Central
Karin Rdg.
East side

CD1 Karin Ridge EC

AMPLE ID	Mn CHEM	Pt & Au	REE	Si Chem	DP Sect.	35mm Pho	Archive	Paleo					
D1-1													
D1-2	Bulk												
D1-3	Bulk			Basalt									
D1-4	Bulk			Breccia									
D1-5													
D1-6	Bulk			Hyalo-clastite									
D1-7	Bulk				✓								
D1-8					✓ Thin Sect			✓					
D1-9					✓ Thin Sect			✓					
D1-10	Layers	Layers	~~Bulk~~	Limestone	✓			✓					
D1-11	Bulk			Mudstone									
D1-12					✓ Thin Sec.			✓					
D1-13													
D1-14	Bulk			Volclastic Sandstone									
D1-15	Bulk			Phos. Limstone									
D1-16	Bulk			Basalt									
D1-17	Layers	Layers	~~Layers~~ Bulk										
D1-18													
D1-19	Bulk			V. Breccia	✓								
D1-20	Bulk				✓								
D1-21	Bulk	Bulk											

Karin Ridge
Johnston Is

Sample Description

Cruise I.D:

Sample I.D: Sta: 01 D CD-1-1

Location: Central Karin Ridge east side

Size: 8x6.5x4cm Weight: ~500g

Mn crust thickness:

Total: min: 3cm max: 3cm ave: 3.3cm

Inner crust: min: max: ave: 1.5cm

Outer crust: min: max: ave: 1.8cm

Surface texture: porous (but flat)

Internal structure:

layered: faintly
laminated:
massive: ✓ [illegible]
porous: ✓ dendritic [illegible]
dendritic:
other:

Mineralogy (XRD):

Associated alteration, phosphorite, or hydrothermal deposits:

Abundant foraminifera on surface

Substratum: NONE

Rock type:

Description:

Mineralogy (XRD):

Analyses and subsamples:

analysis:	analyst:

CDI-1

F7-86-HW
Karin Ridge
Johnston Is

F7-86-HW
Karin Ridge
Johnston Is

Sample Description

Cruise I.D:

Sample I.D: Sta: 001 D CD-1-2

Location: Central Karin Ridge

Size: 8x11x12cm **Weight:** Kg
2/3 of total rock

Mn crust thickness:

Total: min: 11 max: 18 ave: 15mm

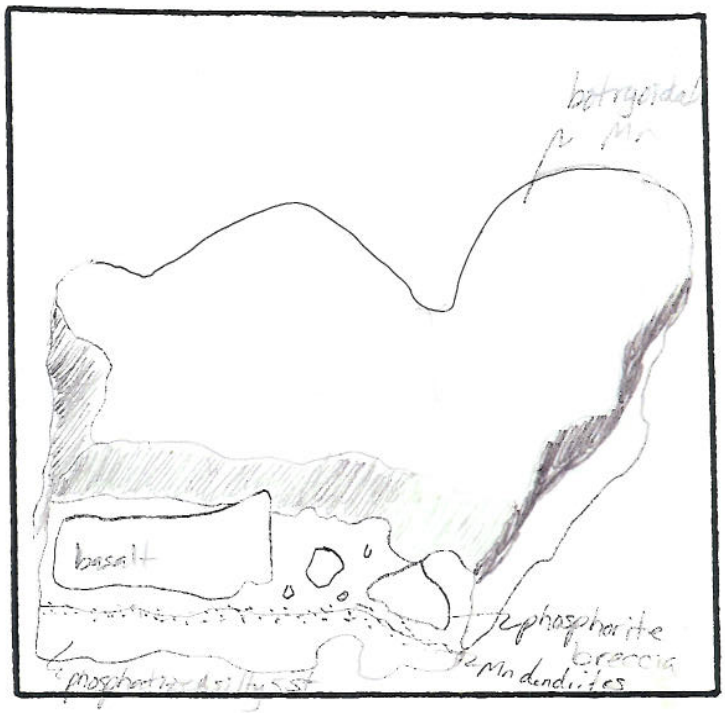
Inner crust: min: max: ave:

Outer crust: min: max: ave:

Surface texture: Large botryoidal & smooth

Internal structure:

layered:
laminated:
massive:
porous: ✓ pores are filled w/ Fe-oxides
dendritic:
other:



Mineralogy (XRD):

Associated alteration, phosphorite, or hydrothermal deposits:

Numerous forams on surface

Substratum:

Rock type: Phosphorite breccia/sandstone

Description: The upper part of the substrate (in contact with the crust) consists of a white phosphorite matrix w/ numerous tiny (<2mm) volcanic fragments & 3 larger (1-5cm) altered brown & gray basalt clasts w/ dendritic crust of Mn. The basaltic clasts protrude into the Mn crust. This layer is separated by Mn dendrites from the lower layer of phosphatized yellow silty sandstone w/ pockets of brown mud.

Mineralogy (XRD):

Analyses and subsamples:

analysis:	analyst:
Mn Crust Package	M. Marcus 10-15
CD1-2A (Bulk Crust) 10-100gm sample	15mm

CD1-2

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

Sample Description

Cruise I.D: 1

Sample I.D: Sta: 101 DCD-1-3

Location: Central Karin Ridge

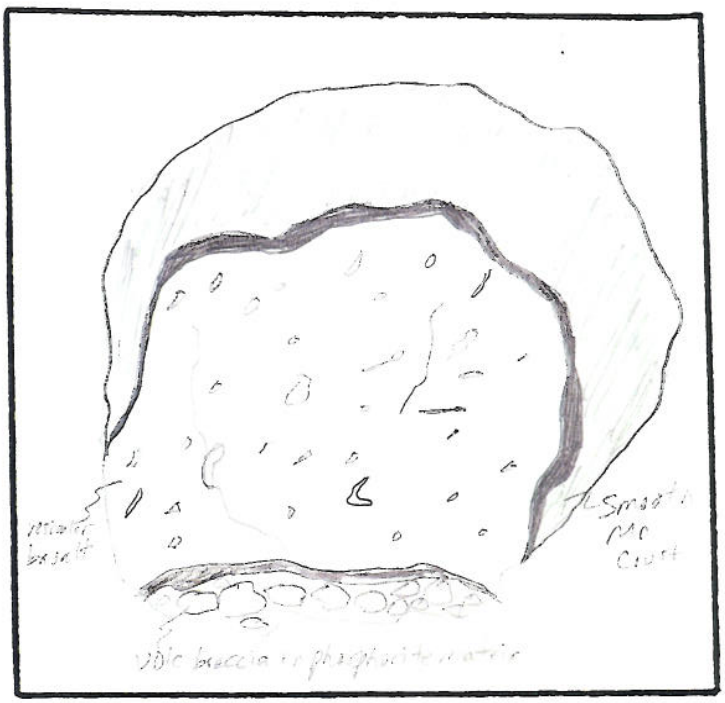
Size: 20X17X12cm **Weight:** ≈9Kg

Mn crust thickness:

Total: min: 1mm max: 5mm ave: 3mm

Inner crust: min: — max: ave:

Outer crust: min: — max: ave:



Surface texture: Smooth

Internal structure:

layered:
laminated:
massive: ✓
porous:
dendritic:
other:

Mineralogy (XRD):

Associated alteration, phosphorite, or hydrothermal deposits:

Numerous forams on surface

Substratum:

Rock type: Basalt

Description: Altered green gray vesicular & fractured basalt w/ green & orange (Fe-oxide) mottling along fractures. Also some phosphorite in fractures & vesicles & lar replacing 2.3 1cm along bottom is volcanic breccia in a phosphorite matrix (also w/ Mn clasts)

see photo on back of [illegible]

Mineralogy (XRD):

Analyses and subsamples:

analysis:	analyst:
Mn-Crust-Phg	M Morrison 10-15-87
CD1-3A BULK CRUST 12.6 gm sample 5mm	
Silicate Chem	
CD1-3B 50.7gm sample	

CO1-3

F7-86-HW
Karin Ridge
Johnston Is

F7-86-HW
Karin Ridge
Johnston Is

Sample Description

Cruise I.I

Sample I.D: Sta: DCD-1-4

Location: Central Karin Ridge

Size: 10mm Weight: ≈ 2kg

Mn crust thickness:

Total: min: 5mm max: 10mm ave: 7mm

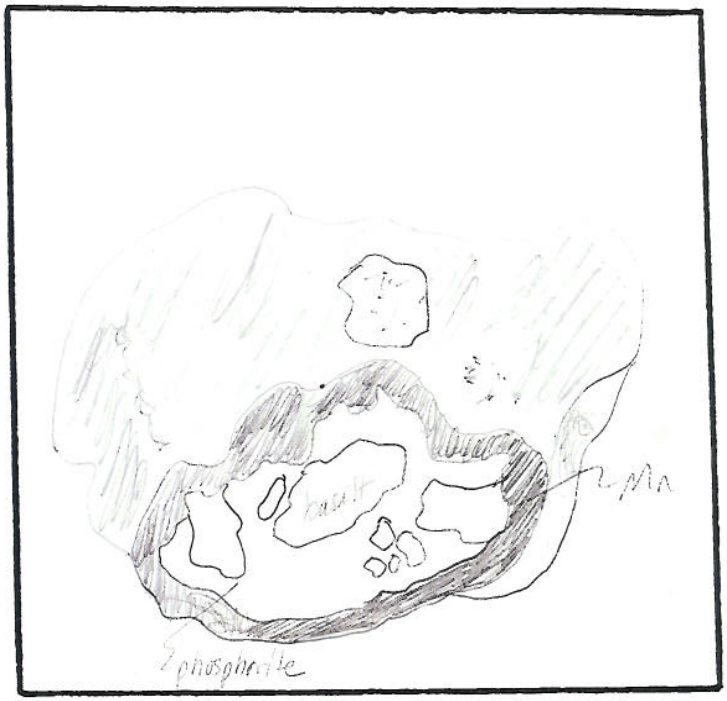
Inner crust: min: — max: — ave: —

Outer crust: min: — max: — ave: —

Surface texture: Botryoidal

Internal structure:

layered:
laminated:
massive: ✓
porous:
dendritic:
other:



Mineralogy (XRD):

Associated alteration, phosphorite, or hydrothermal deposits:

Substratum:

Rock type: Mn crated phosphorite breccia

Description: Fine grained green sub-rounded basalt clasts (1-3cm) w/ phenocrysts of olivine? in a pinkish-brown & tan phosphorite matrix w/a little Mn running along phosphorite veins & around some clasts

Mineralogy (XRD):

Analyses and subsamples:

analysis:	analyst:
Mn Crust Pka	M. Morgan 10-15-87
CD1-4A Bulk Crust 12.49gm sample 0-7mm 7mm	
Silicate Chem	
CD1-4B 14.8gm sample	

CD1-4

F7-86-HW
Karin Ridge
Johnston IS

Cruise I.D: F7-86-HW Karin Ridge Johnston Is

Sample Description

Sample I.D: Sta: 001 DCO-1-5

Location: Central Karin Ridge

Size: 13x8x7.5cm Weight: ≈ 200g

Mn crust thickness:

Total: min: 3cm max: 6cm ave: 4cm

Inner crust: min: max: ave: 1cm

Outer crust: min: max: ave: 3cm

Surface texture: Smooth & granular

Internal structure:

layered: ✓

laminated:

massive: ✓

porous: ✓ on bottom side

dendritic:

other:

Mineralogy (XRD):

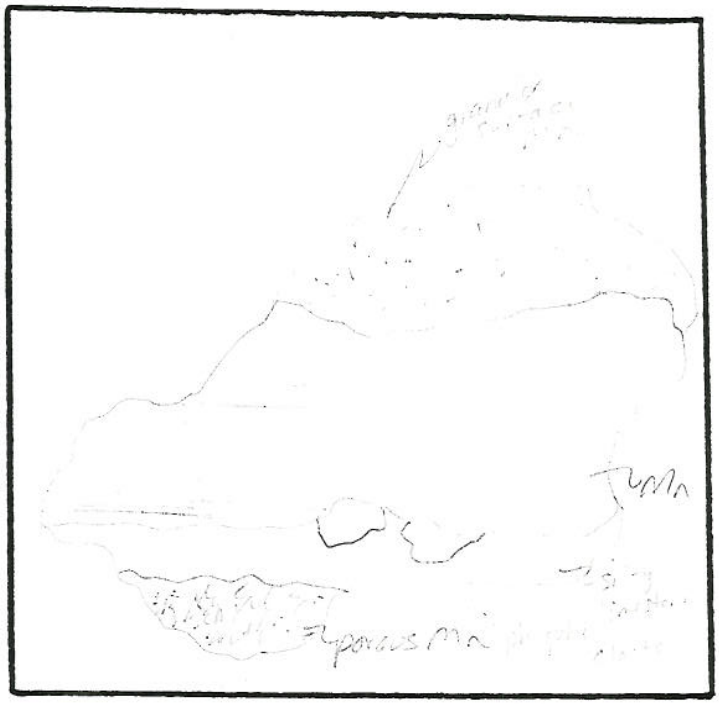
Associated alteration, phosphorite, or hydrothermal deposits:

Substratum: very little (≈2-10mm thick)

Rock type: Carbonate siltstone?

Description: Tan phosphorite clasts in a white indurated carbonate siltstone

Mineralogy (XRD):



Analyses and subsamples:

analysis:	analyst:

F7-86-HW
Karin Ridge
Johnston Is

Sample Description

Cruise I.D:

Sample I.D: Sta: 001 D CD-1-6

Location: Central Karin Ridge

Size: 5x5x2cm **Weight:** ≈ 1kg

Mn crust thickness:

Total: min: 3 max: 12mm ave: 7mm

Inner crust: min: max: ave:

Outer crust: min: max: ave:

Surface texture: Slightly botryoidal & smooth

Internal structure:

layered:
laminated:
massive: ✓ to slightly porous
porous:
dendritic:
other:

Mineralogy (XRD):

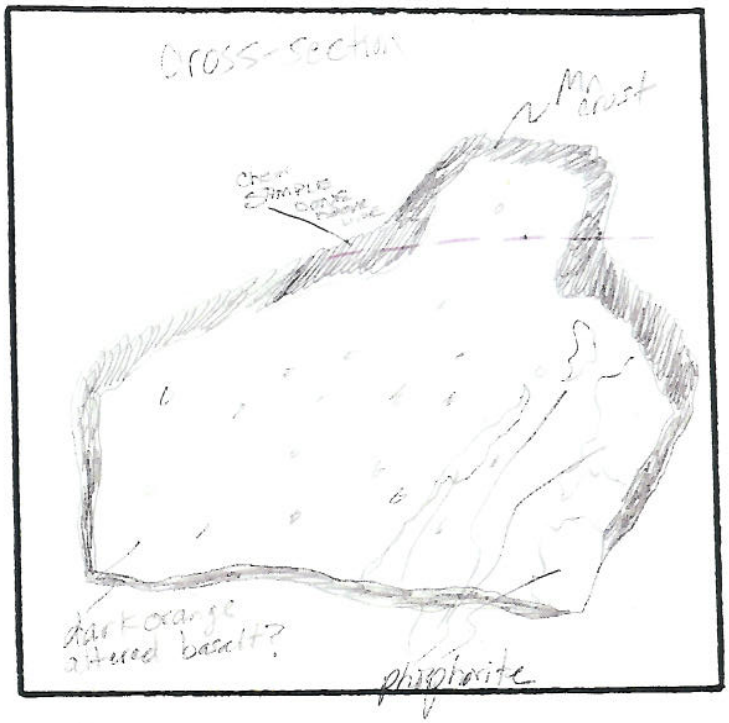
Associated alteration, phosphorite, or hydrothermal deposits:

Substratum:

Rock type: ~~Basalt~~ Hyaloclastite

Description: Extremely altered Fe-oxidized dark orange vesicular ~~basalt~~ w/ some pinkish-brown phosphorite replacement ??

Mineralogy (XRD):



Analyses and subsamples:

analysis:	analyst:
Mn Crust Pkg - XRD	M. Moerison 10-15
CD1-6A ✓ 10.06gm sample	7mm
Silicate Chem	
CD1-6B 13.4gm sample	
Isotope Chem (Sr)	L. Smith
CD1-6B 34gm	

CD1-6

F7-86-HW
Karin Ridge
Johnston Is

F7-86-HW
Karin Ridge
Johnston Is

Sample Description

Cruise I.D:

Sample I.D: Sta: 01 CD-1-7

Location: Central Karin Ridge

Size: [illegible] **Weight:** [illegible] 1kg

Mn crust thickness:

Total: min: 8mm max: 3cm ave: 2cm

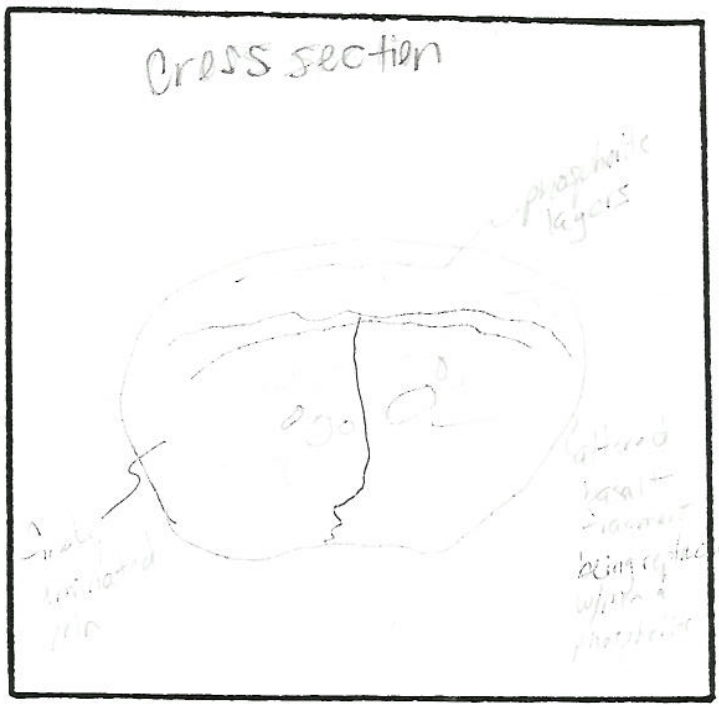
Inner crust: min: max: ave:

Outer crust: min: max: ave:

Surface texture: Smooth to slightly botryoidal

Internal structure:

- layered:
- Finely laminated: / [illegible] phosphorite [illegible] btw laminations
- massive:
- porous:
- dendritic:
- other:



Mineralogy (XRD):

Associated alteration, phosphorite, or hydrothermal deposits:

Several phosphorite layers w/in the crust

Substratum: Nodule

Rock type: Volc. Breccia [illegible]

Description: Brown volcanic fragment (??) being [illegible] phosphorite w/a [illegible] rounded [illegible] Cement [illegible] inside of the volc. fragment

Very Dense & Hard Nodule w/soft outer layer [illegible] layering [illegible]

Mineralogy (XRD):

Analyses and subsamples:

analysis:	analyst:
Mn-Crust-Pkg & XRD	M. Morrison
CD1-7A-I outer Hydrogenous layer	10.17 gm Sample
CD1-7A-II inner layers	36.35 gm sample
D. Polished Thin Section	

D1-7

F7-86-HW
Karin Ridge
Johnston Is

F7-86-HW
Karin Ridge
Johnston Is

Sample Description

Cruise I.D:

Sample I.D: Sta: 01 CD-1-8

Location: Central Karin Ridge East Side

Size: 20 x 8 x 12 cms **Weight:** 1.5 kg

Mn crust thickness: very patchy (<1% of surface) thin (<1.5mm) coating of MnO_2. MnO_2 appears primarily as botriodal coatings within small circular cavities ± in topographic lows

Total: min: max: ave:

Inner crust: min: max: ave:

Outer crust: min: max: ave:

Surface texture:

Internal structure:

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

Mineralogy (XRD):

Associated alteration, phosphorite, or hydrothermal deposits:

Substratum:

Rock type: Limestone

Description: 2 Types - (1) Structural Reef composed dominately of cemented Calcareous worm tubes, Calcareous algae, and shell fragments. Cemented by fine Carbonate debris; (2) massive white to yellow material which may be some type of encrusting algae(?) - Shows laminations → Finely Laminated

Mineralogy (XRD):

Analyses and subsamples:

analysis:	analyst:
TS	Mann
Paleo	Quinterno
XRD	Jorie
↖ Not From Calc. Algae	

CD1-8

F7-86-HW
Karin Ridge
Johnston Is

Sample Description

Cruise I.D: 18 44 x 8 cm

Sample I.D: Sta: 001 ~~D~~ CD1-9

Location: Central Karin Ridge - East slope

Size: _____ **Weight:** 1.5 kg

Mn crust thickness:

Total: min: _____ max: _____ ave: _____

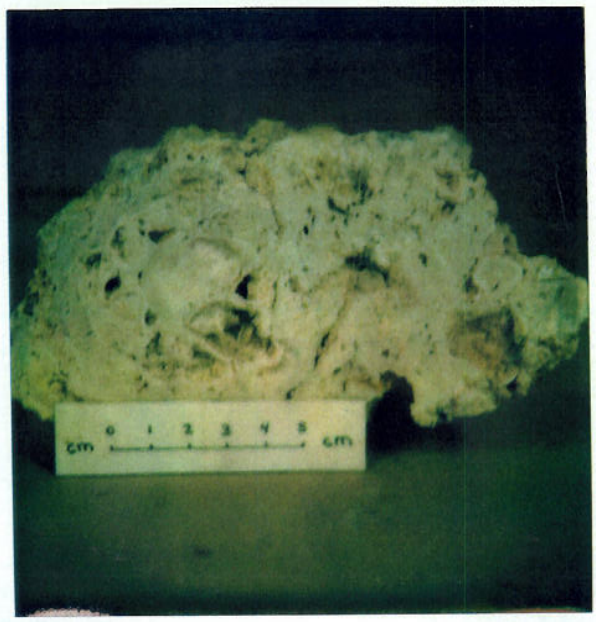
Inner crust: min: _____ max: _____ ave: _____

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

Surface texture: _____

Internal structure: _____

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



E. Karin Ridge CD1-9

Mineralogy (XRD): _____

Associated alteration, phosphorite, or hydrothermal deposits: _____

Substratum:

Rock type: Limestone

Description: Same as (1) of CD1-8 Structured Reef composed of Calcareous algae, ++; moldic porosity — many shells —

Mineralogy (XRD): _____

Analyses and subsamples:

analysis:	analyst:
TS	Mann
Paleo	Quinterno
XRD	Jorie

F7-86-HW
Karin Ridge
Johnston Is

Sample Description

Cruise I.D: **Sample I.D:** Sta: 01 D CD-1-10 **Location:** Karin Ridge

Size: 28x18x12cm **Weight:** ≈ 10 kg

Use for Paleoceanography Study

Mn crust thickness:

Total: min: 3cm max: 16 ave: 3.5cm

Inner crust: min: — max: ave:

Outer crust: min: — max: ave:

Surface texture: Smooth, slightly botryoidal

Internal structure:

layered:
laminated:
massive: ✓
porous:
dendritic:
other:

Mineralogy (XRD):

Associated alteration, phosphorite, or hydrothermal deposits:

Substratum:

Rock type: Phosphatized limestone

Description: Tan to cream colored very fine grained (micrite) in places w/ pockets of yellowish white sandy silt. Can see a few small shell/foram fragments

Mineralogy (XRD):

Analyses and subsamples:

analysis:	analyst:
1 CD1-10B - Sub; Silicate Chem: 56.6 g	Denver
2. CD1-10B - XRD	Jorie
3. CD1-10A1 - Crust Bulb - All Analyses 42 g.	Reston, Denver
4. CD1-10A1 - XRD	Jorie
5. CD1-10A2 - Crust upper 31 cm, 41.95 gm Crust Chem	Reston
6. CD1-10A2 - XRD	Jorie
7. CD1-10A3 - Crust lowest 5mm, 6.8 g Crust Chem	Reston
8. CD1-10A3 - XRD	Jorie
9. CD1-10B - Paleo	Quinterno
10. Polished thin sections	Jorie

2.5 cm Slab A-A' bagged

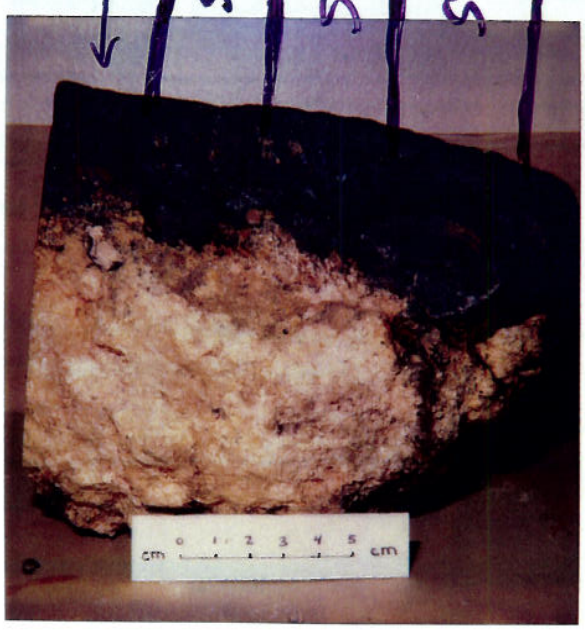
Slab B-B' 2.8-3.0 cm 1-2 mm basalt Frag in [illegible] crust of Slab B - Chem + PS

Slab C-C' 3.0 cm bagged

Slab D-D' 4.5 cm → Preserved w/ Resin

Slab E, end Piece bagged

See Next page



CD1-10

Face

CD1-10

Cont

F7-86-HW
Karin Ridge
Johnston Is

Sample Description

Cruise I.D: **Sample I.D: Sta:** CD1-10 **Location:**

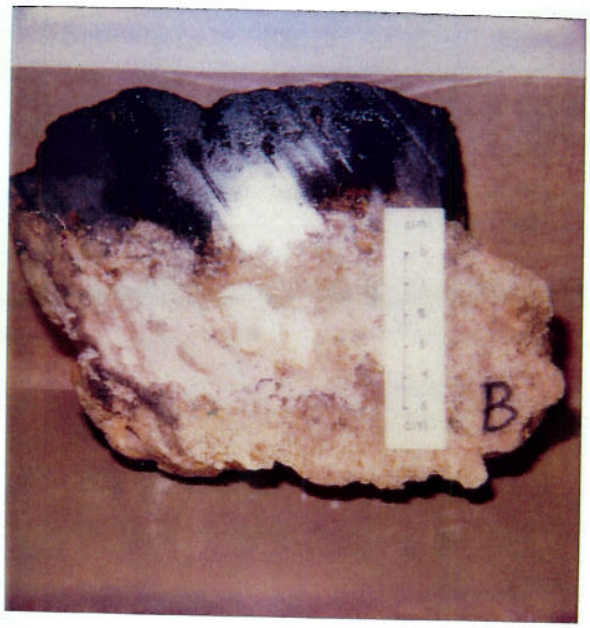
Si... Weight:

Mr...

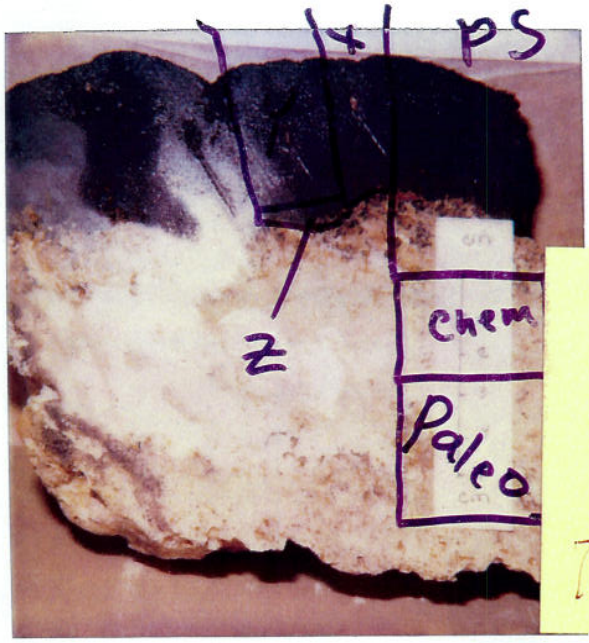
Su...

In...

Mi...



CD1-10 Slab B



Phos study

CD1-10 - Slab B

Associated alteration, phosphorite, or hydrothermal deposits:

Substratum:

Rock type: Crust is loaded w/ Cavities filled w/ soft sed.

Description: Cont. w/ sub. is v. irregular & partly repls. Lms & phosph.? Lms is differentially phosphatized - not possible to get clear separation at contact -

Mineralogy (XRD):

Analyses and subsamples:

analysis:	analyst:
CD1-10A1 = X = Bulk Crust - All Anal	36 mm
CD1-10A2 = Y = upper 31 mm - Gen chem	
CD1-10A3 = Z lower 5 mm - Gen chem	

Cleaned phosphate off bottom of crust - was v. irregular ∴ lower 5 m varied, but was a layer more porous than upper 31 mm

X = 41.95 g
Y = 20.2 g
Z = 6.8 g

35 mm slide (E) G Smith

F7-86-HW
KarinRidge
Johnston Is

Cruise I.D:

Sample Description

Sample I.D: Sta: 001 DCD-1-11

Location: Central Karin Ridge

Size: 15x14x4cm **Weight:** ≈ 900g

Mn crust thickness: 3 small patches

Total: min: 0 max: 2mm ave:

Inner crust: min: max: ave:

Outer crust: min: max: ave:

Surface texture: Granular & porous

Internal structure:

layered:
laminated:
massive: ✓
porous:
dendritic:
other:

removed for Chem

Mineralogy (XRD):

Associated alteration, phosphorite, or hydrothermal deposits:

Substratum:

Rock type: Mudstone

Description: Creamy brown, colored well compacted dense mudstone lightly speckled w/ Mn — Very fine-grained, laminated & bedded w/ Mn — dendrites between beds —

Mineralogy (XRD):

Analyses and subsamples:

analysis:	analyst:
1. Crust 2-4mm Thick Bulk Chem. - 10.02g	Reston
2. Crust XRD	Jorie
3. Substrate 12g	Denver
4. XRD Substrate	Jorie

CD1-11

F7-86-HW
Karin Ridge
Johnston Is

Sample Description

Cruise I.D: **Sample I.D: Sta:** [illegible] D CD-1-12 **Location:** Central Karin Ridge

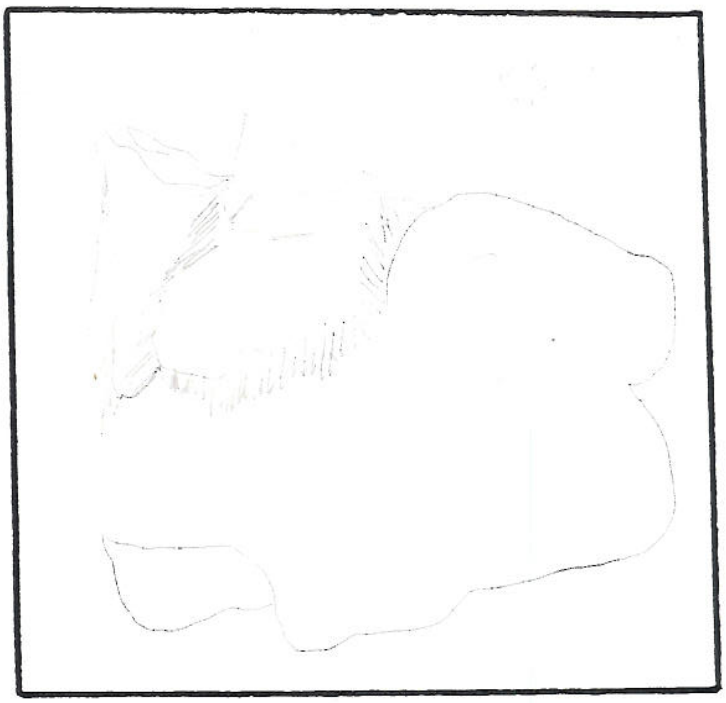
Size: [illegible] **Weight:** ≈600g

Mn crust thickness: none

Total: min: ____ max: ____ ave: ____

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

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



Surface texture: ____

Internal structure: ____

layered: ____
laminated: ____
massive: ____
porous: ____
dendritic: ____
other: ____

Mineralogy (XRD): ____

Associated alteration, phosphorite, or hydrothermal deposits: ____

Substratum:

Rock type: Packstone ?

Description: [illegible] fine grained grain supported [illegible] or a magnite? Rock [illegible] maybe it got speckled in the dredge.

Mineralogy (XRD): ____

Analyses and subsamples:

analysis:	analyst:
TS	Mann
Palco	Quinterno
XRD	Jorie

F7-86-HW
Karin Ridge
Johnston Is

Sample Description

Cruise I.D:

Sample I.D: Sta: 001 D CD-1-13

Location: Central Karin Ridge

Size: 12x10x4cm **Weight:** ≈400g

Mn crust thickness:

Total: min: 1 max: 3cm ave: 2cm

Inner crust: min: max: ave: 1cm only 1 place to [illegible]

Outer crust: min: max: ave: 1.5cm

Surface texture: Granular & flow-like (aperous)

Internal structure:

layered:
laminated:
massive: ✓ inner
porous: ✓ outer
dendritic:
other:

Mineralogy (XRD):

Associated alteration, phosphorite, or hydrothermal deposits:

Substratum:

Rock type: Bioclastic limestone

Description: Yellow very fine grained [illegible] packed w/remnantz of [illegible] probably [illegible] Approx [illegible] of rock has a [illegible] layer of partially phosphatized white carbonate sediment w/a few brown phosphorite grains in it. This layer is [illegible] crust [illegible] the substrate

Mineralogy (XRD):

Analyses and subsamples:

analysis:	analyst:

F7-86-HW
Karin Ridge
Johnston Is

Sample Description

Cruise I.D: **Sample I.D:** Sta: 001 D CD-1-14 **Location:** Central Karin Ridge east side

Size: 15mm x 7cm **Weight:** ≈ 2 Kg

Mn crust thickness:

Total: min: 2mm max: 5mm ave: 5mm

Inner crust: min: max: ave:

Outer crust: min: max: ave:

Surface texture: Granular [illegible]

Internal structure:

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

Mineralogy (XRD):

Associated alteration, phosphorite, or hydrothermal deposits:

Numerous forams on surface

Substratum:

Rock type: Volcanoclastic Breccia

Description: [illegible] Coarse Grained, nearly conglomerate, muddy matrix same color as grains, Outer 5mm showing a different color (alteration rim?)

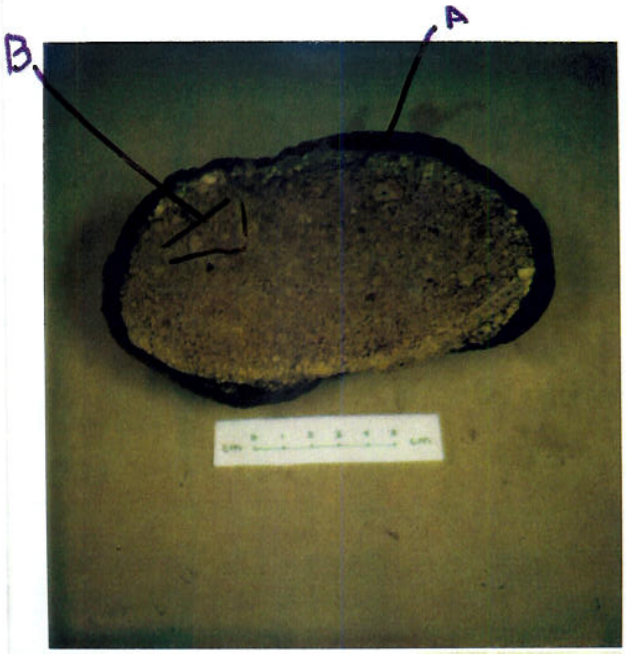
Almost completely crated w/Mn except small area in underneath side

Mineralogy (XRD):

Goethite	67.5%
Carbonate-Apatite	22.9%
Smectite	9.6%

Analyses and subsamples:

analysis:	analyst:
Mn Crust Chem & XRD	M Morrison
CD1-14A 2+0.5mm	10.5gm sample 5mm
Silicate Chem & XRD	
CD1-14B 14.7gm Sample	



CD1-14

F7-86-HW
Karin Ridge
Johnston IS

F7-86-HW
Karin Ridge
Johnston Is

Sample Description

Cruise I.D: **Sample I.D:** Sta: 001 DCD-1-15 **Location:** Central Karin Ridge East side

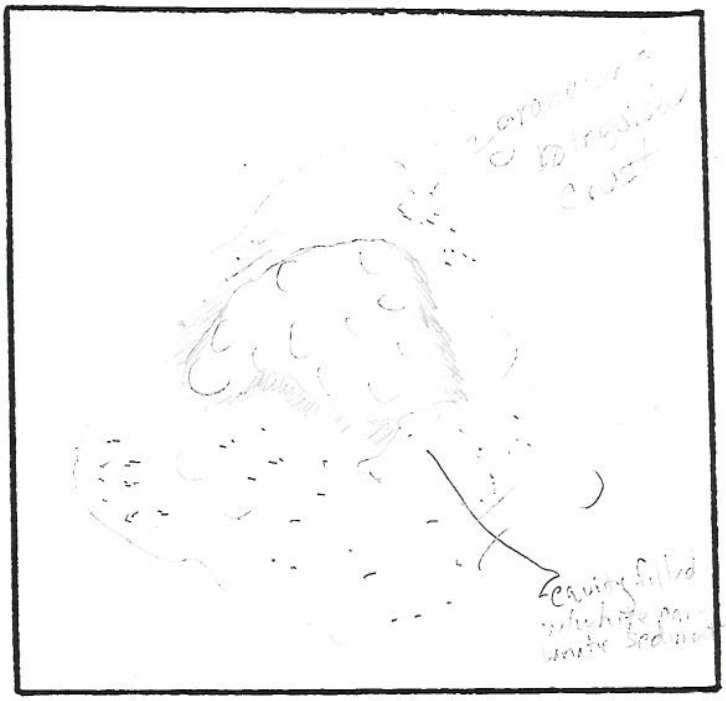
Size: 11x7.5x6" **Weight:** ≈ 500 gr

Mn crust thickness: Completely coated [illegible] to be out

Total: min: ____ max: ____ ave: 2-5mm ?

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

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



Surface texture: Granular & small botryoidal

Internal structure:

layered:
laminated:
massive:
porous: ✓
dendritic:
other:

Mineralogy (XRD): 98% $SMnO_2$ 2 Plagioclase 1% Quartz

Associated alteration, phosphorite, or hydrothermal deposits:

Substratum:

Rock type: Phosphatized Limestone

Description: Cavity is gastropod (?) impression filled with recent sediment. Other biologically induced vugs, filled with sands & muds

In sampling the substrate was unable to totally eliminate the Mn staining. Dendrites seem to permeate the sample.

Mineralogy (XRD):

Analyses and subsamples:

analysis:	analyst:
Mn Crust Chem	M. Morrison
CD-1-15A Bulk Crust	2 to 4 mm
10.3 gm sample	XRD
Silicate Chem XRD	
CD-1-15B Phosphatized Limestone	13.9 gm sample

CD1-15

F7-86-HW
Karin Ridge
Johnston Is

F7-86-HW
Karin Ridge
Johnston Is

Sample Description

Cruise I.D:

Sample I.D: Sta: 001 DCD-1-16

Location: Central Karin Ridge

Size: 20x15x6cm **Weight:** ~5 kg

Mn crust thickness:

Total: min: 0 max: 6mm ave: 4mm

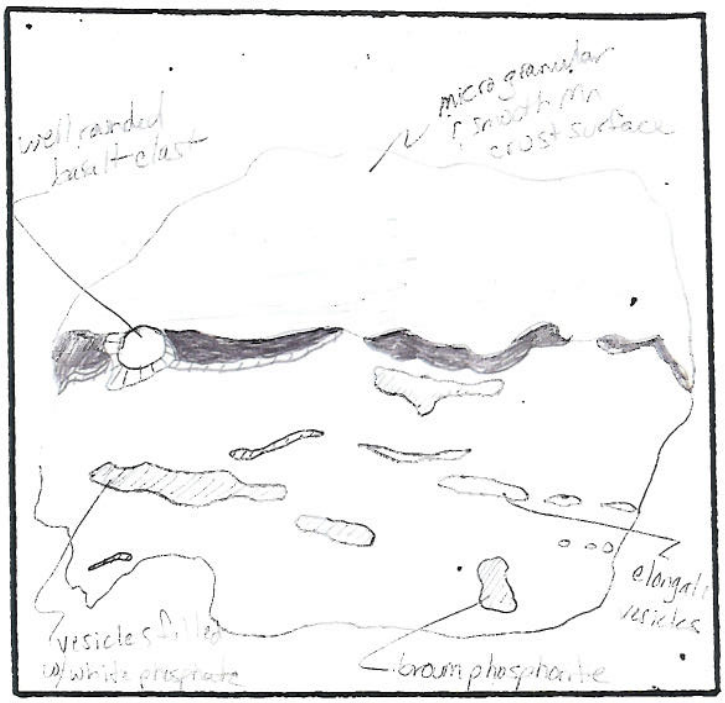
Inner crust: min: max: ave:

Outer crust: min: max: ave:

Surface texture: Granular but smooth looking

Internal structure:

layered:
laminated:
massive: ✓
porous:
dendritic:
other:



Mineralogy (XRD):

Associated alteration, phosphorite, or hydrothermal deposits:

Substratum:

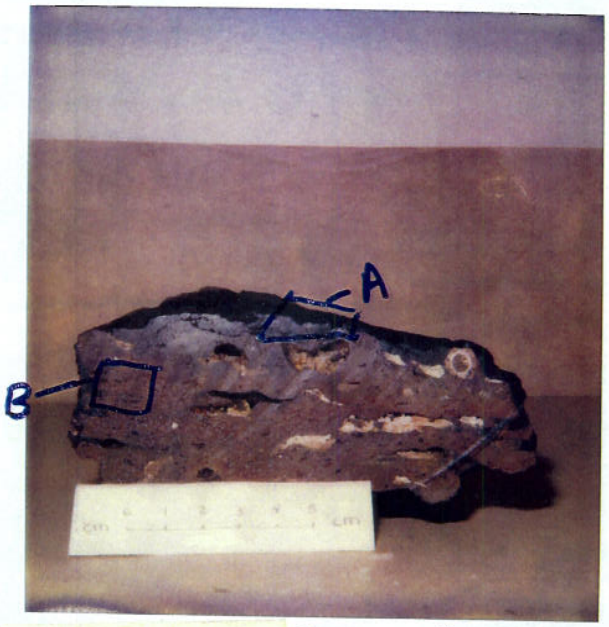
Rock type: Basalt

Description: Very altered red-brown aphanitic vesicular basalt with large blanglate vesicles filled w/ white to brown phosphorite. There is a small very well rounded oceanic clast surrounded by phosphorite incorporated in the Mn crust but also in contact w/ the substrate

Mineralogy (XRD): XRD shows substrate is goethite
Pores + Vugs filled w/ phosphate?
+ carbonate.

Analyses and subsamples:

analysis:	analyst:
Chemistry: (see also back) A= bulk crust - magnetic ptg B= goethite for general [illegible] chem.	Lisa Gein
XRD: (see also back) A= bulk crust B= Goethite	Lisa Gein
CDH6b (05-01-90) ic, Pt, (42.7g) REE (10.6g)	Ames
	DPTS, Sr isotopes, O_2 isotopes, REE, CC, Pt group



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

CD1-16

A - [illegible] crust. Subsampled [illegible] "manheim [illegible]" [illegible] and [illegible]. Thickness of crust sent varies between 2-5 mm.

B - Basalt substrate [illegible] with phosphorite. Subsampled for general silicate chem. and [illegible].

Note: when rock was cut on [illegible] saw to get a piece of basalt [illegible] of reddish-brown mud came out of interior of rock. Jim says is very altered basalt.

F7-86-HW
Karin Ridge
Johnston Is

Sample Description

Cruise I.D:

Sample I.D: Sta: 001 **D** CD-1-17

Location: Central Karin Ridge East side

Size: 84X12X6cm **Weight:** ≈ 600gr

Mn crust thickness:

Total: min: ____ max: ____ ave: 5 cm

Inner crust: min: ____ max: ____ ave: 2 cm

Outer crust: min: ____ max: ____ ave: 3 cm

Surface texture: Granular to porous on the side & bottom has a [illegible] structure

Internal structure:

layered: ✓ maybe more
laminated:
massive: ✓ inner
porous: ✓ outer
dendritic:
other:

Mineralogy (XRD):

Associated alteration, phosphorite, or hydrothermal deposits:

Substratum: very little

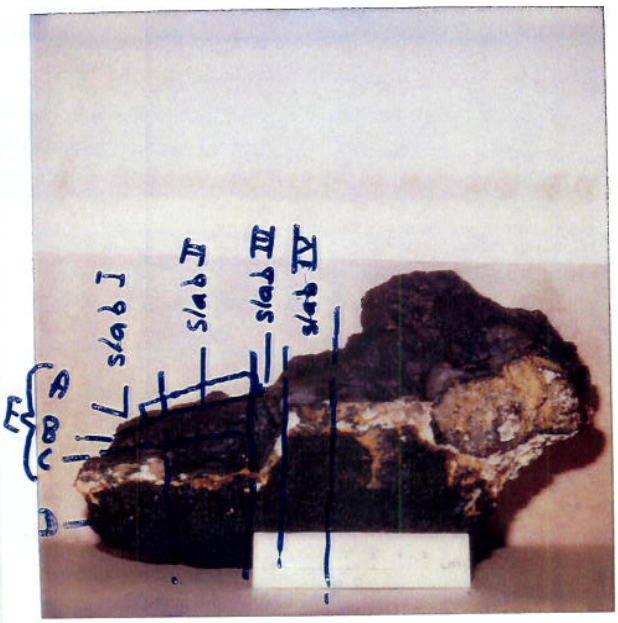
Rock type: [illegible]

Description: ≈ 1/3 is a yellow, fine grained [illegible] that has been slightly phosphatized & is surrounded by Mn. The rest of the substratum is a white, fairly well compacted carbonate sediment that is partially phosphatized & has phosphorite clasts in it & Mn dendrites

Mineralogy (XRD):

Analyses and subsamples:

analysis:	analyst:
Chemistry: Manheim prog	Lisa Gein
A-outer 0-12 mm	
B-middle 12-32 mm	
C-inner 32-52 mm	on Bulk only
All chem (Manheim + REC + Agnus + Au)	
D = bottom (underside, beneath matrix) (4 mm)	
E = F + G + C (bulk)	
XRD	Lisa Gein
A = outer 0-12 mm	
B = middle 12-32 mm	
C = inner 32-52 mm	
D = bottom (underside, beneath matrix)	
E = A + C + C (bulk)	
F = [illegible] carb. sediment substrate	XRD shows only apatite
G = phosphorite clast	



F7-86-HW
Karin Ridge
Johnston Is

CD-1-17

crust in 3 layers above substrate (A, B & C) p
one layer below substrate [illegible] Each layer sent for
marble or plug [illegible] plus [illegible] sample of
A, B & C together [illegible]

A = 8-12 mm. Ave. [illegible] 9-12 mm
B = 10-25 mm. Ave. ≈ 20 mm 18-20 mm
C = 10-20 mm [illegible] 16-20 mm
D = ~10-11 mm ≈ 10 mm 11 mm
E = 38-60 mm. Ave. ≈ 45 mm. Thickness sent for chem. =

wt. of sample sent for chem.
A = 14.07 g
B = 11.9 g
C = 10.63 g
D = 34.6 g
E = 43.0 g

box shows where "A" was sampled

After A was sampled, left half of rock in photo was cut into slabs I, II, and III.

B taken from slabs II and III
C taken from slab II
D taken from slabs I, II, III, IV & archive
E " " " II, III, IV

layers A, B, & C are massive in texture.
layer D is porous, granular in texture.
layer C has phosphorite veins or phosphorite filling pore spaces in hen

layers very difficult to distinguish, so marked w/ dotted lines. C is very hard & has phosphorite (or white carb. [illegible])
[illegible]

F7-86-HW
Karin Ridge
Johnston Is

Sample Description

Cruise I.D:

Sample I.D: Sta: 001 D CD-1-18

Location: Central Karin Ridge East Side

Size: 7x5x3cm **Weight:** ~300 g

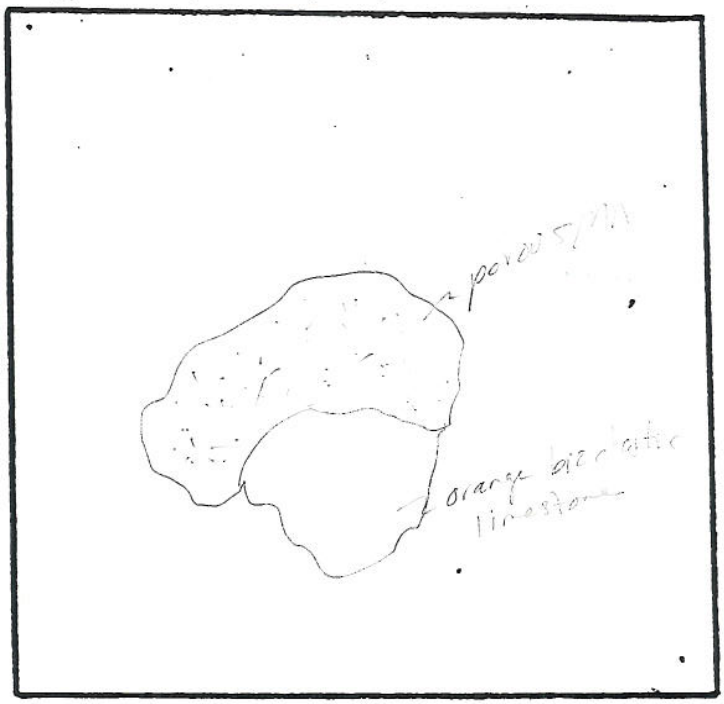
Mn crust thickness:

2 small pieces

Total: min: ____ max: ____ ave: 1.5cm

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

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



Surface texture: Porous & granular

Internal structure:

layered:
laminated:
massive:
porous: ✓
dendritic:
other:

Mineralogy (XRD):

Associated alteration, phosphorite, or hydrothermal deposits:

Substratum:

Rock type: Bioclastic limestone

Description: Orange [illegible] grains [illegible] a couple small shell fragments w/ little or no matrix

Mineralogy (XRD):

Analyses and subsamples:

analysis:	analyst:

F7-86-HW
Karin Ridge
Johnston Is

Sample Description

Cruise I.D:

Sample I.D: Sta: 001 D CD-1-19

Location: Central Karin Ridge East Side

Size: Brassica **Weight:** 4 Kg

Mn crust thickness:

Total: min: .7 max: 1.5 ave: 1.0 cm

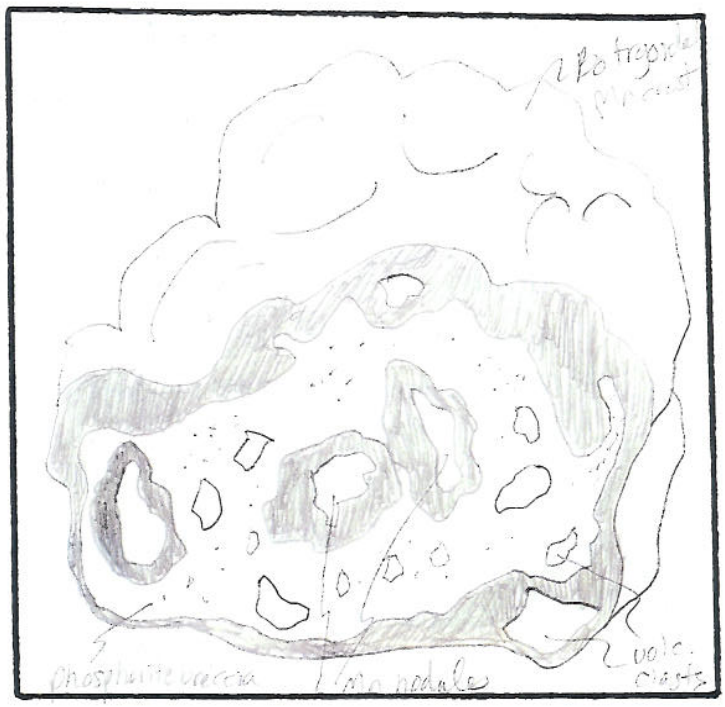
Inner crust: min: max: ave:

Outer crust: min: max: ave:

Surface texture: Botryoidal

Internal structure:

layered:
laminated:
massive: ✓
porous:
dendritic:
other:



Mineralogy (XRD):

Associated alteration, phosphorite, or hydrothermal deposits:

Substratum:

Rock type: Volcanic breccia w/ phosphorite cement

Description: [illegible] white phosphorite breccia which consists of angular to sub rounded poorly sorted (1-15mm) & loosely packed volcanic clasts.

In cutting slabs etc. the Mn Crust Really fills in "holes" of the substrate. Substrate sample includes Mn clast.

Mineralogy (XRD):

Analyses and subsamples:

analysis:	analyst:
one end cut off	[illegible]
Mn Crust Chem	
CD1-19A 12 gm of sample	0-8 mm 8 mm
Silicate Chem on Substrate	
CD1-19B 60 gm of sample	
D.P. Section	Mann

CD1-19

F7-86-HW
Karin Ridge
Johnston Is

F7-86-HW
Karin Ridge
Johnston Is

Sample Description

Cruise I.D: **Sample I.D:** Sta: 001 D CD-1-20 **Location:** Karin Ridge

Size: 12x7x7cm **Weight:** ~500g

Mn crust thickness:

Total: min: 12 max: 2.8 ave: 1.7

Inner crust: min: 0 max: 15mm ave: 5mm

Outer crust: min: 9 max: 17mm ave: 10mm

Surface texture: Botryoidal

Internal structure:

layered: ✓ 2 [illegible]
laminated:
massive: ✓
porous:
dendritic:
other: [illegible] has lots of phosphorite & tiny volcanic & [illegible] clasts

Mineralogy (XRD):

Associated alteration, phosphorite, or hydrothermal deposits:

Numerous forams on the surface

Substratum:

Rock type: Volcanic [illegible]

Description: One large (5cm) altered red aphanitic vesicular volcanic clast & numerous other subrounded poorly sorted volcanic clasts all in a Mn/phosphorite matrix

Mineralogy (XRD):

Analyses and subsamples:

analysis:	analyst:
1/2 rock to Mn-Crust-Chem CD1-20 17gm sample (Bulk)	B Mines 0-25 mm
D. P. Section	Mann
Bulk of Sample - Resined For Archive	

Manganese layers in the breccia

phosphorite w/ manganese coating basalt pebble

Basalt clast

piece left after slabbing for P.S. & chemistry

CD1-20

F7-86-HW
Karin Ridge
Johnston Is

Cruise I.D: F7-86-HW Karin Ridge Johnston Is

Sample Description

Sample I.D: Sta: 001 D CD-1-21 Location: Crater Karin Ridge

Size: 5cm in diameter Weight: _____

Bag of ≈ 50 nodules

Mn crust thickness:

Total: min: <1mm max: 8mm ave: 4mm
usually bottom of nodule

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

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

Surface texture: [illegible]

Internal structure: _____

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

Mineralogy (XRD): _____

Associated alteration, phosphorite, or hydrothermal deposits: _____

Substratum:

Rock type: Various sandy substrates

Description: Sandstones, basalt cobbles, phosphorite, maybe a mud or shale (?)

Thickness of crust varies some nodules uniform thickness and some thick on one side thin on the other

Mineralogy (XRD): _____

CD1-21

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

Analyses and subsamples:

analysis:	analyst:
Mn Crust - Chem, Pt, & Gold	M. Morrison
D1-21 Crusts from several nodules	30.1 gm sample

Cruise Id: F7-86-HW Size _____ (cm) Location: KARIN RIDGE

Sample Id: CDI-22 Weight: _____ (kg) Depth: _____ (m)

Mn Crust Description

Surface Texture: _____

Mn Crust Thickness (mm):

Min: _____ Max: _____ Ave: _____

Layers (Outer to Inner)(mm):

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

* Alicé has this sample. She has numbered it CDI-1

Comments and XRD Mineralogy:

ANALYSES

Subsample Number	Analysis	LayerThickness

Substrate Description

Rock Type: BASALT (benmoreite)

Description:

Biology ?: _____

Described By: Alicé Davis

Subsampled By: