ white phos. or zeol. layer (< ½ mm) separating it from adj layer.

Analyses and subsamples:

subsample, type, thickness ~~analysis~~:	analysis + cut. sent
CD13-27-1: Bulk crust (0.9-1.5cm)	"Mn crust chem." (12.6g),
-3: " " (2.2-2.7cm)	" " " (18.6g),
-8A: " " (0.4-0.7cm)	" " " (14.0g),
-8B: substrate	XRD only

CD 13-27

F7-86-HW
Karin Ridge
Johnston Is
photo 2

nodule measurements (cm)

1. 8½ × 7-½ × 5½
2. 4.4 × 4.0 × 3.7
3. 3.8 × 3.8 × 2.5
4. 5.0 × 3.3 × 2.8
5. 3.1 × 2.5 × 1.8
6. 4.0 × 4.0 × 3.8
7. 4.0 × 3.6 × 3.2
8. 4.0 × 3.5 × 3.0
9. 4.5 × 2.5 × 2.4
10. 2.8 × 2.0 × 1.8

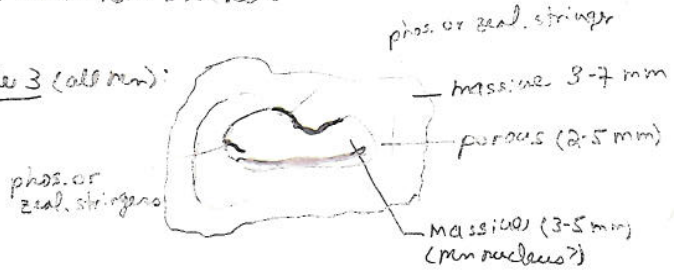
Samples sent for chemistry: Bulk crust, "mn crust chem" (sent 1 vole. breccia, 1 tuff, 1 solid mn)

nodules 1: 3 layers (vole. breccia). 1, 2 slightly porous w/ orange fe-oxides. 3 massive. phos or zeol stringer between parts of layers of 3. On one side, layer 3 is thick w/ phos. or zeol. filling fractures. (upper rt. in photo 2)

Layer 1: 3-7 mm, ave. 5mm
2. 1-5 ", ave. 4 mm (only coated halfway)
3. 1-19 ", " 6 "

Sent area under brackets

nodule 3 (all mn):



nodule 8: (tuff or tuff. silt.). Crust thickness 4-7 m
massive. Not layered.

Good for Phosphorite Study

This boulder didn't get assigned a number on board ship labeled in bag w/ just the dredge number

SAMPLE DESCRIPTION

Cruise Id: F7-86-HW Size: 22cm x 33cm x [illegible] Location: S. Johnston Is Ridge

Sample Id: CD 13-28 Weight: 25 kg Depth:

Mn Crust Description

Surface Texture: Dotryoidal [illegible]

[illegible]

Mn Crust Thickness:

Min: 30 mm Max: 45 mm Ave: 37.5 mm

Cruise on [illegible] side [illegible]

Layers (Outer to Inner):

	Min	Max	Ave	Texture
1.	24 mm	27 mm	25.5 mm	massive w/layers [illegible] Fe stained. [illegible] & bottom
2.	11 mm	20 mm	[illegible]	massive
3.				
4.				
5.				
6.				

CD 13-28

Comments and XRD Mineralogy:

ANALYSES

Subsample & Type	Analysis	Weight
Archive*		
35mm slide		G. Smith

Substrate Description

Rock Type: Volcaniclastic Breccia

Description:

Basalt and Hylocarbon clasts in matrix of phosphorites (below) & Mn (above)

Light brown phosphorite w/burrows seems to be being replaced by darker phosphorite

* NOTE: Tried to slab smaller ½ for Archive fell apart [illegible] will impregnate larger ½ before trying to slab

Described By: JSM Subsampled By: