LITHOLOGIC DESCRIPTION

NANNOFOSIL MARL

Major lithology: NANNOFOSIL MARL, dominantly brownish gray (2.5Y6/2), faintly laminated, locally bioturbated. Scattered rounded, 1-2 mm pumice fragments and 1-5 mm thick pumice layers are present. Section 5 contains a 90 cm thick pumice sand layer which grades to silt at the top of the interval.

Minor lithology:
- a. Nannofossil silty clay, very pale brown (10YR 6/3), faintly laminated, locally bioturbated.

SMERAL SLIDE SUMMARY (%):

<table>
<thead>
<tr>
<th>Texture</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sand</td>
<td>D</td>
<td>D</td>
<td>D</td>
<td>D</td>
<td>D</td>
<td>D</td>
<td>D</td>
<td>D</td>
<td>D</td>
</tr>
<tr>
<td>Silt</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Clay</td>
<td>35</td>
<td>35</td>
<td>33</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

COMPOSITION:

- Amphibole: 10
- Clay: 5
- Feldspar: 5
- Foraminifers: 1
- Glass: 7
- Foraminifers: 3
- Opal: 5
- Pyrite: 2
- Quartz: 1
- Radiolaria: 2
- Spicules: 2
- Nannofossils: 3
- Opaques: 2

SMERAL SLIDE SUMMARY (%):

<table>
<thead>
<tr>
<th>Texture</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sand</td>
<td>40</td>
<td>50</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Silt</td>
<td>50</td>
<td>50</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Clay</td>
<td>40</td>
<td>40</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>

COMPOSITION:

- Clay: 40
- Diatoms: 70
- Feldspar: 4
- Foraminifers: 7
- Glass: 4
- Mang: 2
- Nannofossils: 41
- Oolites: 38
- Radiolaria: 3
- Spicules: 2
SITE 786 HOLE A
CORE 2H
CORED INTERVAL 3067.8-3077.3 mbsl: 9.7-19.2 mbsf

LITHOLOGY

**NANNOFOSSIL MARL**
Major lithology: NANNOFOSSIL MARL, grayish brown (10YR 5/2), is faintly laminated, bioturbated and contains many intercalated pumice ash layers and rounded, 2-8 cm pumice clasts.

Minor lithology: Nannofossil-rich clay, pale brown (10YR 7/3). The core is bioturbated and has rare graded pumice layers.

**SMER SLE SUMMARY (%):**

<table>
<thead>
<tr>
<th>Silt</th>
<th>Clay</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>44</td>
<td>56</td>
</tr>
<tr>
<td>51</td>
<td>46</td>
</tr>
<tr>
<td>51</td>
<td>46</td>
</tr>
</tbody>
</table>

**TEXTURE:**

<table>
<thead>
<tr>
<th>SiO2</th>
<th>2.46</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>D</td>
</tr>
<tr>
<td>D</td>
<td>D</td>
</tr>
<tr>
<td>D</td>
<td>D</td>
</tr>
</tbody>
</table>

**COMPOSITION:**

<table>
<thead>
<tr>
<th>Amphibole</th>
<th>Chlorite</th>
<th>Clay</th>
<th>Diopside</th>
<th>Cassiterite</th>
<th>Glass</th>
<th>Glaucite</th>
<th>Nannofossils</th>
<th>Opaque</th>
<th>Pyrite</th>
<th>Quartz</th>
<th>Radiolarian</th>
<th>Spicules</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>35</td>
<td>25</td>
<td>25</td>
<td>35</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
<td></td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**GRAPHIC LITHOLOGY**

**LITHOLOGIC DESCRIPTION**

[Image of core samples with lithology descriptions]
LITHOLOGIC DESCRIPTION

**Major lithology:** NANNOCOCCUS MARL, dominantly gray (10YR 4/0) to dark gray (10YR 3/1) is bioturbated and contains graded pumice layers and rounded 1-5 mm pumice clasts.

**Minor lithology:**
- a. Feldspar-, glass-, and nannofossil rich clayey silt contains coarse ash layers.
- b. Vitric clayey ash, black (N 4/0) to dark gray (10YR 3/1) is medium to coarse, in 1-3 cm thick layers, and is clay-bearing.

**SMEAR SLIDE SUMMARY (%):**

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>4</th>
<th>4</th>
<th>1</th>
<th>9</th>
<th>0</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.44</td>
<td>1.55</td>
<td>2.57</td>
<td>3.11</td>
<td>6.10</td>
<td>6.02</td>
<td></td>
</tr>
</tbody>
</table>

**TEXTURE:**

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>4</th>
<th>4</th>
<th>1</th>
<th>9</th>
<th>0</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sand</td>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clay</td>
<td>43</td>
<td>39</td>
<td>58</td>
<td></td>
<td>40</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**COMPOSITION:**

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>4</th>
<th>4</th>
<th>1</th>
<th>9</th>
<th>0</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amphibole</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chlorite</td>
<td>7</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diatoms</td>
<td>43</td>
<td>39</td>
<td>58</td>
<td></td>
<td>40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foraminiferous</td>
<td>13</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glass</td>
<td>4</td>
<td>4</td>
<td>95</td>
<td></td>
<td>57</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nannofossils</td>
<td>20</td>
<td>40</td>
<td>58</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Opal</td>
<td></td>
<td>3</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pyrite</td>
<td>8</td>
<td>2</td>
<td>1</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spines</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**NANNOSOSS MARL:**

Major lithology: NANNOSOSS MARL, gray (10YR 5/1) with minor dark gray (10YR 5/1) pumice fragments scattered throughout the sediment. Bioturbation is present where pumice is absent. A sandy pumice interval is present at 29-40 cm in Section CC.

**SMAR SLIDE SUMMARY (%):**

<table>
<thead>
<tr>
<th>Texture</th>
<th>1.15</th>
<th>1.59</th>
<th>1.145</th>
<th>CC. 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silt</td>
<td>D</td>
<td>D</td>
<td>D</td>
<td>D</td>
</tr>
<tr>
<td>Clay</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**TEXTURE:**

<table>
<thead>
<tr>
<th>Silt</th>
<th>Clay</th>
</tr>
</thead>
<tbody>
<tr>
<td>51</td>
<td>49</td>
</tr>
<tr>
<td>59</td>
<td>41</td>
</tr>
<tr>
<td>61</td>
<td>39</td>
</tr>
<tr>
<td>70</td>
<td>30</td>
</tr>
</tbody>
</table>

**COMPOSITION:**

<table>
<thead>
<tr>
<th>Chlorite</th>
<th>Diatomite</th>
<th>Diceratoides</th>
<th>Nannofossils</th>
<th>Opal</th>
<th>Pyrite</th>
<th>Quartz</th>
<th>Radiolarians</th>
<th>Silicoflagellates</th>
<th>Spores</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-4</td>
<td>1-4</td>
<td>1-4</td>
<td>1-4</td>
<td>1-4</td>
<td>1-4</td>
<td>1-4</td>
<td>1-4</td>
<td>1-4</td>
<td>1-4</td>
</tr>
</tbody>
</table>

**GRAPHIC LITHOLOGY**

- **N. Mariae**
- **N. m. gracilis**
- **N. m. obtusata**
- **Cylindrical**
- **Trilobate**
- **Elliptical**
- **Radiolarian**
- **Silicoflagellate**
- **Spores**

**SAMPLE:**

- **Graphite**
- **Lithologic Description**
- **NANNOSOSS MARL:**
  - Major lithology: NANNOSOSS MARL, gray (10YR 5/1) with minor dark gray (10YR 5/1) pumice fragments scattered throughout the sediment. Bioturbation is present where pumice is absent. A sandy pumice interval is present at 29-40 cm in Section CC.
GLASS-RICH CLAY: Major lithology: GLASS-RICH CLAY is grayish brown (2.5Y 5/2) to dark gray (5Y 4/1) and contains scattered pumice fragments. The core is burrowed and mottled throughout. Some burrows are filled with black (10YR 2/1) ash.

Minor lithologies:
- Nannofossil marl, grayish brown (2.5Y 5/2), contains abundant, scattered, rounded pumice fragments up to 2 mm in diameter. The core is extensively bioturbated.
- Vitric ash, black (N 4/0) and brownish gray (10YR 6/2) in 1-2 cm layers with both sharp and diffuse contacts.

SMAR SLIDE SUMMARY (%):
- Sand: 1,20
- Silt: 10
- Clay: 10
- Total: 3,50

TEXTURE:
- Sand: —
- Silt: 50
- Clay: 50
- Total: 100

COMPOSITION:
- Chlorite: 1
- Clay: 35
- Diatoms: 10
- Fossil: 10
- Foraminifers: 2
- Glass: 3
- Microfossils: 2
- Nannobacteria: 4
- Ostracods: 4
- Ophiolites: 3
- Pyroclastics: 3
- Quartz: 3
- Radiolarians: 3
- Silicoflagellates: —
- Spicules: —
- Total: 106

GRAPHIC LITHOLOGY

LITHOLOGIC DESCRIPTION

GLASS-RICH CLAY

GLASS-RICH CLAY is grayish brown (2.5Y 5/2) to dark gray (5Y 4/1) and contains scattered pumice fragments. The core is burrowed and mottled throughout. Some burrows are filled with black (10YR 2/1) ash.

Minor lithologies:
- Nannofossil marl, grayish brown (2.5Y 5/2), contains abundant, scattered, rounded pumice fragments up to 2 mm in diameter. The core is extensively bioturbated.
- Vitric ash, black (N 4/0) and brownish gray (10YR 6/2) in 1-2 cm layers with both sharp and diffuse contacts.

SMAR SLIDE SUMMARY (%):
- Sand: 1,20
- Silt: 10
- Clay: 10
- Total: 3,50

TEXTURE:
- Sand: —
- Silt: 50
- Clay: 50
- Total: 100

COMPOSITION:
- Chlorite: 1
- Clay: 35
- Diatoms: 10
- Fossil: 10
- Foraminifers: 2
- Glass: 3
- Microfossils: 2
- Nannobacteria: 4
- Ostracods: 4
- Ophiolites: 3
- Pyroclastics: 3
- Quartz: 3
- Radiolarians: 3
- Silicoflagellates: —
- Spicules: —
- Total: 106
SILTY MARLSTONE AND CLAYEY SILTSTONE

Major lithology: SILTY MARLSTONE AND CLAYEY SILTSTONE, dark grayish brown (2.5Y 4/2) at the top grading to yellowish brown (10YR 5/6) at the base. Sand-sized pebbles and fragments are scattered throughout the core. Bioturbation is present throughout the core. Two possible unconformities are present in this core, one in Section 6 at 133-140 cm and one in Section 6 at 170 cm.

Minor lithologies:
- Layers of black (N 4/0) vitric ash, 1-6 cm thick, very common throughout the core. Two possible unconformities are present in this core, one in Section 6 at 133-140 cm and one in Section 6 at 170 cm.
- Layers of gray (7.5Y 5/1) argillaceous dolomite, 1-6 cm thick, common throughout the core. Two possible unconformities are present in this core, one in Section 6 at 133-140 cm and one in Section 6 at 170 cm.
- Layers of brown (10YR 5/6) siltstone, 1-6 cm thick, common throughout the core. Two possible unconformities are present in this core, one in Section 6 at 133-140 cm and one in Section 6 at 170 cm.

SMERAL SLIDE SUMMARY (%):

<table>
<thead>
<tr>
<th>TEXTURE</th>
<th>D</th>
<th>2</th>
<th>102</th>
<th>120</th>
<th>145</th>
<th>4</th>
<th>143</th>
<th>5</th>
<th>5</th>
<th>M</th>
<th>M</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sand</td>
<td>10</td>
<td>10</td>
<td>—</td>
<td>10</td>
<td>70</td>
<td>30</td>
<td>90</td>
<td>50</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Silt</td>
<td>25</td>
<td>25</td>
<td>—</td>
<td>25</td>
<td>35</td>
<td>25</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Clay</td>
<td>55</td>
<td>55</td>
<td>—</td>
<td>55</td>
<td>55</td>
<td>20</td>
<td>20</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

COMPOSITION:

| Chlorite | 20 | — | 1 | — | — | — | — | — | — | — | — |
| Clay     | — | 10 | 42 | 35 | 20 | — | — | — | — | — | — |
| Dolomites| — | 2 | — | — | — | — | — | — | — | — | — |
| Feldspar | 19 | 13 | 3 | 7 | 9 | 10 | — | — | — | — | — |
| Foraminifers| — | 5 | — | 5 | — | 5 | — | — | — | — | — |
| Ooids    | — | 60 | — | 20 | 65 | 75 | 9 | — | — | — | — |
| Mica    | 5 | 5 | — | 5 | 5 | — | — | — | — | — | — |
| Nannofossils | 19 | — | 40 | 28 | 3 | — | 3 | — | — | — | — |
| Diatoms | 5 | 5 | 1 | 2 | — | 10 | 80 | — | — | — | — |
| Pyrite   | 5 | 5 | 1 | — | 5 | 5 | 3 | — | — | — | — |
| Radiolarians | 5 | 5 | 1 | 2 | — | 10 | 80 | — | — | — | — |
| Rock Fragments | 5 | 5 | 1 | 2 | — | 10 | 80 | — | — | — | — |
| Silicoflagellates | — | — | — | 3 | — | — | — | — | — | — | — |
| Spicules | — | — | — | — | 7 | 2 | — | — | — | — | — |
| Others  | — | — | — | — | — | — | — | — | — | — | — |

DISP, F.A.M. ONS

R./P.

G. 2

CC

GRAPHIC LITHOLOGY

LITHOLOGIC DESCRIPTION

SILTY MARLSTONE AND CLAYEY SILTSTONE

Major lithology: SILTY MARLSTONE AND CLAYEY SILTSTONE, dark grayish brown (2.5Y 4/2) at the top grading to yellowish brown (10YR 5/6) at the base. Sand-sized pebbles and fragments are scattered throughout the core. Bioturbation is present throughout the core. Two possible unconformities are present in this core, one in Section 6 at 133-140 cm and one in Section 6 at 170 cm.

Minor lithologies:
- Layers of black (N 4/0) vitric ash, 1-6 cm thick, very common throughout the core. Two possible unconformities are present in this core, one in Section 6 at 133-140 cm and one in Section 6 at 170 cm.
- Layers of grayish brown (2.5Y 5/1) argillaceous dolomite, 1-6 cm thick, common throughout the core. Two possible unconformities are present in this core, one in Section 6 at 133-140 cm and one in Section 6 at 170 cm.
- Layers of brown (10YR 5/6) siltstone, 1-6 cm thick, common throughout the core. Two possible unconformities are present in this core, one in Section 6 at 133-140 cm and one in Section 6 at 170 cm.

SMERAL SLIDE SUMMARY (%):

<table>
<thead>
<tr>
<th>TEXTURE</th>
<th>D</th>
<th>2</th>
<th>102</th>
<th>120</th>
<th>145</th>
<th>4</th>
<th>143</th>
<th>5</th>
<th>5</th>
<th>M</th>
<th>M</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sand</td>
<td>10</td>
<td>10</td>
<td>—</td>
<td>10</td>
<td>70</td>
<td>30</td>
<td>90</td>
<td>50</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Silt</td>
<td>25</td>
<td>25</td>
<td>—</td>
<td>25</td>
<td>35</td>
<td>25</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Clay</td>
<td>55</td>
<td>55</td>
<td>—</td>
<td>55</td>
<td>55</td>
<td>20</td>
<td>20</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

COMPOSITION:

| Chlorite | 20 | — | 1 | — | — | — | — | — | — | — | — |
| Clay     | — | 10 | 42 | 35 | 20 | — | — | — | — | — | — |
| Dolomites| — | 2 | — | — | — | — | — | — | — | — | — |
| Feldspar | 19 | 13 | 3 | 7 | 9 | 10 | — | — | — | — | — |
| Foraminifers| — | 5 | — | 5 | — | 5 | — | — | — | — | — |
| Ooids    | — | 60 | — | 20 | 65 | 75 | 9 | — | — | — | — |
| Mica    | 5 | 5 | — | 5 | 5 | — | — | — | — | — | — |
| Nannofossils | 19 | — | 40 | 28 | 3 | — | 3 | — | — | — | — |
| Diatoms | 5 | 5 | 1 | 2 | — | 10 | 80 | — | — | — | — |
| Pyrite   | 5 | 5 | 1 | — | 5 | 5 | 3 | — | — | — | — |
| Radiolarians | 5 | 5 | 1 | 2 | — | 10 | 80 | — | — | — | — |
| Rock Fragments | 5 | 5 | 1 | 2 | — | 10 | 80 | — | — | — | — |
| Silicoflagellates | — | — | — | 3 | — | — | — | — | — | — | — |
| Spicules | — | — | — | — | 7 | 2 | — | — | — | — | — |
| Others  | — | — | — | — | — | — | — | — | — | — | — |
**Lithologic Description**

**NANNOFOSIL MARL**

Major lithology: NANNOFOSIL MARL varies from light brown (10YR 6/2) to gray (5YR 5/1) to reddish-brown (10YR 4/1). Intermixed sands in 44% to light brown (10YR 6/2) silt layers and scattered pumice fragments are present. Section 4 is broken and filled with dark gray to purple grains. The lower part of Section 5 is severely disturbed by drilling.

**Smear Slide Summary (%)**

<table>
<thead>
<tr>
<th>Texture</th>
<th>1.36</th>
<th>2.23</th>
<th>2.57</th>
<th>3.27</th>
<th>4.69</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sand</td>
<td></td>
<td>15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Silt</td>
<td>15</td>
<td>70</td>
<td>45</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Clay</td>
<td>80</td>
<td>30</td>
<td>40</td>
<td>50</td>
<td></td>
</tr>
</tbody>
</table>

**Texture:**
- Sand: 15%
- Silt: 70%
- Clay: 80%

**Composition:**
- Clay: 29%
- Feldspar: 29%
- Foraminifera: 29%
- Glass: 29%
- Mica: 29%
- Nannofossils: 29%
- Opaque: 29%
- Pyrite: 29%
- Quartz: 29%
- Red ochers: 29%
Drilling disturbance is severe in this core of the NANNOFossil MARL. Major lithology: NANNOFossil MARL, grayish brown (10YR 5/2) to gray (10YR 5/1), is structureless.

SMEAR SLIDE SUMMARY (%):

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sand</td>
<td>10</td>
</tr>
<tr>
<td>Silt</td>
<td>60</td>
</tr>
<tr>
<td>Clay</td>
<td>30</td>
</tr>
</tbody>
</table>

COMPOSITION:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clay</td>
<td>25</td>
</tr>
<tr>
<td>Feldspar</td>
<td>5</td>
</tr>
<tr>
<td>Glaeb</td>
<td>10</td>
</tr>
<tr>
<td>Mica</td>
<td>30</td>
</tr>
<tr>
<td>Nannofossils</td>
<td>25</td>
</tr>
<tr>
<td>Pynolite</td>
<td>77</td>
</tr>
<tr>
<td>Quartz</td>
<td>5</td>
</tr>
</tbody>
</table>
LITHOLOGIC DESCRIPTION

NANOFOSIL MARL

Major lithology: NANOFOSIL MARL, gray (10YR 6/1) to light brownish gray (10YR 6/2). The core is severely disturbed by bioturbation. In Section 3, three 40 cm thick distinct graded intervals of black (10YR 2/1) to pinkish gray (5YR 6/2) sand are present.

Minor lithology:
- Black (10YR 2/4), 22 cm thick layer of manganese oxide in Section 5 at 55-67 cm. The interval is weakly indurated and dirty when dry.
- Volcanic ash, reddish brown (10YR 5/4) is present in Section 3 at 30-50 cm and in Section 6 at 9-15 cm.

SMER SLIDE SUMMARY (%):

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clay</td>
<td>17</td>
<td>30</td>
<td>10</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Silt</td>
<td>80</td>
<td>20</td>
<td>10</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Texture</td>
<td>Sand</td>
<td>50</td>
<td>30</td>
<td>10</td>
<td>5</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Clay</td>
<td>30</td>
<td>10</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

SMER SLIDE SUMMARY (%):

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clay</td>
<td>17</td>
<td>30</td>
<td>10</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Silt</td>
<td>80</td>
<td>20</td>
<td>10</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Texture</td>
<td>Sand</td>
<td>50</td>
<td>30</td>
<td>10</td>
<td>5</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Clay</td>
<td>30</td>
<td>10</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

COMPOSITION:

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clay</td>
<td>17</td>
<td>30</td>
<td>10</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Silt</td>
<td>80</td>
<td>20</td>
<td>10</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Texture</td>
<td>Sand</td>
<td>50</td>
<td>30</td>
<td>10</td>
<td>5</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Clay</td>
<td>30</td>
<td>10</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
Site 786, Hole A

Cored Interval: 3144.5-3154.1 mbsf; 86.4-86.0 mbsf

Upper Eocene - Upper Oligocene

<table>
<thead>
<tr>
<th>C/M</th>
<th>C/P</th>
</tr>
</thead>
<tbody>
<tr>
<td>P16-P17</td>
<td></td>
</tr>
</tbody>
</table>

A/G CP16a CP18 CP19

<table>
<thead>
<tr>
<th>N</th>
<th>Meters</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Microfossils**

- Taxa:
  - Foraminifera
  - Nannofossils
  - Radiolaria

**Description**

- Lithologic Description
- Cored Sample Summary

**Textural Description**

- Description
- Texture

**Composition**

- Composition

**Paleomagnetic**

- Paleomagnetic
- Paleointensity
- Paleomagnetic

**Chemistry**

- Chemistry
- Section

**Drilling Disturbance**

- Disturbance
- Sed. Structures

**Sample**

- Sample

- Data Table

**Time-Rock Unit**

- Time-Rock Unit

**Site 786**
### Major Lithology:

**NANNOFOSSIL MARL.**

- Major lithology: NANNOFOSSIL MARL, light reddish brown (5YR 6/5) to reddish brown (10YR 5/4). Scattered ash and pumice fragments are present throughout. Biostratification is sight throughout. In Section 4 it's a fault cut the core at an angle of approximately 45 degrees.
- Minor lithologies: a. Vitric sand, light yellowish brown (10YR 6/4) to light brownish gray (2.5YR 6/4) contains scattered pumice fragments and altered glass.

#### SMEAR SLIDE SUMMARY (%):

<table>
<thead>
<tr>
<th>TEXTURE</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sand</td>
<td>10</td>
<td>20</td>
<td>10</td>
<td>20</td>
<td>10</td>
<td>10</td>
<td>50</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Silt</td>
<td>55</td>
<td>60</td>
<td>80</td>
<td>20</td>
<td>45</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clay</td>
<td>35</td>
<td>20</td>
<td>10</td>
<td>10</td>
<td>50</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### COMPOSITION:

- Clay: 35\% 20\% 10\% 10\% 50\% 100\%
- Feldspar: 2\% 7\% 1\% 1\% 1\% 1\%
- Foraminifera: 2\% 5\% 1\% 1\% 1\% 1\%
- Glass: 2\% 3\% 5\% 1\% 1\% 1\%
- Micrite: 25\% 5\% 1\% 1\% 1\% 1\%
- Nannofossils: 25\% 5\% 1\% 1\% 1\% 1\%
- Opal: 10\% 5\% 3\% 1\% 1\% 1\%
- Pumice: 1\% 3\% 3\% 1\% 1\% 1\%
- Radiolarians: 1\% 1\% 1\% 1\% 1\% 1\%
- Sericite: 1\% 1\% 1\% 1\% 1\% 1\%
- Sideromelane: 1\% 1\% 1\% 1\% 1\% 1\%
- Spicules: 1\% 1\% 1\% 1\% 1\% 1\%

#### SMEAR SLIDE SUMMARY (%):

<table>
<thead>
<tr>
<th>TEXTURE</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silt</td>
<td>100</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### COMPOSITION:

- Feldspar: 1\% 5\% 1\% 1\% 1\%
- Glass: 58\% 50\% 1\% 1\% 1\% 1\%
- Pumice: 1\% 5\% 1\% 1\% 1\% 1\% 1\% 1\% 1\%
**SITE 786 HOLE A CORE 12X CORED INTERVAL 3163.8-3173.4 mbsl; 105.7-115.3 mbsf**

<table>
<thead>
<tr>
<th>TIME-ROCK UNIT</th>
<th>DIAGRAM</th>
<th>BIOSTRAT, ZONAL, FOSSIL, CHARACTER</th>
<th>LITHOLOGIC DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>PALYNOLITHS</td>
<td>NANNOSOSSIL MARL, white (2.5Y 6/2) to light gray (2.5Y 7/2) contains numerous pumice fragments. Pumice fragments are broken (10YR 6/2 to 10YR 6/6), rounded, up to 6 cm in length, vesicular, and float in the nannofossil ooze matrix. The average clast size decreases upward. A sharp color and texture change occurs in Section CC at 15 cm. The amount of matrix material decreases and clasts become dark greenish gray (5BG 4/1).</td>
</tr>
</tbody>
</table>

**SITE 786 HOLE A CORE 12X CORED INTERVAL 3173.4-3183.0 mbsl; 115.3-124.9 mbsf**

<table>
<thead>
<tr>
<th>TIME-ROCK UNIT</th>
<th>DIAGRAM</th>
<th>BIOSTRAT, ZONAL, FOSSIL, CHARACTER</th>
<th>LITHOLOGIC DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>PALYNOLITHS</td>
<td>NANNOSOSSIL MARL, greenish gray (5BG 4/1) contains drill cuttings and many vesicular volcanic clasts.</td>
</tr>
</tbody>
</table>

**SITE 786 HOLE A CORE 13X CORED INTERVAL 3173.4-3183.0 mbsl; 115.3-124.9 mbsf**

<table>
<thead>
<tr>
<th>TIME-ROCK UNIT</th>
<th>DIAGRAM</th>
<th>BIOSTRAT, ZONAL, FOSSIL, CHARACTER</th>
<th>LITHOLOGIC DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>PALYNOLITHS</td>
<td>NANNOSOSSIL MARL, greenish gray (5BG 4/1) contains drill cuttings and many vesicular volcanic clasts.</td>
</tr>
</tbody>
</table>
### LITHOLOGIC DESCRIPTION

This core consists entirely of drill cuttings of igneous rocks and a few clasts from the overlying nannofossil marls.

**SMERE SLIDE SUMMARY (%):**

1, 10 1, 14

**TEXTURE:**

- Silt: 41%
- Clay: 59%

**COMPOSITION:**

- Chlorite: 90%
- Serpentine: 10%
- Nannofossils: 35%
- Pyroxenes: 1%

---

### LITHOLOGIC DESCRIPTION

This core consists of drill cuttings and chips primarily composed of igneous and volcaniclastic rocks.

**TEXTURE:**

- Silt: 100%

**COMPOSITION:**

- Serpentine: 100%

---

### LITHOLOGIC DESCRIPTION

This core consists entirely of drill cuttings and igneous rock fragments.

**TEXTURE:**

- Silt: 100%

**COMPOSITION:**

- Serpentine: 100%
This core consists entirely of igneous rock clasts.

This core consists entirely of drill cuttings and igneous rocks.
Section 1 and 0-9 cm in Section CC in this core consist entirely of drill cuttings. The remainder of the core (9-34 cm in Section CC) consists of igneous rock capped by a thin (11 cm) veneer of dark greenish gray (5G 4/1) to dark reddish brown (2.5YR 3/4) sheared, coarse sand-sized material.

**SMEAR SLIDE SUMMARY (%):**

<table>
<thead>
<tr>
<th>TEXTURE</th>
<th>CC, 11</th>
<th>CC, 17</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sand</td>
<td>75</td>
<td>1</td>
</tr>
<tr>
<td>Silt</td>
<td>25</td>
<td>51</td>
</tr>
<tr>
<td>Clay</td>
<td>—</td>
<td>8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COMPOSITION</th>
<th>CC, 11</th>
<th>CC, 17</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clay</td>
<td>—</td>
<td>9</td>
</tr>
<tr>
<td>Glass</td>
<td>85</td>
<td>1</td>
</tr>
<tr>
<td>Morne</td>
<td>—</td>
<td>91</td>
</tr>
<tr>
<td>Sideromelane</td>
<td>15</td>
<td>—</td>
</tr>
</tbody>
</table>
UNIT 1: VARIABLY ALTERED VOLCANICS

Pieces multiple fragments

CONTACTS: Clasts in marl.

PHENOCRYSTS:
- Clinopyroxene: 1%; < 1 mm; euhedral; black.

GROUNDMASS: Glassy when green, maybe very finely crystalline when olive.

VESICLES: 10-30%; < 1 cm; sub-rounded; distributed throughout rock.

COLOR: Olive, (5Y 4/3); tones of green (5GY 7/6 to 5GY 5/6).

STRUCTURE: None.

ALTERATION: Variably altered, locally white silky replacement.

VEINS/FRACTURES: Trace; 1 mm thick; randomly oriented; veins and zones of ochre-colored alteration.

ADDITIONAL COMMENTS: Reworked subrounded breccia clast at 100-105 cm; volcanioclastic horizon at 125-140 cm and at 146-150 cm.
UNIT 1: ALTERED VOLCANICLASTICS

Pieces multiple fragments

CONTACTS: Fragments in marl.

PHENOCRYSTS:
- Clinopyroxene - trace; < 1 mm.

GROUNDMASS: Devitrified glass.

VESICLES: 10-30%; < 5 mm; sub-rounded; distributed throughout rock.

COLOR: Green (5GY 7/4 to 5GY 4/8).

STRUCTURE: None.

ALTERATION: Varibly altered.

VEINS/FRACTURES: Absent.

ADDITIONAL COMMENTS: Clasts in distinct beds, well sorted, variable bed thickness (0.25 - 15 cm).
UNIT 1: ALTERED VOLCANICLASTICS

Pieces multiple fragments

CONTACTS: Fragments in marl.

PHENOCRYSTS:
- Plagioclase: 1%; 1-2 mm; euhedral, altered.
- Clinopyroxene: trace; <1 mm; euhedral, black.
- Orthopyroxene: 1%; <2 mm; anhedral, light green.

GROUNDMASS: Probably very finely crystalline and altered.

VESICLES: 30%; <4 mm; round to elongated; distributed throughout rock; some vesicles may be filled with clear glassy material (or rock contains rounded quartz grains).

COLOR: Grayish brown (10YR 5/2 to 10YR 5/6).

STRUCTURE: None

ALTERATION: Around rim of clast and in core of largest cm-size green clasts.

VEINS/FRACTURES: Trace; <0.1 mm thickness; randomly distributed; black-appearing veins, probably filled with white milky opal.

ADDITIONAL COMMENTS: Bedding; sorting; description mainly relevant to large clast at 13-16 cm.
UNIT 1: ALTERED VOLCANICLASTICS

Pieces multiple clasts

CONTACTS: Clasts in marl.

PHENOCRYSTS: Euhedral crystals, commonly surrounded by dark-green altered orthopyroxene in large grayish-brown clasts; small green fragments are phenocryst-free.

- Plagioclase - trace; <1 mm; euhedral, altered.
- Clinopyroxene - trace; <1 mm; euhedral, black.
- Orthopyroxene - 2%; <2 mm; anhedral, light green.

GROUNDMASS: Altered, very finely crystalline or glassy material in large clasts; small green clasts are altered glass.

VESICLES: 30%; <4 mm; round to elongated; distributed throughout rock, some vesicle filling.

COLOR: Grayish brown (10YR 6/2 to 10YR 5/2); green (5GY 7/6 to 5GY 5/8).

STRUCTURE: None.

ALTERATION: Alteration at clast rim; green cm-size clasts altered in the center.

VEINS/FRACTURES: Trace; tiny <0.1 mm; randomly oriented; fractures postdating alteration are present, veinlets appear black but contain glassy opal.

ADDITIONAL COMMENTS: Large clasts at 90-95, 110-120, and 130-150 cm; well-sorted beds; green fragments are small (<2 cm) and common in marl matrix.
UNIT 1: CONTINUED

Pieces multiple fragments

CONTACTS: N/A.
PHENOCRYSTS: N/A.
GROUNDMASS: N/A.
VESICLES: N/A.
COLOR: N/A.
STRUCTURE: N/A.
ALTERATION: N/A.
VEINS/FRACTURES: N/A.
ADDITIONAL COMMENTS: Interval 0-17 cm is continuation of 125-786A-12X-2.

UNIT 1: ALTERED VOLCANICLASTICS

Pieces multiple fragments

CONTACTS: Clasts in marl.
PHENOCRYSTS:

- Plagioclase - trace; <2 mm; euhedral, altered.
- Orthopyroxene - 1%; 1-3 mm; anhedral to subhedral.
GROUNDMASS: Very finely crystalline, altered.
VESICLES: 30%; < 4 mm; round to elongated; distributed throughout sample; some are filled with milky white opal(?)
COLOR: Grayish brown (7.5YR 6/2).
STRUCTURE: None.
ALTERATION: Clast rims are ochre colored; strongly altered.
VEINS/FRACTURES: Trace; white opal(?) veins; randomly oriented; veins and filled vesicles contain same white material.
ADDITIONAL COMMENTS: Large grayish-brown and green clasts appear consanguineous in this section.
UNIT 1: ALTERED BASALTIC ANDESITE

Pieces multiple fragments

CONTACTS: Not visible.

PHENOCRYSTS: Monomineralic glomerocrysts.
  Plagioclase - 5%; <1 mm; euhedral, altered.
  Orthopyroxene - 10%; <1 mm; anhedral, fresh.

GROUNDMASS: Glassy, commonly altered.

VESICLES: 20%, < 2 mm; sub-rounded; randomly distributed.

COLOR: Black when fresh and wet; grayish-green (5G 4/2) when altered.

STRUCTURE: None.

ALTERATION: White opal along veins and alteration of glass.

VEINS/FRACTURES: 5%; up to 2 mm-thick veins; random orientation; white veins through black glass.

ADDITIONAL COMMENTS: Brecciated clasts with white vein filling.
UNIT 1: OLIVINE PHYRIC GLASS

Pieces multiple fragments

CONTACTS: Not visible.

PHENOCRYSTS:
Olivine - 20%; <1 mm; euhedral, yellow-colored, not very forsterite-rich.

GROUNDMASS: Glassy, commonly pervasively altered.

VESICLES: 20%; < 3 mm; sub-round; distributed throughout rock.

COLOR: Fresh glass is gray to black (N 7/ to 5B 4/1); altered glass is bluish gray (5BG 5/1).

STRUCTURE: None

ALTERATION: Glass shows alteration.

VEINS/FRACTURES: Not visible.

ADDITIONAL COMMENTS: Probably holochalyne rock.
UNIT 1: OLIVINE- AND BRONZITE-BEARING ANDESITE
(BONINITE SERIES?)

Pieces drilling breccia

CONTACTS: None visible.

PHENOCRYSTS:
- Orthopyroxene - <0.5 mm; elongate, euhedral.
- Olivine - <0.3 mm; equant with spinel inclusions.

GROUNDMASS: Approximately 70-85% of rock; glassy with chilled plagioclase.
- Microcrysts and spinel microcrysts (usually as inclusions within olivine).

VESICLES: 10-15%; <0.1 - 3 mm; irregular to rounded; n/a; slight clay filling.

COLOR: Dark greenish gray (10Y 4/1), mottled.

STRUCTURE: None visible.

ALTERATION: Chlorite, clays.

VEINS/FRACTURES: <1%; <1.5 mm; no apparent orientation; dark green, amorphous
material.

ADDITIONAL COMMENTS: Pieces vary in size from <1 mm to 4 cm; other rock types may
be present but this appears to be the dominant lithology.
UNIT 1: OLIVINE- AND BRONZITE-BEARING ANDESITE

Pieces: Clasts in sediment

CONTACTS: None visible.

PHENOCRYSTS:
- Orthopyroxene - ?, <0.5 mm; elongate to euhedral.
- Olivine - ?, <0.3 mm; equant with spinel inclusions.

GROUNDMASS: Glassy up to 70-80%, quench plagioclase and spinel microcrysts are present.

VESICLES: 10-15%; <0.1-3 mm; irregular to round; random.

COLOR: Dark greenish gray (10Y 4/1), mottled.

STRUCTURE: None visible.

ALTERATION: 30-80% altered to chlorite and clay minerals.

VEINS/FRACTURES: <1%; <1.5 mm; no apparent orientation.
UNIT 1: OLIVINE- AND BRONZITE-BEARING ANDESITE
(BONINITÉ SERIES?)

Pieces drilling breccia

CONTACTS: None visible.

PHENOCRYSTS:
- Orthopyroxene - ?; <0.5 mm; elongate to euhedral.
- Olivine - ?; <0.3 mm; equant with spinel inclusions.

GROUNDMASS: Approximately 70-80%; glassy with quench crystals of plagioclase and spinel.

VESICLES: 10-15%; <0.1-3 mm; round to irregular; random.

COLOR: Dark greenish gray (10Y 4-1).

STRUCTURE: None visible.

ALTERATION: Chlorite and clays.

VEINS/FRACTURES: <<1%; <1-2 mm; no visible orientation; dark green amorphous material.

ADDITIONAL COMMENTS: Pieces range from <1 mm to 3-4 mm in diameter. Other rock types may be present, but this appears to be the dominant lithology.
UNIT 1: OLIVINE- AND BRONZITE-BEARING ANDESITE (BONINITE SERIES)

Pieces drilling breccia

CONTACTS: None visible.

PHENOCRYSTS:
Orthopyroxene - ?; <0.5 mm; elongate to euhedral.
Olivine - ?; <0.3 mm; equant with spinel inclusions.

GROUNDMASS: Approximately 80%, glassy with quench crystals of plagioclase and spinel (usually as inclusions within olivine).

VESICLES: 10-15%; <0.1-3 mm; round to irregular; random.

COLOR: Dark greenish gray (10Y 4/1).

STRUCTURE: None visible.

ALTERATION: Chlorite and clays.

VEINS/FRACTURES: <1%; <1.5 mm; no apparent orientation; filled with dark green amorphous material.

ADDITIONAL COMMENTS: Pieces range from <1 mm to 3-4 cm in diameter; other rock types may be present but this appears to be the dominant lithology.
UNIT 1: BASALT

Pieces multiple, set in sediment

CONTACTS: None visible.

PHENOCRYSTS:
- Olivine - 0-8%; <0.5-1 mm; equant, euhedral, green.
- Orthopyroxene - 4-6%; <0.3 mm; euhedral to elongate.
- Clinopyroxene - 3-5%; <0.5 mm; euhedral, equant.
- Plagioclase - 2%; <0.1 mm; laths.

GROUNDMASS: Approximately 80% of rock is glassy with quench crystals of plagioclase and clinopyroxene.

VESICLES: 7-10%; bimodal <0.5-1; 2-3 mm; round; random.

COLOR: Gray to dark gray (7.5YR 4/0-5/0).

STRUCTURE: None visible.

ALTERATION: Chlorite and celadonite staining on phenocrysts.

VEINS/FRACTURES: None visible.

ADDITIONAL COMMENTS: Rock pieces range from 3-6 cm in diameter.
UNIT 1: BASALT

Pieces multiple, set in sediment

CONTACTS: None visible.

PHENOCRYSTS:
- Olivine - 6-8%; <0.5-1 mm; euhedral, green, contains fluid inclusions.
- Orthopyroxene - 4-6%; <0.3 mm; euhedral to elongate with fluid inclusions.
- Clinopyroxene - 3-5%; <0.3 mm; euhedral, equant.
- Plagioclase - 2%; 0.1 mm; laths.

GROUNDMASS: Approximately 70-80%, glassy with quench crystals of plagioclase and clinopyroxene.

VESICLES: 10-15%; bimodal: <0.5-1, 2-3 mm; usually round, also elongate, irregular; random.

COLOR: Gray to dark gray (7.5YR 4/0-5/0).

STRUCTURE: None visible.

ALTERATION: Chlorite, clays, with celadonite staining.

VEINS/FRACTURES: None present.

ADDITIONAL COMMENTS: Clasts are 2-6 cm in diameter.
UNIT 1: OLIVINE- AND BRONZITE-BEARING ANDESITE (BONINITE SERIES)

Pieces drilling breccia

CONTACTS: None visible.

PHENOCRYSTS:
- Orthopyroxene - ?; <0.5 mm; elongate, euhedral.
- Olivine - ?; <0.3 mm; equant with spinel inclusions.

GROUNDMASS: Approximately 70-80% glass, quench crystals of plagioclase and spinel are present.

VESICLES: 10-15%; <0.1-3 mm; irregular to rounded; random.

COLOR: Dark greenish gray (10Y 4/1).

STRUCTURE: None visible.

ALTERATION: Chlorite, clays.

VEINS/FRACTURES: <1%; <1.5 mm; no apparent preferred orientation; dark green, amorphous material.

ADDITIONAL COMMENTS: Pieces range from <1 mm to 2-3 cm in diameter; there may be other rock types present but this is the dominant lithology.
UNIT 1: OLIVINE AND BRONZITE-BEARING ANDESITE (BONINITE SERIES) (CONTINUATION OF 18-1)

Pieces 1-4

CONTACTS: None visible.
PHENOCRYSTS: N/A.
GROUNDMASS: Same as 125-786A-18X-1.
VESICLES: None.
COLOR: Dark greenish gray (10Y 4/1).
STRUCTURE: None.
ALTERATION: Chlorite, clays.
VEINS/FRACTURES: Dark green, amorphous material.
ADDITIONAL COMMENTS: Continuation of 125-786A-18X-1; same dominant lithology.
UNIT 1: OLIVINE PHYRIC GLASS/ROCK

Pieces drill cuttings

CONTACTS: Not visible.

PHENOCRYST: Olivine may be glomerocrystic.

Olivine - 10%; < 1 mm: subhedral, yellow-green.

GROUNDMASS: Black when glassy, gray when glass and fine crystals.

VESICLES: 10-25%; 2-3 mm round; distributed throughout sample; some vesicles are filled with dark blue-green zeolite.

COLOR: Black (10YR 2/1); gray (10Y 5/1).

STRUCTURE: None.

ALTERATION: Glass alters to bluish-green material.

VEINS/FRACTURES: Not present.

ADDITIONAL COMMENTS: Glass and partly crystalline material can be observed in gradational contact in some fragments indicating that they are the same composition.
125-786A-19X-CC

UNIT 1: 19X-1 CONTINUED

Pieces: drill cuttings

CONTACTS: N/A.
PHENOCRYSTS: N/A.
GROUNDMASS: N/A.
VESICLES: N/A.
COLOR: N/A.
STRUCTURE: N/A.
ALTERATION: N/A.
VEINS/FRACTURES: N/A.

ADDITIONAL COMMENTS: Interval 0-10 cm is continuation of 125-786A-19X-1.

UNIT 1: ALTERED PLAGIOCLASE MICRO-PHENOCRYSTIC BASALT

Piece 1

CONTACTS: Top in contact with chlorite/clay.
PHENOCRYSTS: Plagioclase is completely altered.
GROUNDMASS: Completely altered.
VESICLES: 0-5%; <1 mm; irregular to round; distributed throughout rock; some are filled with zeolites.
COLOR: Dark gray (N 4/).
STRUCTURE: None.
ALTERATION: Basalt seems to alter to dark green chlorite (serpentine-like) clay.
VEINS/FRACTURES: 10%; 1-2 cm wide; sub-horizontal with 90 degree dip; one vein is light gray with ochre-brown rims; other vein is chlorite-rich zone.
UNIT 1: BONINITE

Pieces 1-15

CONTACTS: Not visible.

PHENOCRYSTS: Phenocrysts are fresh; glomerocrysts of olivine and of plagioclase are also present.
  Plagioclase - 10-15%; <2 mm; euhedral to anhedral, fresh, clear, colorless.
  Orthopyroxene - 5%; <3 mm; coke-bottle green, euhedral.
  Spinel - trace; <0.5 mm; glassy, black, as inclusions in olivine.
  Olivine - 10%; <2 mm; anhedral, yellow to brown.

GROUNDMASS: Glassy to very fine grained.

VESICLES: 15-25%; <1 cm; round to elongated; distributed throughout rock; vesicles are always filled with bluish mineral.

COLOR: Gray (N 5).

STRUCTURE: Beige-colored streak (2 cm wide); in Piece 6 could be magma-mixing.

ALTERATION: Clay minerals and/or zeolites in vesicles, orthopyroxene coloration might be caused by alteration. Pieces 4, 7, 8 are locally altered to bright green chlorite(?)-rich material. Phenocrysts remain largely unaltered in these areas.

VEINS/FRACTURES: Not present.

ADDITIONAL COMMENTS: Slight variation in phenocryst content and proportion throughout rock.
UNIT 1: BONINITE (786B-1R-1 CONTINUED)

Pieces 1-14

CONTACTS: None visible.

PHENOCRYSTs: Phenocrysts are fresh.
   Plagioclase - 10%; <2 mm; euhedral and anhedral, fresh, clear, colorless.
   Orthopyroxene - 5%; <1 mm; coke-bottle green, euhedral.
   Clinopyroxene - trace; <0.5 mm; anhedral, black glassy.
   Olivine - 10%; <2 mm; anhedral, yellow.

GROUNDMASS: Glassy to fine-grained.

VESICLES: 15-25%; <1 cm; round to elongated; distributed throughout rock; vesicles are filled with bluish mineral.

COLOR: Gray (N 5).

STRUCTURE: Absent.

ALTERATION: Clay minerals and/or zeolites in vesicles; sharp boundaries between green altered rock and gray fresh rock. Rock appears brecciated. Fracture-controlled alteration.

VEINS/FRACTURES: 0-90%; cm-wide alteration zones; random orientation; very sharp contact going from altered to fresh rock. Locally highly altered, most pieces do not show green alteration zones.

ADDITIONAL COMMENTS: Section is continuation of 125-786B-1R-1.
UNIT 1: BONINITE (786B-2R-1 CONTINUED)

Pieces 1-15

CONTACTS: Not visible.

PHENOCRYSTS: Some variations in phenocryst mode from piece to piece.
- Plagioclase - 2-15%; <2 mm; euhedral and anhedral, clear, colorless, fresh.
- Orthopyroxene - 5-10%; <2 mm; euhedral, coke-bottle green, fresh.
- Olivine - 5-15%; <2 mm; anhedral, yellow, iddingsite.
- Clinopyroxene - 1%; <0.5 mm; anhedral, black-glassy, only occurs with olivine in glomerocrysts.

GROUNDMASS: Glassy to finely crystalline.

VESICLES: 15-25%; <1 cm; round to flattened, parallel orientation; distributed throughout; vesicles are filled with bluish zeolite.

COLOR: Gray (N 5/).

STRUCTURE: Absent.

ALTERATION: Alteration zones with sharp transitions to fresh rock (e.g. in Piece 2). Towards bottom (Pieces 12-15) more strongly altered to light gray material.

VEINS/FRACTURES: 0-90%; alteration seems vein controlled; random orientation; alteration is not pervasive but occurs in varying proportions in adjacent pieces.

ADDITIONAL COMMENTS: Section is a continuation of 125-786B-1R-1 and 2R-1.
UNIT 1: BONINITE (3R-1 CONTINUED)

Pieces 1-30

CONTACTS: Not visible.

PHENOCRYSTS: Phenocrysts are fresh.
- Plagioclase - 5-15%; <2 mm; euhedral, fresh, colorless.
- Orthopyroxene - 5-10%; <2 mm; euhedral, coke-bottle green.
- Olivine - 5-15%; <1 mm; anhedral, yellow, in glomerocrysts.
- Spinel - 1%; <1 mm; anhedral, included in olivine (glomerocrysts).

GROUNDMASS: Glassy to partly crystalline.
VESICLES: 15-25%; <1 cm; elongated, parallel; distributed throughout; filled with bluish mineral.
COLOR: Gray (N 5).

STRUCTURE:Absent.
ALTERATION: Locally groundmass is altered and green in color.
VEINS/FRACTURES: Alteration may be fracture-controlled.
ADDITIONAL COMMENTS: Continuation of Core 125-786B-1R-1 to -3R-1.
UNIT 1: TWO-PYROXENE ANDESITE

 Pieces 1-25

 CONTACTS: None visible.

 PHENOCRYSTS: Glomerocrysts of plagioclase and pyroxene are present.
 Orthopyroxene - 5-10%; 0.2-1 mm; euhedral.
 Clinopyroxene - 2-5%; 0.2-0.5 mm; euhedral.
 Olivine - trace; 0.8-2 mm; highly altered to orange-brown carbonate/Fe-oxide assemblage.
 Plagioclase - 5-10%; 0.3-4 mm; euhedral.

 GROUNDMASS: Glassy to fine-grained, variably altered from <10-90%.

 VESICLES: 2-7%; <7 mm; elongate; throughout rock; some are filled with light blue amorphous material; often elongated and aligned.

 COLOR: Olive-gray to gray (5Y 4/2 - 5Y 5/1).

 STRUCTURE: Massive with multiple alteration boundaries.

 ALTERATION: Patchy with distinct boundaries between fresh glassy cores and highly altered coke-bottle green material; cores are 2-5 cm in diameter; alteration minerals give a saussuritized appearance.

 VEINS/FRACTURES: <1%; <1-2.5 mm wide; subvertical; calcite and chlorite, most common in Pieces 1-4.

 ADDITIONAL COMMENTS: Sharp alteration fronts are unusual, matrix is highly altered and phenocrysts are quite fresh. Rock type is generally a continuation from Cores 1R-1 through 4R-1.
UNIT 1: TWO-PYROXENE ANDESITE

Pieces 1-5

CONTACTS: None visible.

PHENOCRYSTS: Glomerocrysts of plagioclase and pyroxene are present; most phenocrysts are quite fresh.
Orthopyroxene - 5-10%; 0.2-1 mm; equant to elongate, euhedral, bronze to black-brown.
Clinopyroxene - 2-5%; 0.2-0.5 mm; equant to elongate, coke-bottle green.
Plagioclase - 5-10%; 0.3-4 mm; equant, euhedral.
Olivine - trace; 0.8-2 mm; highly altered to orange-brown carbonate/Fe-oxide assemblage.

GROUNDMASS: 80-85%, glassy to fine-grained, variably altered to a brown (hydrothermal?) appearance.

VESICLES: 10-15%; 1-5 mm; irregular and smooth; throughout; some vesicles are filled with amorphous light-blue material.

COLOR: Light yellowish brown to yellowish brown (10YR 6/4-5/4) for the altered portions; very dark gray to black (2.5Y 4/0-2/0) for the fresh portions.

STRUCTURE: Massive.

ALTERATION: Variable 5-50%; primarily brown clays.

VEINS/FRACTURES: >1%; 3-4 mm by 7 mm; no orientation; only Piece 1 has an elongate patch of carbonate vein.

ADDITIONAL COMMENTS: Alteration in this part of the core is distinct from Core 5R-1; all alteration here is brown and amorphous; mineralogically this is a continuation from Core 1R-1 through 5R-1.

UNIT 2: TWO-PYROXENE ANDESITE/OLIVINE PHYRIC BASALT

Pieces 6A, B, C; 7A, B, C

CONTACTS: Contorted; appear to result from magma mixing between the two rock types.

PHENOCRYSTS: Assemblage varies between the two rock types.
Orthopyroxene - 5-10%; 0.1-1 mm; equant to elongate, euhedral, bronze to dark brown; similar in both rock types but smaller and less abundant (trace) in basalt segment.
Clinopyroxene - 2-5%; 0.2-0.5 mm; equant to elongate; coke-bottle green; similar but smaller (<0.2 mm) and less abundant (<1%) in basalt segment.
Plagioclase - 5-10%; 0.3-4 mm; equant; euhedral microphenocrysts (<0.1 mm; <1%) in basalt segment.
Olivine - 5-7%; 0.5-2 mm; euhedral, altering to carbonate and Fe/oxides; none present in andesite; Cr-spinel inclusions; olivine only present in basalt.

GROUNDMASS: Basalt contains light brown glass with quench crystals of feldspar and pyroxene.

VESICLES: 5-10%; <0.5 - 4 mm; irregular; throughout; some are filled with a pale blue amorphous material.

COLOR: Alteration/compositional boundary is light yellow brown (2.5Y 5/4); bulk of rock is light yellowish-brown to grayish brown (2.5Y 6/4 - 5/2).

STRUCTURE: Massive with the exception of the compositional/alteration boundary.

ALTERATION: Variable <10-65%; two patches (2-4 cm in diameter) of the andesite are fresh and black the remainder is brown and altered to clays.

VEINS/FRACTURES: <1%; <1-2.5 mm; random to sub-parallel to core axis; mostly carbonate but some proportion of other white material.

ADDITIONAL COMMENTS: This is a boundary between Cores 1R-1 through 5R-1, Pieces 1-5, and below.

UNIT 2: OLIVINE PHYRIC BASALT

Pieces 8-13

CONTACTS: None visible.

PHENOCRYSTS:
Olivine - 5-7%; 0.2-2.5 mm; euhedral, slightly elongate, altering to carbonate/Fe-oxide assemblage; inclusions of Cr-spinel.
Clinopyroxene - 2-3%; 0.1-1 mm; squarish, euhedral.
Orthopyroxene - trace; <1 mm; euhedral.
Plagioclase - 1%; <1 mm; euhedral laths.

GROUNDMASS: Glassy, light brown with quench crystals of feldspar and pyroxene.

VESICLES: 4-7%; 1-4 mm; irregular, elongate, throughout but locally concentrated; locally they trend in parallel strings.

COLOR: Light yellowish brown to grayish brown (2.5Y 6/4 - 5/2).

STRUCTURE: Massive.

ALTERATION: Alteration is relatively consistent throughout at 40-60%, altering to brown amorphous clays.

VEINS/FRACTURES: <1%; 0.5 - 4 mm; sub-parallel to core axis, random; vein-filling is white carbonate material probably mixed with another white phase (zeolite?).

ADDITIONAL COMMENTS: This rock type is a continuation of the basaltic portion of 5R-2 Pieces 6 and 7.
UNIT 2: OLIVINE PHYRIC BASALT (CONTINUATION OF 5R-2, PIECES 8-13)

Pieces 1-25, 27-33

CONTACTS: None visible.

PHENOCRYSTS:
- Olivine - 5-7%; 0.2-2.5 mm; euhedral, slightly elongate, altering to carbonate/Fe-oxide assemblage, inclusions of Cr-spinel.
- Clinopyroxene - 2-3%; 0.1-1 mm; equant, euhedral.
- Orthopyroxene - trace; <1 mm; euhedral.
- Plagioclase - 1%; <1 mm; laths, euhedral.

GROUNDMASS: Glassy, light brown with quench crystals of feldspar and pyroxene.

VESICLES: 4-7%; 1-4 mm; irregular, elongate; throughout but locally concentrated; some alignment of elongate vesicles.

COLOR: Light yellowish brown to grayish brown (2.5Y 6/4 - 5/2).

STRUCTURE: Massive.

ALTERATION: Consistent throughout at 40-60%, consisting of brown amorphous clays; Piece 19 has red-orange (hematite?) alteration.

VEINS/FRACTURES: <1-1%; 0.5-3.5 mm; random, some preference for sub-parallel; white, amorphous predominantly carbonate with a second phase of an unknown white mineral (zeolite?).

ADDITIONAL COMMENTS: This rock type is continuous with Core 5R-2, Pieces 8-12.

UNIT 2: ZEOLITE (?)

Piece 26

CONTACTS: None.

PHENOCRYSTS: Not a volcanic sample.

GROUNDMASS: Not applicable.

VESICLES: None.

COLOR: White with streaks of olive green (5Y 5/3) along the edge.

STRUCTURE: Massive.

ALTERATION: Probably a piece of nearly pure (95%) zeolite.

VEINS/FRACTURES: May be a fragment of a large vein.

ADDITIONAL COMMENTS: Probably a zeolite, appears to be similar to the white vein filling phase in the surrounding volcanics, this piece is approximately 1x3x3 cm.
UNIT 2: OLIVINE PHYRIC BASALT (CONTINUATION OF CORE 6R-1)

Pieces 1-23

CONTACTS: None.

PHENOCHRYSIS:
- Olivine - 5-7%; 0.2-2.5 mm; euhedral, slightly elongate altering to carbonate/Fe-oxide/zeolite assemblage; inclusions of Cr-spinel.
- Clinopyroxene - 2-3%; 0.1-1 mm; euhedral.
- Orthopyroxene - trace; <1 mm; equant, euhedral.
- Plagioclase - 1%; <1 mm; euhedral laths.

GROUNDMASS: Glassy, light yellow-brown, with quench crystals of feldspar and pyroxene.

VESICLES: <2-12%; 0.5 - 8 mm; irregular to elongate and oval; throughout but locally concentrated; Pieces 1-4, 20-23 have 10-15% vesicles of 2-8 mm diameters, some pieces have aligned vesicles; Pieces 19-20 and 23 have vesicles aligned perpendicular to core axis.

COLOR: Fresh portions are gray to dark gray (2.5Y 5/0 - 4/0); altered portions are yellowish brown to grayish brown (2.5Y 6/4 - 5/2).

STRUCTURE: Massive.

ALTERATION: Variable. Pieces 1-17 have 20-50% alteration to brown amorphous clays, Pieces 18-23 are much fresher with <10% alteration.

VEINS/FRACTURES: <1%; 1-3 mm; sub-parallel to core axis; filled with white amorphous carbonate and zeolite(?).

ADDITIONAL COMMENTS: This rock is a continuation of Cores 5R-2, Pieces 8-12 and 5R-1.
UNIT 2: OLIVINE PHRYIC BASALT (CONTINUATION OF CORE 6R-2)

Pieces 1-5

CONTACTS: None visible.

PHENOCRYSTS:
- Olivine - 5-7%; 0.2-2.5 mm; euhedral, slightly elongate, altering to carbonate/Fe-oxide/zeolite assemblage; inclusions of Cr-spinel.
- Clinopyroxene - 2-3%; 0.1-1 mm; equant, euhedral.
- Orthopyroxene - trace; <1 mm; euhedral.
- Plagioclase - 1%; <1 mm; euhedral.

GROUNDMASS: Glassy, light yellow-brown, with quench crystals of feldspar and pyroxene.

VESICLES: 2-10%; 1-8 mm; irregular to elongate and oval; throughout, locally concentrated; alignment of large vesicles in Piece 5 at a 40 degree angle to core axis.

COLOR: Light yellowish brown to grayish brown (2.5Y 6/4 - 5/2).

STRUCTURE: Massive.

ALTERATION: Variable, but usually less than 20%, to brown amorphous clays.

VEINS/FRACTURES: None in these pieces.

ADDITIONAL COMMENTS: This rock type is continuous with Core 5R-2, Pieces 8-12, through 6R-2.
UNIT 3: PYROXENE PHYRIC ANDESITE

Pieces 1-10

CONTACTS: None visible.

PHENOCRYSTS:
- Clinopyroxene - 1-3%; 0.2-0.8 mm; euhedral, elongate to equant.
- Orthopyroxene - 1-2%; 0.2-0.6 mm; euhedral to subhedral, elongate to equant.
- Plagioclase - 1%; <0.1-0.4 mm; subhedral laths.

GROUNDMASS: Fine-grained with quench crystals of plagioclase.

VESICLES: 5-15%; 1-8 mm; round to irregular; throughout but locally concentrated;
elongate vesicles are aligned especially in Piece 1.

COLOR: Fresh portions are gray (2.5Y 6/0-5/0), altered portions are dark grayish brown
(2.5Y 5/2).

STRUCTURE: Massive.

ALTERATION: Variable <10-40% to brown amorphous clays; also rinds of green,
coarse-grained sand(?) with small clasts (1-2 mm) of rock.

VEINS/FRACTURES: None present.

ADDITIONAL COMMENTS: Rock is relatively fresh.
UNIT 3: PYROXENE PHYRIC ANDESITE (CONTINUATION OF CORE 7R-1) BRECCIA

Pieces 1-19

CONTACTS: None visible.
PHENOCRYSTS: Glomerocrysts of clinopyroxene and orthopyroxene.
- Clinopyroxene: 3-5%; 0.1-0.5 mm; equant, euhedral.
- Orthopyroxene: 1-2%; 0.1-0.3 mm; equant, subhedral.
GROUNDMASS: Very fine-grained to glassy with quench crystals of plagioclase and pyroxene.
VESICLES: 2-15%; 1-22 mm; elongate, stretched; throughout, locally concentrated; most are aligned and stretched approximately sub-parallel to the core axis.
- Miaroles: Green crystalline (sand, alteration?).
COLOR: Dark gray to light gray (2.5Y 7/0 - N4/0) in fresh rock to grayish green (5G 4/2) in breccia rinds.
STRUCTURE: "Brecciated" texture between black fresh rock and green alteration/sand rinds and breccia matrix, brecciation in some pieces appears to be in situ.
ALTERATION: Green rinds containing pyroxene, olivine, and plagioclase fragments, 1-3 mm thick probably locally derived.
VEINS/FRACTURES: <1%; <1 mm; 45 degrees to core axis; fracture in Piece 7 perpendicular to elongate vesicles.
ADDITIONAL COMMENTS: This rock appears to be a continuation of Core 7R-1 but the brecciated texture was not preserved in 7R-1.
UNIT 3: PYroxene Phytic Andesite Breccia
(CONTINUATION OF 8R-1)

Pieces 1-21

CONTACTS: None visible.

PHENOCRYST:
- Clinopyroxene - 3-5%; 0.1-0.5 mm; equant, euhedral.
- Orthopyroxene - 1-2%; 0.1-0.3 mm; equant, subhedral.
- Plagioclase - 4-5%; <0.2 mm; laths, euhedral.

GROUNDMASS: Very fine-grained to glassy with quench crystals of plagioclase and pyroxene, green matrix material is coarse-grained (1-3 mm) and appears to comprise pyroxene, olivine and plagioclase grains.

VESICLES: 1-9%; <1-3; round to elongate; throughout, locally dense; pieces 1-5 are nearly vesicle free (<1-1%, <1-1 mm); pieces lower in the section are rounder, larger and have a higher proportion of vesicles.

COLOR: From dark gray to light gray (2.5Y N7/0 - N4/0) in basalt to grayish green (5G 4/2) in breccia matrix.

STRUCTURE: "Brecciated" texture between black fresh rock and green sandy alteration matrix material, brecciation in some pieces appears to be in situ.

ALTERATION: Green rinds and matrix are composed of pyroxene, olivine, and plagioclase fragments, (1-3 mm across) probably locally derived.

VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: This rock appears to be a continuation of Cores 7R-1-8R-1.
UNIT 3: PYROXENE PHYRIC ANDESITE BRECCIA
(CONTINUATION OF 9R-1)

Pieces 1-23

CONTACTS: None visible.

PHENOCRYSTS: Glomerocrystic patches with plagioclase, ortho-, and clinopyroxene.
   Clinopyroxene - 3-6%; 0.1-0.5 mm; equant, dark-green, euhedral.
   Orthopyroxene - 2-4%; 0.1-0.3 mm; equant yellow-brown, euhedral.
   Plagioclase - 3-5%; <0.2 mm; euhedral laths.

GROUNDMASS: Very fine-grained to glassy with quench feldspar and pyroxene; green matrix material is coarse-grained and appears to comprise pyroxene and feldspar grains cemented by green and white zeolites.

VESICLES: 1-10%; <0.2 - 3 mm; spherical - elongate; variable from clast to clast.

COLOR: Basalt is dark to light gray (2.5Y N7/0 - N4/0); breccia matrix is grayish green (5G 4/2).

STRUCTURE: Brecciated texture.

ALTERATION: Clasts have alteration rims 0.1-1.5 mm thick. The matrix is composed of orthopyroxene, clinopyroxene, plagioclase and glass; these phases are angular, 1-3 mm in size. The glass is altered and the matrix as a whole is cemented by a green and white zeolite clay phase.

VEINS/FRACTURES: <1%; <0.5 - 1 mm wide; random; vein-filling is white zeolite cutting both matrix and clasts.

ADDITIONAL COMMENTS: This lithology has different types of clasts ranging from pale gray pumice to dark basalt. The degree of pervasive alteration of the clasts is highly variable.
UNIT 3: ANDESITE BRECCIA

Pieces 1-16

CONTACTS: Not visible.

PHENOCRYSTS: Phenocrysts also occur in breccia matrix.
- Orthopyroxene - 5-10%; <2 mm; glass-green (euhedral) and yellow, altering to orange brown (anhedral). Probably two orthopyroxene varieties present.
- Clinopyroxene - 2-5%; <2 mm; dark-green to black, glassy. Often associated with yellow orthopyroxene in glomerocrysts.
- Plagioclase - 0-5%; <1 mm; euhedral, clear, colorless; also in glomerocrysts with orthopyroxene.
- Olivine - 0-1%; <2 mm; euhedral, but altered to red and white, also occurs in xenolith and then contains nearly opaque Cr-spinel.

GROUNDMASS: In breccia clasts; glassy to finely crystalline.

VESICLES: 10-20%; < 1 cm; round to parallel or elongated; randomly distributed throughout; breccia matrix does not contain vesicles; some have bluish coating.

COLOR: Beige to gray (10YR 6/2 to 7.5YR 5/0) for andesite; green for breccia matrix.

STRUCTURE: Matrix-supported breccia.

ALTERATION: Andesite clasts alter to greenish matrix-like product but clast-matrix boundaries are distinct (e.g. in Piece 4C).

VEINS/FRACTURES: Trace; 1-5 mm; fractures in clasts only; random orientation; alteration of clasts seems to occur along fractures and clast surfaces.

ADDITIONAL COMMENTS: Evidence for brecciation: 1) clasts have different phenocryst modes than matrix; 2) vesicles in different clasts have different orientations but are parallel within a single clast; 3) sharp clast-matrix boundaries sometimes show reaction rim in clasts; 4) vesicles at clast rims are filled with matrix; 5) matrix is not vesicular.

ADDITIONAL SPARSE CLASTS: Microlith of 1) olivine (with almost opaque Cr-spinel inclusions + orthopyroxene + clinopyroxene); 2) Orthopyroxene + clinopyroxene (Piece 3); 3) Olivine (with spinel incl.) + orthopyroxene (Piece 3); and 4) others, including pumice.

Some large clasts are almost completely plagioclase free and olivine is rare in all clasts and often absent.
UNIT 3: ANDESITE BRECCIA (10R-1 CONTINUED)

Pieces 1-14

CONTACTS: Not visible.

PHENOCRYSTS: Microliths of orthopyroxene + clinopyroxene of 1 cm size in Piece 3B; phenocrysts also occur in breccia matrix where orthopyroxene is dominant.
- Orthopyroxene - 8-15%; <2 mm; glass-green (euhedral), yellow to brown (anhedral).
- Clinopyroxene - 2-4%; <1 mm; black, glassy, with yellow.
- Orthopyroxene; Anhedral.
- Plagioclase - 0-5%; <2 mm; euhedral to anhedral.
- Olivine - trace; <1 mm; reddish alteration (olivine occurs in very few pieces only).

GROUNDMASS: Fine-grained to glassy in clasts, less glass than in 10R-1.

VESICLES: 5-15%; <1 cm; sub-rounded to parallel or elongated; randomly distributed.

COLOR: Gray (7.5 YR 5/0) for clasts; pale green (5G 6/2) for matrix.

STRUCTURE: Breccia.

ALTERATION: Clasts alter to green matrix-like product.
- 1%; 1-5 mm; along clast rim; white, soft, not carbonate (zeolite?).

ADDITIONAL COMMENTS: Altered olivine only in matrix; matrix is poorly packed; matrix grain-size is larger (0-2 cm) than in 10R-1; voids along clast boundaries filled with sugary greenish colloform substance; light blue and gray material (zeolite?) in clasts.
UNIT 3: ANDESITE BRECCIA (10R-2 CONTINUED)

Pieces 1-14

CONTACTS: Not visible.
PHENOCHRYS: Plagioclase and orthopyroxene microlith in Piece 7; orthopyroxene, clinopyroxene and plagioclase microlith in Piece 12.
Orthopyroxene - 8-15%; <2 mm; glass-green (euhedral), yellow to brown (anhedral).
Clinopyroxene - 2-4%; <1 mm; black, glassy, with yellow.
Orthopyroxene: anhedral.
Plagioclase - 0-5%; <2 mm; euhedral and anhedral.
Olivine - trace; <1 mm; reddish alteration (olivine occurs in very few pieces only).
GROUNDMASS: In clasts: fine-grained to glassy; less glass than in 10R-1.
VESICLES: 5-15%; <1 mm; sub-round to parallel, elongated; randomly distributed.
COLOR: Gray (7.5YR 5/0) for clasts; pale green (5G 6/2) for matrix.
STRUCTURE: Breccia.
ALTERATION: Clasts alter to green matrix-like product.
VEINS/FRACTURES: 1%; 1-5 mm; along clast rim; vein filling is white, soft, not carbonate (zeolite?).
ADDITIONAL COMMENTS: Matrix grain size is 0-2 cm; section is a continuation of 125-786B-8R-1.

UNIT 3: BASALT BRECCIA

Pieces 15-19

CONTACTS: Not visible.
PHENOCHRYS: Orthopyroxene - 2%; <2 mm; euhedral and anhedral, glass-green.
Clinopyroxene - 3%; <1 mm; black as individual phenocryst and with orthopyroxene in glomerocrysts.
Plagioclase - 5%; <2 mm; anhedral.
Olivine - 1%; <1 mm; reddish, altered.
GROUNDMASS: In clast: fine-grained to glassy, less glass than in 10R-1
VESICLES: 5-15%; <1 cm; subround to parallel elongated; randomly distributed.
COLOR: Gray (7.5YR 5/0) for clasts; pale green (5G 6/2).
STRUCTURE: Breccia.
ALTERATION: Clasts alter to matrix-like product.
VEINS/FRACTURES: 1%; 1-5 mm; along clast; vein filling is white, soft, not carbonate (zeolite?).
ADDITIONAL COMMENTS: Altered olivine only in matrix; matrix is poorly packed; matrix grain-size is 0-2 cm; voids along clast boundaries; voids filled with sugary greenish colloform substance; light blue and gray zeolites/coll in clasts.
UNIT 3: BASALT BRECCIA (11R-1, PIECES 15-19 CONTINUED)

Pieces 1-4

CONTACTS: Not visible.

PHENOCRYSTS:
- Orthopyroxene - 2%; <2 mm; euhedral and anhedral, glass-green.
- Clinopyroxene - 3%; <1 mm; euhedral, black, as individual phenocrysts; with orthopyroxene in gnamocrysts.
- Plagioclase - 5%; <2 mm; anhedral.
- Olivine - 1%; <1 mm; reddish, altered.

GROUNDMASS: In clasts, fine-grained to glassy.

VESICLES: 5-15%; <1 cm; subrounded to parallel elongated; randomly distributed.

COLOR: Gray (7.5YR 5/0) for clasts; pale green (5G 6/2) for matrix.

STRUCTURE: Breccia.

ALTERATION: Clasts alter to green matrix-like product.

VEINS/FRACTURES: 1%; 1-5 mm; along clast rim; vein filling is white, soft, not carbonate (zeolite?).

ADDITIONAL COMMENTS: Groundmass of breccia matrix locally cellular structure within clasts; walls are green, filling is white; green tubules also present; amount of green material varies from 10-95%; at high % it looks like phenocrysts in green groundmass; coarse-grained breccia groundmass with voids caused by poor packing.
UNIT 3: BASALT BRECCIA (11R-2 CONTINUED)

Pieces 1-20

CONTACTS: Not visible.

PHENOCRYSTS:
- Orthopyroxene - 2%; <2 mm; euhedral and anhedral; glass-green.
- Clinopyroxene - 3%; <1 mm; euhedral; black; as individual phenocrysts and with
  orthopyroxene in glomerocrysts.
- Plagioclase - 5%; <2 mm; anhedral.
- Olivine - 1%; <1 mm; reddish; altered.

GROUNDMASS: In clasts: fine-grained to glassy.

VESICLES: 5-15%; <1 cm; subrounded to parallel elongated; randomly distributed.

COLOR: Gray (7.5YR 5/0) for clasts; pale green (5G 6/2) for matrix.

STRUCTURE: Breccia.

ALTERATION: Clasts alter to green matrix-like product.

VEINS/FRACTURES: 1%; 1-5 mm; along clast rim; vein filling is white, soft, not carbonate
(zoollite?).

ADDITIONAL COMMENTS: Groundmass of breccia matrix has locally cellular structure
within clasts; walls are green, filling is white; also green tubules present; amount of
green material varies from 10-95%; at high % maybe phenocrysts in green groundmass;
coarse-grained breccia groundmass with voids caused by poor packing; Pieces 18 and
19 contain very glassy clasts, consisting of plagioclase 5%, orthopyroxene 5%, and
clinopyroxene trace; different clasts (very dark grayish-brown, 2.5Y 3/2) also occur in
Pieces 6-17 and consist of plagioclase 10%, clinopyroxene 5%, and orthopyroxene
trace %.
UNIT 3: BASALT BRECCIA

Pieces 1-17

CONTACTS: Not visible.

PHENOCRYSTS: Contains glomerocrysts of clinopyroxene + plagioclase,
clinopyroxene + orthopyroxene, olivine + clinopyroxene.
Plagioclase - 5-8%; 1-4 mm; rounded, anhedral and euhedral; shows poikilitic texture
with clinopyroxene.
Clinopyroxene - 2-6%; <2 mm; euhedral in individual crystals.
Orthopyroxene - 0-2%; <1 mm; yellow, anhedral, glomerocryst.

GROUNDMASS: Glassy to finely crystalline in clasts; coarse-grained cellular altered clasts
and fines with few voids in breccia.

VESICLES: 5-15%; <1 cm; subrounded to parallel elongated; randomly distributed.

COLOR: Gray (7.5YR 5/0) for clasts; pale green (5G 6/2) for matrix.

STRUCTURE: Breccia.

ALTERATION: Clasts alter to green matrix-like product.

VEINS/FRACTURES: 1%; 1-5 mm; random; vein filling is white, soft, not carbonate,
zeolite (?)..

ADDITIONAL COMMENTS: Pieces 8-17 have more phenocrysts (up to 30% with
plagioclase 15%) and plagioclase microphenocrysts; some pieces (9, 12, 15, 16)
consist almost entirely of greenish matrix.
UNIT 3: BONINTE BRECCIA

Pieces 1-23

CONTACTS: Not visible.

PHENOCRYSTS:
- Plagioclase - 10-15%; 1-4 mm; rounded, euhedral.
- Orthopyroxene - 0-10%; <1 mm; yellow, anhedral.
- Clinopyroxene - trace; <2 mm; euhedral, individual crystal; shows poikilitic texture with plagioclase.

GROUNDMASS: Glassy in clasts; coarse-grained in breccia; cellular altered clasts and fines; few voids.

VESICLES: 5-15%; <1 cm; subrounded to parallel elongated; randomly distributed; filled with bluish minerals.

COLOR: Gray (7.5YR 5/0) for clasts; pale green (5G 6/2) for matrix.

STRUCTURE: Breccia.

ALTERATION: Clasts alter to green matrix-like product.

VEINS/FRACTURES: 1%; 1-5 mm; random; vein-filling is white, soft, not carbonate, zeolite(?).

ADDITIONAL COMMENTS: In addition to common clasts, Pieces 12, 15, 22 and 23 contain plagioclase microphenocrysts in groundmass; Piece 21 (black clast) is glassy, and contains phenocrysts of clinopyroxene 2%, plagioclase trace % and orthopyroxene trace %; some clasts have alteration rims with matrix occupying 70% of total rock.
UNIT 3: BONINITE BRECCIA

Pieces 1-20

CONTACTS: Not visible.

PHENOCRYSTS:
- Plagioclase - 5-10%; <4 mm; anhedral to euhedral.
- Orthopyroxene - 5-10%; <1 mm; yellow, anhedral.
- Clinopyroxene - trace; <2 mm; euhedral, usually associated with orthopyroxene.

GROUNDMASS: Glassy to fine-grained matrix with plagioclase microphenocrysts.

VESICLES: 5-15%; <1 mm; subrounded to parallel elongated; randomly distributed.

COLOR: Gray (7.5YR 5/0) for clasts; pale green (5G 6/2) for matrix.

STRUCTURE: Breccia.

ALTERATION: Clasts alter to green matrix-like product.

VEINS/FRACTURES: 1%; 1-5 mm; random; vein filling is white, soft, not carbonate.

zeolite(?).
UNIT 3: BONINITE BRECCIA (13R-2 CONTINUED)

Pieces 1-2

CONTACTS: N/A.
PHENOCRYSTS: N/A.
GROUNDMASS: N/A.
VESICLES: N/A.
COLOR: N/A.
STRUCTURE: N/A.
ALTERATION: N/A.
VEINS/FRACTURES: N/A.
ADDITIONAL COMMENTS: Section is continuation of 125-786B-13R-2.
UNIT 3: ANDESITE BRECCIA

Pieces 1-32

CONTACTS: Not visible.

PHENOCRYSTS: Occur as glomerocrypic and poikilitic assemblages as well as isolated phases.
   Plagioclase - 5-8%; 0.5 - 1.5 mm; euhedral elongate.
   Orthopyroxene - 1-3%; <1 mm; euhedral equant - elongate.
   Clinopyroxene - 2-5%; <1.5 mm; euhedral.

GROUNDMASS: Glassy to very fine-grained with quench feldspar.

VESICLES: 1-15%; <10 mm long; elongate; locally aligned; blue coating to vesicle wall in Pieces 1 and 2.

COLOR: Gray (7.5YR 5/0) clasts; pale green (5G 6/2) matrix.

STRUCTURE: Breccia.

ALTERATION: Variable alteration of clasts with reaction boundaries 2 -10 mm in width;
   Pieces 3-8 are pervasively stained with possible manganiferous alteration having a brown color (10YR 5/3).

VEINS/FRACTURES: Trace; 1-5 mm wide; random; white non-carbonate filling.
UNIT 3: MICRODIORITE

Piece 1

CONTACTS: Not visible.

PHENOCRYSTS: Amphibole-pyroxene glomerocrysts as well as isolated phases.
- Amphibole - 5-8%; 0.2-0.6 mm; equant, euhedral, elongated.
- Orthopyroxene - 8-12%; 0.5-2 mm; elongate, subhedral.
- Plagioclase - <80%; 0.1-1 mm; elongate, euhedral-subhedral.
- Magnetite - <2%; <0.1 mm; euhedral, equant.

GROUNDMASS: Composed of same phases as phenocrysts; rock has hypabyssal texture.

VESICLES: None.

COLOR: Light gray (5Y 7/1).

STRUCTURE: Rock has isotropic fabric.

ALTERATION: Minor chlorotic alteration.

ADDITIONAL COMMENTS: Texture of this piece is very different from under-and overlying core although phase assemblage is the same.

UNIT 3: ANDESITE BRECCIA

Pieces 2-21

CONTACTS: Not visible.

PHENOCRYSTS: Occur as glomerocrystic and poikilitic assemblages as well as isolated phases.
- Plagioclase - 5-8%; 0.5-1.5 mm; euhedral, elongate.
- Orthopyroxene - 1-3%; <1 mm; euhedral, equant, elongate.
- Clinopyroxene - 2-5%; <1.5 mm; equant, euhedral.

GROUNDMASS: Glassy to very fine-grained with quench feldspar.

VESICLES: 3-5%; 0.2-0.5 mm in diameter; <22 mm long; pipe-shape; aligned; pale white(?); zeolites on walls of vesicles in Pieces 19-21.

COLOR: Gray (7.5YR 5/0) clasts; pale green (5G 6/2) breccia matrix.

STRUCTURE: Breccia.

ALTERATION: Variable alteration of clasts with reaction boundaries 2-10 mm in width.

VEINS/FRACTURES: Trace; 0.5 mm wide; subvertical; filled with white zeolite.

ADDITIONAL COMMENTS: Some of the clasts have a macroscopic orthorhombic fracture pattern; in-situ brecciation of clasts; appears to be abundant altered glassy pillow rinds in Piece 15.
UNIT 3: ANDESITE BRECCIA

Pieces 1-20

CONTACTS: Not visible.

PHENOCRYSTS: Occur as glomerocrystic and poikilitic assemblages as well as isolated phases.
  Plagioclase - 3-5%; 0.5-1 mm; euhedral, lath.
  Orthopyroxene - 1-3%; <1 mm; euhedral, euhedral.
  Clinopyroxene - 2-5%; <1.5 mm; equant, euhedral, elongate.

GROUNDMASS: Glassy to very fine-grained with quench feldspar.

VESICLES: 1-15%; 0.2-3 mm; pipe-shaped; aligned; mostly subvertical; pale white to transparent zeolites(?) on walls of vesicles.

COLOR: Gray (7.5YR 5/0) clasts; pale green (5G 6/2) matrix.

STRUCTURE: Breccia.

ALTERATION: Variable alteration of clasts with reaction boundaries 2-10 mm in width.

VEINS/FRACTURES: Trace; <0.3 mm wide; random; filled with white zeolite(?)

ADDITIONAL COMMENTS: Proportion of clasts to matrix is variable from piece to piece.
UNIT 3: ANDESITE BRECCIA

Pieces 1-21

CONTACTS: Not visible.

PHENOCRYSTs: Occur as glomerocrycic and poikilitic assemblages as well as isolated phases.

- Plagioclase - 3-6%; 0.5-1 mm; euhedral laths.
- Orthopyroxene - 1-3%; <1.5 mm; euhedral, equant.
- Clinopyroxene - 2-8%; <1.5 mm; equant, euhedral to elongate.

GROUNDMASS: Glassy to very fine-grained with quench feldspar.

VESICLES: 1-15%; 0.2-3 mm in diameter; pipe-shaped; oriented pieces; horizontal-subvertical; pale white, transparent to pale blue zeolites(?) on walls of some vesicles.

COLOR: Gray (7.5YR 5/0) clasts; pale green (5G 6/2) matrix.

STRUCTURE: Breccia.

ALTERATION: Variable alteration of clasts with reaction boundaries 2 - 20 mm in width; some clasts totally altered.

VEINS/FRACTURES: Trace; <2 mm in width; random; filled with white zeolite.

ADDITIONAL COMMENTS: Matrix is cellular structured with green cell walls and white zeolites(?), feldspar, orthopyroxene and clinopyroxene filling the cells.
UNIT 3: ANDESITE BRECCIA

Pieces 1-15

CONTACTS: None visible.

PHENOCRYSTS: Occur as glomerocrystic and poikilitic assemblages as well as isolated phases:
- Plagioclase - 3-6%; 0.5-1 mm; euhedral laths.
- Orthopyroxene - 1-3%; <1.5 mm; euhedral, equant.
- Clinopyroxene - 2-5%; <1.5 mm; equant, euhedral.

GROUNDMASS: Glassy to very fine-grained with quench feldspar.

VESICLES: 1-15%; 0.2-8 mm; irregular, elongate; throughout; some pieces have vertical orientation.

COLOR: Gray (7.5YR 5/0) clasts; pale green (5G 6/2) matrix.

STRUCTURE: Brecciated.

ALTERATION: Variable alteration of clasts with reaction boundaries 2-20 mm in width; some clasts are completely altered.

VEINS/FRACTURES: Trace; <1 mm wide; random orientation; white, zeolite(?)-filled.

ADDITIONAL COMMENTS: Matrix is cellular structured with green cell walls and white zeolite(?), feldspar, orthopyroxene and clinopyroxene filling the cells.
UNIT 3: ANDESITE BRECCIA

Pieces 1-2, 5-12, 14-24

CONTACTS: Not visible.

PHENOCRYSTS: Occur as glomerocrystic and poikilitic assemblages as well as isolated phases.
- Plagioclase - 3-6%; 0.5-1 mm; euhedral laths.
- Orthopyroxene - 1-3%; <1.5 mm; euhedral, equant.
- Clinopyroxene - 2-5%; <1.5 mm; euhedral-elongate.

GROUNDMASS: Glassy to very fine-grained with quench feldspar.

VESICLES: 1-15%; 0.2-3 mm in diameter; pipe; random; white to pale blue zeolites on the walls of some vesicles.

COLOR: Gray (7.5YR 5/) clasts; pale green (5G 6/2) matrix.

STRUCTURE: Breccia.

ALTERATION: Variable alteration of clasts with reaction boundaries 2-10 mm in width.

VEINS/FRACTURES: Trace; <1 mm in width; random; white zeolite(?)-filled.

ADDITIONAL COMMENTS: Proportion of apparently relict hyaloclastic matrix is higher in Pieces 3-7 and 17 than in previous cores; Piece 7 has minor Fe-oxide staining in matrix.

UNIT 3: MICRODIORITE

Pieces 3, 4

CONTACTS: None visible.

PHENOCRYSTS: Amphibole-pyroxene-olivine glomerocrysts.
- Amphibole - 5-8%; 0.2-0.6 mm; equant, euhedral, subhedral.
- Orthopyroxene - 8-12%; 0.5-2 mm; elongate, subhedral.
- Plagioclase - <80%; 0.1-1 mm; elongate, euhedral-subhedral.
- Magnetite - <2%; <0.1 mm; euhedral, equant.
- Olivine - <1%; 0.5-1.5 mm; equant, altered with Fe-oxide staining.

GROUNDMASS: Composed of same phases that occur as phenocrysts; rock has hypabyssal textures.

VESICLES: None.

COLOR: Light gray (5Y 7/1).

STRUCTURE: Massive.

ALTERATION: Minor chlorite alteration.

VEINS/FRACTURES: None visible.

ADDITIONAL COMMENTS: Texture of this piece is very different from surrounding core, it is the same as 15R-1 Piece 1.

UNIT 3: SPARSELY PHYRIC ANDESITE

Piece 13

CONTACTS: None visible.

PHENOCRYSTS: Glomerocrysts of pyroxene, plagioclase and magnetite.
- Clinopyroxene - <1-1%; <0.5 mm; equant, euhedral.
- Orthopyroxene - <1%; <0.25 mm; equant to elongate, euhedral.
- Plagioclase - <2%; <0.5 mm; tabular laths, euhedral.
- Magnetite - <1%; <0.2-0.5 mm; equant, euhedral.

GROUNDMASS: Fine-grained and glassy with quench feldspar.

VESICLES: 2-5%; 1-3 mm; round to elongate, pipe-shaped; throughout; filled with white zeolites(?).

COLOR: Gray to light gray (5Y 5/1 - 7/1).

STRUCTURE: Massive.

ALTERATION: None visible.

VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: This sample is paler, less phytic and has less orthopyroxene than the other samples in this section.
UNIT 4: ANDESITE

Pieces 1-23

CONTACTS: None visible.

PHENOCRYSTS: Olivine phenocrysts occur sporadically throughout this section.
- Clinopyroxene - 5-7%; 0.4-1 mm; euhedral to elongate.
- Orthopyroxene - 1-2%; 0.7-1.5 mm; elongate, subhedral.
- Plagioclase - 1-2%; 0.1-0.5 mm; elongate, subhedral.
- Olivine - trace; 1-2 mm; elongate, euhedral, poikilitically enclosed in pyroxene glomerocrysts.

GROUNDMASS: Fine-grained plagioclase and pyroxene crystals and a small amount of brown glass; amount of glass is variable throughout.
- VESICLES: 3-12%; 2-6 mm; oval to round; throughout; pipe morphology.

COLOR: Gray to light gray (5Y 6/1).

STRUCTURE: Massive.

ALTERATION: 10-40% chlorite and clays.

VEINS/FRACTURES: None.
UNIT 4: ANDESITE

Pieces 1-16

CONTACTS: None visible.

PHENOCRYSTS: Pyroxene glomerocrysts enclose highly altered olivine crystals.
- Clinopyroxene: 5-7%; 0.4-1 mm; equant to elongate, euhedral.
- Orthopyroxene: 1-2%; 0.7-1.5 mm; elongate, subhedral.
- Plagioclase: 1-2%; 0.1-0.5 mm; elongate, euhedral-subhedral.
- Olivine: trace; 1-2 mm; elongate, euhedral, poikilitically enclosed in pyroxene glomerocrysts.

GROUNDMASS: Brown glass and quench crystals of plagioclase and pyroxene.

VESICLES: 3-10%; 2-6 mm; oval to round; pipe vesicles; throughout.

COLOR: Gray to light gray (5Y 6/1).

STRUCTURE: Massive.

ALTERATION: Chlorite and clays 10-25%.

VEINS/FRACTURES: None visible.
UNIT 4: TWO-PYROXENE ANDESITE

Pieces 1-22

CONTACTS: None visible.

PHENOCRYSTS:
- Orthopyroxene - 2-3%; 0.5-2 mm; equant, euhedral.
- Clinopyroxene - 1-2%; 0.2-0.4 mm; anhedral to subhedral.
- Plagioclase - 2%; 0.2-0.6 mm; equant, euhedral.
- Olivine - trace; <3 mm; equant, anhedral to subhedral; altered and appear to have orthopyroxene reaction rims.

GROUNDMASS: Fine- to medium-grained; plagioclase laths.

VESICLES: 1-12%; 2-4 mm; elongate; smooth outlines; throughout; alignment parallel to core axis in Piece 22; lined with pale blue to gray zeolite or clay.

COLOR: Greenish gray (5GB 3/1 to 4/1).

STRUCTURE: Massive.

ALTERATION: Pervasive and patchy; chlorites and clays 10-30%.

VEINS/FRACTURES: 1-5%; <8 mm wide; steeply inclined; anastomosing; filled with white materials including carbonate, zeolite, and chlorite.

ADDITIONAL COMMENTS: Piece 4 has Fe-oxide staining as a pervasive alteration.
UNIT 5: TWO-PYROXENE ANDESITE BRECCIA

Pieces 1-4

CONTACTS: None visible.

PHENOCRYSTS: Glomerocrysts of clinopyroxene and orthopyroxene.
Orthopyroxene - <1%; <0.5 mm; euhedral, equant.
Clinopyroxene - <2%; <0.75 mm; euhedral, elongate.
Plagioclase - 1-2%; <1 mm; euhedral, tabular laths.
Olivine - trace; 0.5-1.5 mm; euhedral, elongate.

GROUNDMASS: Glassy to fine-grained with quench crystals of plagioclase.
VESICLES: 2-7%; <4 mm; elongate; random, locally concentrated; filled with transparent, white zeolite(?).

COLOR: Greenish gray (5G2 5/1 to 4/1).

STRUCTURE: Massive with alteration and possible shear boundaries.
ALTERATION: 10-40%, minor chlorite, zeolites and clays.

ADDITIONAL COMMENTS: Piece 3A is brecciated along a plane parallel to a vein that appears to be fault gouge. This rock is similar to the overlying Section 20R-1.

UNIT 5: HIGHLY BRECCIATED META-ANDESITE

Pieces 5-6

CONTACTS: None visible.

PHENOCRYSTS: None visible.

GROUNDMASS: Zeolite, clays and chlorite.

VESICLES: None present.

COLOR: Dark greenish gray to very light greenish gray (10Y 5/2 to 8/1).

STRUCTURE: Breccia.
ALTERATION: Pieces are altered andesitic breccia; minor iron oxide staining is present.

ADDITIONAL COMMENTS: Crystals of orthopyroxene, clinopyroxene, plagioclase and magnetite <0.2 mm in size are present in the matrix.

UNIT 6: FLOW-BANDED GLASSY DACITE

Pieces 7-12

CONTACTS: Piece 7: contact with overlying sediment (fine-grained sand and silt with fragments of underlying rock).

PHENOCRYSTS:
Orthopyroxene - <2%; <0.5 mm; equant to elongate, euhedral.
Clinopyroxene - <1%; <0.5 mm; elongate, euhedral.
Plagioclase - <3%; <1.5 mm; equant to tabular, euhedral.
Magnetite - trace; <0.2 mm; equant, euhedral.

GROUNDMASS: Brown glass and minor quench crystals of plagioclase.
VESICLES: None.

COLOR: Black to dusky yellow to olive gray (5Y 6/4).

STRUCTURE: Flow banding at a high angle to the core axis.
ALTERATION: Pervasive Fe-oxide staining; Pieces 7 and 8 may contain palagonite.

VEINS/FRACTURES: <1%; <1 mm wide; subvertical; irregular; filled with white zeolite(?).

ADDITIONAL COMMENTS: These pieces appear to represent the top portion of a flow unit.
UNIT 6: GLASSY DACITE (CONTINUATION OF 21R-1, PIECES 7-12)

Piece 1

CONTACTS: None obvious.

PHENOCRYSTs:
- Plagioclase - 7%; <1.5 mm; equant to tabular, euhedral.
- Olivine - 1%; <1.5 mm; equant, subhedral.
- Clinopyroxene - 1%; <1.5 mm; equant, subhedral.

GROUNDMASS: Fine-grained to glassy with plagioclase microcrystals.

VESICLES: 10%; up to 1 cm; irregular to rounded; none; mostly filled, but largest have vugs; possibly including zeolite.

COLOR: Pale gray to whitish brown (2.5Y 8/0 to 8/2) infilling.

STRUCTURE: N/A.

ALTERATION: Pervasive brownish alteration (2.5Y 6/2) and olivine of groundmass; variable alteration of other phenocrysts.

VEINS/FRACTURES: <1%; <1 mm wide; irregular; white infilling (carbonate(?) and zeolite).

UNIT 7: GLASSY BASALT

Pieces 2-6

CONTACTS: Between Pieces 1 and 2: two units (intrusion?).

PHENOCRYSTs:
- Clinopyroxene - <1%; <0.5 mm; elongate, euhedral.
- Orthopyroxene - 1-2%; <0.5 mm; equant to elongate, euhedral.
- Plagioclase - <3%; <1.5 mm; equant to tabular, euhedral.
- Olivine - trace; <0.2 mm; equant, subhedral.
- Magnetite - trace; <0.2 mm; equant, euhedral.

GROUNDMASS: Clear, brown glass with quench crystals of plagioclase.

VESICLES: 0-12%; 0.2-2 mm; round; only in Pieces 3-7; in Piece 3 they are concentrated at the top (below the glassy margin) and in Piece 7 they are filled with a pale yellow clay.

COLOR: Black to dusky yellow to olive gray (5Y 6/4).

STRUCTURE: Pieces 2-7 appear to be the top of a cooling unit and Piece 1 the bottom of the overlying cooling unit. Piece 1 is mostly glass, Piece 1C is a glassy extrusion.

ALTERATION: Variable; Piece 1 has Fe-oxide staining; Piece 7 has clay-filled vesicles.

VEINS/FRACTURES: <1%; 1-4 mm wide; subvertical; filled with carbonate and zeolite.

ADDITIONAL COMMENTS: Pieces 1 and 2 have a large amount of fresh glass and represent a contact between two volcanic units.

UNIT 7: BASALT

Pieces 7-8

CONTACTS: None obvious.

PHENOCRYSTs:
- Plagioclase - 7%; <1.5 mm; equant to tabular, euhedral.
- Clinopyroxene - 1%; <0.5 mm; equant, subhedral.
- Olivine - trace; <0.2 mm; equant, subhedral.

GROUNDMASS: Fine-grained to glassy with plagioclase microcrystals.

VESICLES: 10%; 1 cm; irregular to rounded; n/a; mostly filled but largest have vugs, pale gray to whitish brown (2.5Y 8/0 to 8/2) infilling possibly including zeolite.

COLOR: N/A.

STRUCTURE: N/A.

ALTERATION: Pervasive brownish alteration (2.5Y 6/2) of groundmass and olivine; variable alteration of other phenocrysts.

VEINS/FRACTURES: <1%; <1 mm wide; irregular; with white infilling (carbonate and zeolite).

ADDITIONAL COMMENTS: Pieces 7 and 8 appear distinct from 1-6, possibly suggesting a contact between 6 and 7.
UNIT 7: BASALT PEBBLES

Pieces 1-7

CONTACTS: Piece 7 has sepiolite from underlying rock on lower surface.
PHENOCRYSTS: Clinopyroxene appears fresh; other phases are variably altered.
- Clinopyroxene - <1%; 0.4-0.4 mm; equant, euhedral.
- Orthopyroxene - trace; <0.5 mm; subhedral-elongate.
- Plagioclase - <0.5%; <0.5 mm; euhedral laths.
GROUNDMASS: Glassy to fine-grained; variably altered.
VESICLES: 0.4%; 1-3 mm; round; Pieces 1, 2, and 7 only.
COLOR: Dark greenish gray (10Y 5/2).
STRUCTURE: Massive.
ALTERATION: To clays.
VEINS/FRACTURES: None.
ADDITIONAL COMMENTS: Pieces show a wide range of alteration: Piece 2 is freshest. Sepiolite appears on one side of Piece 5 and as a tiny vein (<0.5 mm) in working half, Piece 5.

UNIT 8: VITRIC SILTSTONE

Pieces 8-13

CONTACTS: N/A.
PHENOCRYSTS: N/A.
GROUNDMASS: N/A.
VESICLES: N/A.
COLOR: N/A.
STRUCTURE: N/A.
ALTERATION: N/A.
VEINS/FRACTURES: N/A.
ADDITIONAL COMMENTS: 28.5-41 cm: sepiolite-foliated, massive and pink-red (5R 5/4; 5R 7/4). 45-53 cm: vitric siltstone-breccia with angular clasts in a silty matrix; gray (10YR 4/1). 55-65 cm: vitric clayey siltstone - breccia cut by a fault; gray (10YR 4/1-5/1). 66-99 cm: vitric clayey siltstone - slight brecciation with vertical streaks, small faults, slump feature; dark gray (2.5YR 5/10). 99-124 cm: vitric clayey siltstone - similar to above, but slumped and faulted; dip-50 degree; dark gray (2.5YR 3/0 to 10YR 5/1). 125-134 cm: breccia with one 2 cm basalt clast in a vitric siltstone matrix; dark gray (2.5YR 5/10). 135-148 cm: volcanic breccia; sheared and rounded basalt and pumice clasts in fine-grained matrix. Dark grayish brown (10YR 4/2).
UNIT 8: VOLCANIC BRECCIA

Pieces 1-7

CONTACTS: None.

PHENOCRYSTS: Clinopyroxene appears fresh; other phases are variably altered.
- Clinopyroxene: <1%; 0.4 mm; equant, euhedral.
- Orthopyroxene: trace; <0.5 mm; subhedral-elongate.
- Plagioclase: <0.5%; <0.5 mm; euhedral laths.

GROUNDMASS: Glassy to fine-grained; variably altered.

VESICLES: 0.4%; 1-3 mm; round; Pieces 1, 2, and 7 only.

COLOR: Dark greenish gray (10Y 5/2).

STRUCTURE: Massive.

ALTERATION: To clays.

ADDITIONAL COMMENTS: Clasts (0.5-3 cm in size) mainly of basalt (described above) but also pumice and vesicular basalt; matrix is sheared, palagonitic, with good stratification in upper portion; numerous small faults.
UNIT 8: VOLCANIC BRECCIA

Pieces 1-3

CONTACTS: None obvious.
PHENOCRYSTS: Clinopyroxene appears fresh; other phases are variably altered.
  - Clinopyroxene: <1%; 0.4 mm; euhedral, equant.
  - Orthopyroxene: trace; <0.5 mm; subhedral-elongate.
  - Plagioclase: <0.5%; <0.5 mm; euhedral laths.
GROUNDMASS: Glassy to fine-grained; variably altered.
VESICLES: 0-4%; 1-3 mm; round; Pieces 1, 2, and 7 only.
COLOR: Brown (10YR 4/3).
STRUCTURE: Massive.
ALTERATION: To clays.
VEINS/FRACTURES: None.

UNIT 8: VITRIC SILT-SANDSTONE

Piece 4

CONTACTS: None.
PHENOCRYSTS: N/A.
GROUNDMASS: N/A.
VESICLES: N/A.
COLOR: Dark grayish brown (10YR 4/2).
STRUCTURE: N/A.
ALTERATION: N/A.
VEINS/FRACTURES: N/A.
ADDITIONAL COMMENTS: 80-80.5 cm: Silty layer with deformational structures, perhaps the result of loading. 80.5-124 cm: Graded breccia from 80.5 to 117 cm, lower portion finer-grained but includes 5 cm basalt clast.
UNIT 9: TWO-PYROXENE DACITE

Pieces 1-3

CONTACTS: None visible.

PHENOCRYSTS: Sparse glomerocrysts of ortho- and clinopyroxene.
  Orthopyroxene - <1%; 0.5-2 mm; elongate, subhedral.
  Clinopyroxene - <1%; 0.2-0.5 mm; equant, euhedral.
  Plagioclase - <1%; 0.5-1.0 mm; tabular laths, euhedral-subhedral.
  Magnetite - trace; 0.2 mm; euhedral.

GROUNDMASS: Glassy to very fine-grained.

VESICLES: 7-15%; 0.5-6 mm; irregular-elongate; throughout; aligned; some lined with light blue mineral; also some translucent prisms with opalescent spherical cores.

COLOR: Dark greenish gray (10Y 5/1).

STRUCTURE: Massive.

ALTERATION: Plagioclase may be variably altered.

VEINS/FRACTURES: None.
UNIT 9: TWO-PYROXENE DACITE

Pieces 1-23

CONTACTS: None visible.

PHENOCRYSTS: Glomerocrysts containing all phenocryst phases (clinopyroxene + orthopyroxene + plagioclase + magnetite).

Orthopyroxene - <1%; 0.5-1 mm; euhedral.
Clinopyroxene - 1-2%; 0.2-2 mm; euhedral, tabular to lath-like.
Plagioclase - <1%; 0.5-0.8 mm; tabular, laths, euhedral-subhedral.
Magnetite - Trace; 0.2 mm; euhedral.

GROUNDMASS: Glassy to very fine-grained.

VESICLES: 7-15%; 0.5-6 mm; irregular, elongate; throughout and aligned; some lined with light blue and translucent prisms with opalescent spherical cores of zeolite.

Microlites: None.

COLOR: Dark greenish gray (10Y 5/1).

ALTERATION: Patches of variable alteration (5-35%) predominantly to clays.

VEINS/FRACTURES: Trace; <1 mm; random; filled with white zeolite (?).

ADDITIONAL COMMENTS: This unit is a continuation of the overlying core (23R-1).
UNIT 9: TWO-PYROXENE DACITE

Pieces 1-9

CONTACTS: None visible.

PHENOCRYSTS: Sparse glomerocrysts of ortho- and clinopyroxene, plagioclase and magnetite.
- Clinopyroxene - <1%; 0.5-1 mm; equant-elongate.
- Orthopyroxene - <1%; 0.5-1 mm; equant-euhedral.
- Plagioclase - <1%; 0.5-1.5 mm; tabular laths.
- Magnetite - trace; <0.2 mm; euhedral.

GROUNDMASS: Glassy to very fine-grained.

VESICLES: 5-20%; <15 mm; elongate; throughout; some empty, others are lined with light blue and prismatic pale green minerals.

COLOR: Dark greenish gray (10Y 5/1) to altered zones dark yellowish brown (10YR 4/4).

STRUCTURE: Massive.

ALTERATION: Variable: Pieces 5 to 9 are pervasively altered whereas Pieces 2 and 3 have alteration locally, concentrated in the vicinity of fractures and veins.

VEINS/FRACTURES: 2-5%; in Pieces 2 and 3; veins <3 mm wide; conjugate, steeply inclined; veins are filled with white, amorphous, zeolite with a subsequent fill of pale green microprismatic zeolite.
UNIT 9: SPARSELY PHYRIC DACITE

Pieces 1-12

CONTACTS: None visible.

PHENOCRYSTS:
- Clinopyroxene - 0-1%; <1 mm; euhedral, equant, black to dark green.
- Plagioclase - 0-1%; <1 mm; euhedral, columnar.
- Orthopyroxene - trace; <1 mm; euhedral, octahedral.
- Magnetite - trace; <0.1 mm; euhedral, octahedral.

GROUNDMASS: Glassy to very fine-grained.

VESICLES: 15%; <2 cm; parallel elongated; randomly distributed; partially filled with hexagonal clear white flakes.

COLOR: Gray to grayish brown (10YR 5/1 - 5/2).

STRUCTURE: None.

ALTERATION: Pieces 1-5 are altered, some appear brecciated.

VEINS/FRACTURES: Not present.
UNIT 9: SPARSELY PHYRIC DACITE

Pieces 1-11

CONTACTS: None visible.

PHENOCRYSTS:
- Plagioclase: trace; <1 mm; euhedral; also in glomerocrysts with clinopyroxene.
- Clinopyroxene: trace; <1 mm; euhedral; commonly with plagioclase in glomerocrysts.

GROUNDMASS: Glassy to finely crystalline.

VESICLES: 10%; <1 cm; sub-rounded to elongate; random throughout; vesicles elongated in horizontal direction; hexagonal greenish flakes in vesicles.

COLOR: Dark greenish gray (10Y 4/1).

STRUCTURE: None.

ALTERATION: Piece 1 is altered to beige color; rim of Piece 2 is altered.

VEINS/FRACTURES: Not present.

ADDITIONAL COMMENTS: Piece 1 is continuation of 25R-1.
UNIT 9: DACITE BRECCIA

Pieces 1-14

CONTACTS: A sedimentary contact is present at 106 cm where coarse sand and breccia are in contact; at 96-103 cm, a steeply dipping contact between unaltered volcaniclastic breccia and sedimentary breccia occurs. Sediment to altered clinopyroxene-plagioclase-phryic andesite contact at 142 cm.

PHENOCRYSTS:
- Plagioclase - 0-2%; <1 cm; euhedral.
- Magnetite - trace; <0.1 mm; black specks in groundmass.

GROUNDMASS: Glassy; breccia matrix is also glassy.

VESICLES: 0-50%; 0-1 cm; round to elongated; some fragments are pumiceous; vesicles are differently oriented from clast to clast in breccia.

COLOR: Black to dark greenish-gray (10Y 3/1 - 4/2).

STRUCTURE: Breccia.

ALTERATION: In Piece 11 (96-103 cm), there is a sedimentary(?) or alteration boundary(?).

VEINS/FRACTURES: None present.

ADDITIONAL COMMENTS: Breccia is composed of a single kind of rhyolite clast.
- Beige-black color variation occurs also in single clasts (Piece 12).

UNIT 10: VITRIC SAND

Pieces 14-17

CONTACTS: Between volcanic breccia and sediment in Piece 14.

PHENOCRYSTS: N/A.

GROUNDMASS: N/A.

VESICLES: N/A.

COLOR: Grayish green (5G 4/2) to pale green (5G 7/2) to light greenish gray (10Y 8/1) to white (N8/).

STRUCTURE: N/A.

ALTERATION: Ubiquitous clay-chlorite alteration.

VEINS/FRACTURES: N/A.

ADDITIONAL COMMENTS: Piece 15 is a sand that contains angular to subrounded 0.25 cm-size clasts at top to 1 cm-size clasts at base; generally mottled with no primary sedimentary structures. Piece 17 ranges from very coarse sand to silt, is cross-bedded, and contains at least three depositional (flow or slump?) units defined by crossbed dips and erosive set bases. The basal unit is horizontal; the steepest unit is about 38 degrees.
UNIT 11: TWO-PYROXENE, PLAGIoclASE PHYRIC BONINITE

Pieces 1-8

CONTACTS: Not visible.

PHENOCRYSTs: Plagioclase is absent in weathered portions.
- Orthopyroxene - 15%; 2-8 mm; euhedral, equant, black when unfractured, yellow-brown when fractured.
- Plagioclase - 15-20%; 2-10 mm; euhedral, columnar.
- Clinopyroxene - 1-2%; <1 mm; dark green when unfractured, pale green when fractured.

GROUNDMASS: Glassy to finely crystalline.

VESICLES: 10%; <3 mm; rounded to irregular shape; randomly distributed; no preferred orientation.

COLOR: Gray (2.5YR 4/0) to grayish yellow-green (5GY 7/4) in altered parts.

STRUCTURE: None.

ALTERATION: Progressively more altered up-section; Pieces 7-8 are fresh.

VEINS/FRACTURES: Not present.

ADDITIONAL COMMENTS: This is not a breccia. In 27R-1 at 142-144 cm contact is exposed of this rock and overlying sediment.
UNIT 11: TWO-PYROXENE, PLAGIOCLASE PHYRIC BONINITE (27-2 CONTINUED)

Pieces 1-18

CONTACTS: None visible.

PHENOCRYSTS:
- Orthopyroxene - 10-15%; 1-4 mm; euhedral, black when unfractured, pale yellow when fractured.
- Plagioclase - 10-15%; 1-5 mm; euhedral and round.
- Clinopyroxene - 5%; not visible; dark green when unfractured, pale green when fractured.

GROUNDMASS: Glassy to partly crystalline.

VESICLES: 5-10%; <4 mm; irregular; randomly distributed; some have gray-blue filling.

COLOR: Gray (5BG 5/1) when fresh to greenish-gray (5G 6/1) when altered

STRUCTURE: None.

ALTERATION: Pieces 1, 4, 7, 12 and 16 are altered.

VEINS/FRACTURES: Trace; 1 mm; steeply dipping; in Piece 17 multiple calcite veins; Piece 15 crack with brown alteration zone.

ADDITIONAL COMMENTS: Continuation of Section 125-786B-27R-2.
UNIT 11: TWO-PYROXENE, PLAGIOCLASE PHYRIC BONINITE (28-1 CONTINUED)

Pieces 1-9

CONTACTS: Not visible.

PHENOCRYSTS:
- Orthopyroxene - 8%; <4 mm; subhedral to euhedral; black when unfractured, yellow-brown when fractured.
- Clinopyroxene - 6%; <2 mm; dark green when unfractured, pale greenish yellow when fractured, euhedral.
- Plagioclase - 10%; <5 mm; euhedral and round.

GROUNDMASS: Partly glassy, partly finely crystalline.

VESICLES: 10%; <3 mm; irregular; randomly distributed; filled with pale gray-blue mineral.

COLOR: Gray (10YR 4/1) to pale yellow-brown (10YR 7/4) when altered.

STRUCTURE: None.

ALTERATION: Pieces 2, 3, 4, and 6 show brownish alteration.

VEINS/FRACTURES: Trace; <1 mm; sub-vertical; fractures are filled with white talc-like material and have alteration zones.

ADDITIONAL COMMENTS: Continuation of 125-786B-27R-2. Piece 8 is aphyric, sparsely vesicular and vesicles are filled with calcite.
UNIT 11: TWO-PYROXENE, PLAGIOCLASE PHYRIC BONINITE (29-1 CONTINUED)

Pieces 1-10

CONTACTS: None visible.

PHENOCRYSTS:
- Orthopyroxene - 10-15%; 1-10 mm; yellow to brown, altering to serpentine.
- Plagioclase - 8-10%; <3 mm; euhedral and rounded.
- Clinopyroxene - 2-5%; <2 mm; dark green, pale green when fractured; euhedral.

GROUNDMASS: Glassy with plagioclase microphenocrysts.

VESICLES: 5-10%; <4 mm; irregular shape; randomly distributed; filled with calcite or with greenish coating.

COLOR: Blush gray (5B 5/1) where fresh, greenish gray (5G 5/1) and weak red (10R 4/3) where altered.

STRUCTURE: None.

ALTERATION: Along veins and cracks to reddish and greenish colors.

VEINS/FRACTURES: Trace; <0.2 mm; sub-vertical; veins filled with calcite; some fractures appear may be dark green serpentine(?).

ADDITIONAL COMMENTS: Section is a continuation of 125-786B-27R-2.
UNIT 11: TWO-PYROXENE, PLAGIOCLASE PHYRIC BONINITE (30R-1 CONTINUED)

Pieces 1-16

CONTACTS: None visible.

PHENOCRYSTS:
Orthopyroxene - 15-20%; 2-10 mm; yellow to brown, altering to serpentine.
Plagioclase - 8-10%; <3 mm; euhedral and rounded.
Clinopyroxene - 3-5%; <2 mm; dark green, pale green when fractured.

GROUNDMASS: Glassy with plagioclase microphenocrysts.

VESICLES: 5-10%; <4 mm; irregular shape; randomly distributed; filled with calcite or dark-green coating.

COLOR: Bluish gray (5B 5/1) where fresh, greenish gray (5G 5/1) and weak red (10R 4/3) when altered.

STRUCTURE: None.

ALTERATION: Along veins and cracks to reddish and greenish colors.

VEINS/FRACTURES: Trace; <0.2 mm; sub-vertical; some filled with calcite; some appear dark green; serpentine(?).

ADDITIONAL COMMENTS: Section is a continuation of 125-786B-27R-2.
UNIT 11: TWO-PYROXENE, PLAGIOCLASE PHYRIC BONINITE (30R-2 CONTINUED)

Pieces 1-4

CONTACTS: None visible.

PHENOCRYSTS:
- Orthopyroxene - 15-20%; 1-10 mm; yellow-brown, altering to serpentine, euhedral and anhedral.
- Plagioclase - 8-10%; <3 mm; euhedral and rounded.
- Clinopyroxene - 5-8%; <3 mm; dark green, euhedral.

GROUNDMASS: Glassy with plagioclase crystals.

VESICLES: 5-10%; <4 mm; irregular; n/a

COLOR: Bluish gray (5B 5/1) where fresh, dark green (5G 4/2) when altered

STRUCTURE: None.

ALTERATION: Dark green alteration veins and patches.

VEINS/FRACTURES: Trace; <0.2 mm; random orientation; dark-green veins (serpentine?).

ADDITIONAL COMMENTS: Section is a continuation of 125-786B-27R-2. N.B. Piece 4 is like Section 31R-1.
UNIT 11: OLIVINE, PLAGIoclase, Two-Pyroxene
PHYRIC BONINITE

Pieces 1-17

CONTACTS: None visible.

PHENOCRYSTS: Glomerocrysts of orthopyroxene.
Orthopyroxene - 10-15%; <5 mm; yellow, euhedral.
Plagioclase - 10-15%; <2 mm; subhedral to euhedral.
Clinopyroxene - 2-5%; <1 mm; dark green, euhedral.
Olivine - 5%; <1 mm; alteration products are hematite and carbonate

GROUNDMASS: Finely crystalline.

VESICLES: 0-1%; <2 mm; round; randomly distributed; filled with calcite and a green mineral.

COLOR: Gray (7.5RYR 5/0) to reddish gray (5R 5/1).

STRUCTURE: None.

ALTERATION: Olivine altered to hematite and carbonate.

VEINS/FRACTURES: 1%; <2 mm; random orientations; filled with calcite.
125-786B-31R-2

UNIT 11: OLIVINE, PLAGIOCLASE, TWO-PYROXENE BONINITE (31R-1 CONTINUED)

Pieces 1-15

CONTACTS: None visible.

PHENOCRYSTS: Orthopyroxene clomerocrysts.
- Plagioclase - 10-15%; <2 mm; subhedral to euhedral.
- Orthopyroxene - 10-15%; <5 mm; yellow, euhedral.
- Clinopyroxene - 2-5%; <1 mm; dark green, euhedral.
- Olivine - 5%; <1 mm; alteration products include hematite and carbonate.

GROUNDMASS: Finely crystalline.

VESICLES: 0-1%; <2 mm; round; randomly distributed; filled with calcite and green unidentified material (zeolite?, clay?).

COLOR: Reddish gray (5R 5/1).

STRUCTURE: None.

ALTERATION: Olivine alters to hematite and carbonate.

VEINS/FRACTURES: 1%; 2 mm wide; randomly oriented; filled with calcite.

ADDITIONAL COMMENTS: Continuation of Section 125-786B-30R-1.
UNIT 11: OLIVINE-BEARING BONINITE

Pieces 1-17

CONTACTS: None visible.

PHENOCRYSTS: Two-pyroxene glomerocrysts, some with plagioclase, are common.
- Orthopyroxene - 7-10%: 0.7-2.5 mm: elongate, subhedral.
- Clinopyroxene - 5-8%: 0.2-2 mm: elongate, euhedral to subhedral.
- Plagioclase - 5-7%: <0.5 mm: euhedral, lath-like.
- Olivine - 3-5%: <2.5 mm: euhedral, elongate.
- Magnetite - <1%: 0.25 mm: euhedral, equant.

GROUNDMASS: Fine-grained to glassy.

VESICLES: 1-3%: 0.5-1.5 mm: irregular, jagged; throughout; appear concentrated near glomerocrysts.

COLOR: Dark reddish gray (10R 4/1 to 3/1).

STRUCTURE: Massive.

ALTERATION: Hematitic staining along fractures; overall color of rock appears to result from minor alteration; chlorite is present in the matrix after glass. Olivine phenocrysts are pervasively altered to an Fe-oxide carbonate assemblage.

VEINS/FRACTURES: <1%; 1-2 mm: subparallel; filled with carbonate and a pale green material (chlorite or zeolite?).

ADDITIONAL COMMENTS: Continuation of Section 125-786B-31R-02.
UNIT 11: OLIVINE-BEARING BONINITE (32R-1 CONTINUED)

Pieces 1-3, 12

CONTACTS: None visible.

PHENOCRYSTS: Glomerocrysts of two pyroxenes with or without plagioclase.
   - Orthopyroxene - 7-10%; 0.7-2.5 mm; elongate, subhedral.
   - Clinopyroxene - 5-8%; 0.2-2 mm; elongate, euhedral to subhedral.
   - Plagioclase - 5-7%; <0.5 mm; tabular laths, euhedral.
   - Olivine - 3-5%; <2.5 mm; equant, euhedral.
   - Magnetite - <1%; 0.25 mm; equant, euhedral.

GROUNDMASS: Fine-grained to glassy with tiny magnetite crystals.

VESICLES: 1-3%; 0.5-1.5 mm; irregular, jagged; throughout but random concentrations; tend to cluster near the glomerocrysts.

COLOR: Dark reddish gray (10R 4/1 to 3/1).

STRUCTURE: Massive.

ALTERATION: Hematitic staining along fractures; overall color of rock appears to result from minor alteration; glass is altered to chlorite; olivine phenocrysts are pervasively altered to an Fe-oxide/carbonate assemblage.

VEINS/FRACTURES: <1%; 1-2 mm; subparallel; filled with carbonate and a pale green material (chlorite or zeolite?).

ADDITIONAL COMMENTS: Continuation of Section 32R-1

UNIT 12: RHYOLITE

Pieces 4-11, 13

CONTACTS: None.

PHENOCRYSTS: Glomerocrysts of two pyroxenes with or without plagioclase.
   - Orthopyroxene - <2%; <0.5 mm; equant, euhedral.
   - Clinopyroxene - 1-2%; <0.5 mm; equant, euhedral.
   - Plagioclase - 4-5%; <2 mm; tabular laths, euhedral to subhedral.
   - Magnetite - trace; <0.25 mm; equant, euhedral.

GROUNDMASS: Fine-grained to glassy, altered.

VESICLES: 1-2%; 0.5-1.5 mm; irregular, ragged; throughout, locally oriented.

COLOR: Gray (5Y 5/1).

STRUCTURE: Massive.

ALTERATION: Varially altered (5-35%) to clays and chlorite.

VEINS/FRACTURES: None.
UNIT 13: OLIVINE-BEARING BASALTIC ANDESITE

Pieces 1-6

CONTACTS: None visible.

PHENOCRYSTS: Ortho- and clinopyroxene, plagioclase and magnetite occur as glomerocrysts as well as isolated phases.

Orthopyroxene - 7-19%; 0.1-1.4 mm; euhedral-subhedral; jacketed by clinopyroxene on some crystals.

Clinopyroxene - 3-6%; 0.2-2 mm; equant-elongate.

Plagioclase - 3-5%; 0.5-1.5 mm; equant, euhedral.

Olivine - 3-5%; 0.2-1.5 mm; euhedral-subhedral magnetite - trace; <0.2 mm; euhedral.

GROUNDMASS: Fine-grained, glassy and stained red.

VESICLES: None.

COLOR: Dark reddish gray (10R 4/1 to 3/1).

STRUCTURE: Massive.

ALTERATION: Redness appears to result from pervasive hematitic alteration, localized around olivine and disseminated in the matrix.

VEINS/FRACTURES: Trace; <0.1 mm; sub-vertical; carbonate-filled.

UNIT 14: MINERALIZED TWO-PYROXENE ANDESITE

Pieces 7-13

CONTACTS: None visible.

PHENOCRYSTS: Orthopyroxene, clinopyroxene and plagioclase form both glomerocrystic clusters and individual crystals.

Plagioclase - 3-5%; 0.5-2.5 mm; euhedral, equant.

Orthopyroxene - 1-2%; <0.5 mm; euhedral, tabular.

Clinopyroxene - <2%; <0.5 mm; euhedral, equant.

Magnetite - trace; <0.2 mm; equant, euhedral.

GROUNDMASS: Fine-grained, glassy, with chloritic alteration. Carbonate, zeolite and silica in vugs in the groundmass.

VESICLES: None visible.

COLOR: Gray (7.5YR 5/0).

STRUCTURE: Massive.

ALTERATION: Pervasive chloritization.

VEINS/FRACTURES: <1%; <1 mm wide; random; pyrite, silica and zeolite fill veins.

ADDITIONAL COMMENTS: The rock has a greenschist metamorphic alteration assemblage; disseminated pyrite (up to 1 mm in size) grains have euclidean habits when in open vugs, otherwise they form aggregates of ragged anhedral grains.

UNIT 14: ANDESITIC-GLASSY BRECCIA

Pieces 14-15

CONTACTS: None visible.

PHENOCRYSTS: Both pyroxenes are variably altered to chlorite.

Plagioclase - 5%; <1.5 mm; euhedral laths.

Orthopyroxene - 5-8%; <0.1 mm; euhedral, equant.

Clinopyroxene - 5%; <1.5 mm; equant, elongate.

Magnetite - trace; <0.5 mm; euhedral.

GROUNDMASS: Flow-banded glass comprises 70%-85%, now altered with trace amounts of pyrite (<0.2 mm grains).

VESICLES: 0-10%; <0.5 mm; elongate; variable; present in some clasts but not in others.

COLOR: Dark yellowish brown (10YR 4/6).

STRUCTURE: Breccia.

ALTERATION: Pervasive, Fe-oxide stained chloritization of pyroxenes.

VEINS/FRACTURES: <0.5%; <1 mm wide; sub-vertical; vein fill is predominately carbonate.
UNIT 14: META-BRECCIATED ANDESITE

Pieces 16-20

CONTACTS: None visible.

PHENOCRYSTS: Two-pyroxene and plagioclase glomerocrysts.
- Plagioclase - <1%; 0.5-1 mm; subhedral laths.
- Clinopyroxene - 1-2%; 0.5-2 mm; elongate, equant.
- Orthopyroxene - 1-2%; 0.5-2 mm; elongate, equant and subhedral.
- Magnetite - trace; <0.2 mm; equant, euhedral.

GROUNDMASS: Fine-grained, chlorite and clay alteration products.

VESICLES: None.

COLOR: Light gray (10YR 7/2) to dark yellow-brown (10YR 3/6).

ALTERATION: Pervasive chloritization affecting both clasts and matrix; clasts have alteration rim 3-5 mm wide.

VEINS/FRACTURES: <1%; <3 mm wide; subvertical; filled with carbonate, chlorite and white zeolite. One vug in Piece 19A, is filled with 5-mm dog-tooth calcite crystals.

ADDITIONAL COMMENTS: Pyrite forms disseminated crystals, subhedral to euhedral, especially abundant in chloritized zones and veins (<0.1% of rock).
UNIT 14: TWO-PYROXENE ANDESITE

Pieces 1-2

CONTACTS: None visible.

PHENOCRYSTS: Clino- and orthopyroxene and plagioclase form glomerocrysts as well as isolated phases.

- Plagioclase - <2%; <0.5 mm; euhedral laths.
- Orthopyroxene - <1%; <0.2 mm; equant, euhedral.
- Clinopyroxene - <1%; <0.2 mm; equant, elongate.

GROUNDMASS: Fine-grained, felted, feldspar-rich.

VESICLES: None.

COLOR: Gray (7.5YR 6/0).

STRUCTURE: Massive.

ALTERATION: Minor chlorotic alteration.

VEINS/FRACTURES: Trace; <0.2 mm; conjugate; appear to be filled with hematite and chlorite.

UNIT 14: BRECCIATED FLOW-BANDED ANDESITE

Pieces 3-6

CONTACTS: Bottom of Piece 6 with underlying sediment.

PHENOCRYSTS: Pyroxene and feldspar form as glomerocrysts and as individual crystals.

- Plagioclase - 10-20%; 0.2-2.5 mm; equant, subhedral.
- Clinopyroxene - 5-8%; 0.2-0.5 mm; equant, subhedral.
- Orthopyroxene - 1%; <0.3 mm; equant, tabular.
- Magnetite - trace; <0.2 mm; equant, euhedral.

GROUNDMASS: Very fine-grained to glassy; pervasively altered.

VESICLES: 2%; <0.2 mm; elongate; variable; partially filled with translucent zeolite.

COLOR: Gray (10YR 6/1) to yellowish brown (10YR 5/4).

STRUCTURE: Indurated; breccia; flow-banded at the base.

ALTERATION: Chlorite, minor epidote; some individual clasts show oxidation, others are greenschist facies.

VEINS/FRACTURES: <1%; <0.9 mm wide; sub-vertical, anastomosing; veins are filled with chlorite, epidote and some translucent zeolite.

ADDITIONAL COMMENTS: Disseminated pyrite, as aggregates of anhedral grains and individual cubes, is disseminated throughout. Contact with red sandstone below is glassy, flow banded and has rip-up clasts of the sediment. Contact with glassy chilled margin is 0.5 to 1 cm wide.

UNIT 14: VITRIC SILTY SANDSTONE

Pieces 7-9

CONTACTS: None.

PHENOCRYSTS: N/A.

GROUNDMASS: N/A.

VESICLES: N/A.

COLOR: Dark reddish brown (2.5 YR 3/4).

STRUCTURE: N/A.

ALTERATION: N/A.

VEINS/FRACTURES: N/A.

ADDITIONAL COMMENTS: Piece 7 is a redbed, homogeneous with suggestion of size-grading (normal), perhaps some burrowing (?) and vague laminae; upper edge of piece has slickensides. Piece 8 is lower portion of redbed, normal size-grading, may have slickensides. Piece 9 is a small piece of redbed attached to an andesite clast.
UNIT 14: BRECCIATED FLOW-BANDED TWO-PYROXENE ANDESITE

Pieces 10-18

CONTACTS: Top contact (with red sediment) forms a 1 to 5 mm-wide glassy chill; relationship with sediment is ambiguous; bottom contact defined by Pieces 18 & 19, forming a glassy chill at least 3 cm wide.

PHENOCRYSTS: Both pyroxenes and plagioclase form as glomerocrysts and as individual crystals.
- Plagioclase: 10-20%; 0.2-2.5 mm; equant, subhedral.
- Clinopyroxene: 5-6%; 0.2-0.6 mm; equant, subhedral.
- Orthopyroxene: <1%; <0.3 mm; equant, euhedral.
- Magnetite: <0.1%; <0.2 mm; equant, euhedral-subhedral.

GROUNDMASS: Very fine-grained to glassy, especially Pieces 18 & 19 which are >75% glass.

VESICLES: 1-2%; <0.2 mm; elongate; variable distribution; partially filled with translucent to pale green material.

COLOR: Gray (10YR 6/1) to olive (10YR 5/3).

STRUCTURE: Indurated breccia with flow-banded clasts and a matrix that is altered flow-banded glass.

ALTERATION: Patches, chlorotic and Fe-oxidation, variable between clasts. Matrix is pale red (10R 6/2) in places.

VEINS/FRACTURES: <1%; vugs 0.2 to 2 mm wide; sub-vertical; veins are filled with a white stubby prismatic zeolite and green chlorite.

ADDITIONAL COMMENTS: Pyrite mineralization is disseminated throughout the rock especially concentrated in the chlorite-rich altered areas. Sulfide forms <1% of the rock.

UNIT 15: BASALT

Piece 19

CONTACTS: None visible.

PHENOCRYSTS: Glomerocrysts of pyroxene and plagioclase are present.
- Plagioclase: 3%; <1.5 mm; euhedral laths.
- Clinopyroxene: 3%; <2 mm; equant to elongate.
- Magnetite: trace; <0.2 mm; euhedral.

GROUNDMASS: Fine-grained to glassy; microlites of plagioclase.

VESICLES: 2-5%; <0.5 mm; spherical; localized in patches, some contain zeolite and carbonate.

COLOR: Black (7.5YR 7/0).

STRUCTURE: Massive.

ALTERATION: Minor chlorite alteration around vesicle patches.

VEINS/FRACTURES: None visible; none visible.

ADDITIONAL COMMENTS: The rock has disseminated sulfide (pyrite) as cubes and aggregates of anhedral blebs (<0.5 mm in size).
UNIT 15: BASALT

Pieces 1-2

CONTACTS: None visible.

PHENOCRYSTS:
- Plagioclase - 3-4%; <1.5 mm; euhedral laths.
- Clinopyroxene - 3%; <2 mm; equant to elongate.
- Magnetite - trace; <0.2 mm; euhedral.

GROUNDMASS: Glassy to very fine-grained; micro-laths of plagioclase are set in a matrix of glass.

VESICLES: 2-5%; <1 mm; spherical; in patches; some contain pale green to white zeolites(?) and minor carbonate linings.

COLOR: Black (7.5YR 7/0).

STRUCTURE: Massive.

ALTERATION: Minor chloritization about vesicles.

ADDITIONAL COMMENTS: Disseminated sulfide (pyrite) is present as both cubes and patches of anhedral grains, <0.5 mm in size.

UNIT 15: META-OLIVINE BEARING TWO-PYROXENE BASALTIC ANDESITE

Pieces 3-11

CONTACTS: None visible.

PHENOCRYSTS:
- Plagioclase - 1-2%; <0.4 mm; elongate euhedral.
- Orthopyroxene - <1%; <0.8 mm; equant subhedral to elongate and altered.
- Clinopyroxene - 0.5-1%; 0.5-1 mm; equant euhedral to subhedral and fresh.
- Magnetite - <1%; <0.1 mm; equant to subhedral.
- Olivine - trace; <1 mm; elongate to equant, altered.

GROUNDMASS: Pervasively altered with quench crystals of plagioclase.

VESICLES: 5-10%; 1-2 mm; round; throughout; filled with pale green clay and carbonate.

COLOR: Greenish gray (5G 6/1).

STRUCTURE: Massive.

ALTERATION: Chlorite, clay and carbonate.

VEINS/FRACTURES: 1-2%; <3 mm; subvertical; filled with carbonate and hematite.

ADDITIONAL COMMENTS: Traces of pyrite disseminated throughout.
UNIT 15: META-OLIVINE-BEARING TWO-PYROXENE BASALT

Pieces 1-17

CONTACTS: Vesicular meta-two-pyroxene andesite with glassy margin is in contact with host in pieces 11, 12 and 13, apparently as xenoliths.

PHENOCRYSTS:
- Plagioclase - 1-2%; <0.4 mm; elongate euhedral.
- Orthopyroxene - <1%; <0.8 mm; equant subhedral to elongate and altered.
- Clinopyroxene - 0.5-1%; 0.5-1 mm; equant euhedral/subhedral, fresh.
- Magnetite - <1%; <0.1 mm; equant to subhedral.
- Olivine - trace; <1 mm; elongate to equant.

GROUNDMASS: Pervasively altered with chlorite and clay minerals; originally glassy with feldspar quench crystals.

STRUCTURE: Massive.

ALTERATION: Chlorite, clay and carbonate.

VEINS/FRACTURES: 1-2%; <3 mm; subvertical; filled with carbonate and hematite.

ADDITIONAL COMMENTS: Traces of pyrite disseminated throughout; continuation of Section 125-786B-34R-02.
UNIT 15: META-BASALT

Pieces 1-6

CONTACTS: Chilled margin in Piece 4.

- Orthopyroxene - <10%; <2 mm; euhedral, altered to serpentine.
- Clinopyroxene - <3%; <1 mm; black to yellow, unaltered, lath-shape, euhedral.
- Plagioclase - <2%; <2 mm; only visible in Piece 4; altered?

GROUNDMASS: Fine-grained greenschist facies minerals (chlorite is visible).
VESICLES: Trace; <1 mm; round to elongate; in zones; filled with calcite.
COLOR: Greenish gray (5G 5/1).
STRUCTURE: None.
ALTERATION: Groundmass and phenocrysts are altered to greenschist facies minerals.
VEINS/FRACTURES: Trace; <2 mm wide; dominantly steep dipping; filled with calcite; coarsely crystalline chlorite in veins.

UNIT 15: ORTHOPYROXENE, PLAGIOCLASE VESICULAR DACITE

Pieces 7-8B

CONTACTS: Not visible.

PHENOCRYSTS: Phenocrysts are fresh.
- Plagioclase - 5%; <2 mm; rounded and as euhedral laths.
- Orthopyroxene - 2%; <3 mm; euhedral, yellow.

GROUNDMASS: Glassy to partly crystalline.
VESICLES: 20%; <2 cm; round to elongated; parallel orientation; random distribution; filled with calcite and with dark green coating.
COLOR: Bluish gray (between 5B 5/1 and 6/1).
STRUCTURE: None.
ALTERATION: Little alteration.
VEINS/FRACTURES: Not present. Pyrite-chlorite zone at rim of stratigraphically highest clast. Related to contact with overlying flow?
ADDITIONAL COMMENTS: Lithology continues in 35R-1. Note contrast in degree of alteration with overlying lithology.
UNIT 15: ORTHOPYROXENE, PLAGIOCLASE VESICULAR DACITE (34R-4 CONTINUED)

Pieces 1-19B

CONTACTS: None visible.

PHENOCRYSTS:
- Plagioclase - 2-5%; <2 mm; euhedral-lath and rounded zoned crystals.
- Orthopyroxene - 2-5%; <2 mm, some of 1 cm size; yellow to brown; euhedral.
- Clinopyroxene - <2%; <1 mm; dark green; euhedral.

GROUNDMASS: Glassy to partly crystalline.

VESICLES: 20-30%; < 2 cm; elongated; randomly distributed; locally filled with calcite in addition to green or gray coating.

COLOR: Gray 2.5Y 4/0 to 5/0.

STRUCTURE: None.

ALTERATION: Very minor.

VEINS/FRACTURES: Trace; 4 mm; 20 degree dip; vein in Piece 1 of light-green to white coarse crystalline material containing pyrite and with margins and veins of silky dark-green material.

ADDITIONAL COMMENTS: Continuation of Section 125-786B-34R-4; finely vesicular clasts entrained.
UNIT 15: ORTHOPYROXENE, PLAGIOCLASE VESICULAR DACITE (35R-1 CONTINUED)

Pieces 1-19

CONTACTS: None visible.

PHENOCRYSTS: Phenocrysts are fresh.
- Plagioclase - 2-5%; <2 mm; euhedral laths and rounded; zoned crystals.
- Orthopyroxene - 2-5%; < 2 mm, but some are 1 cm in size; euhedral, yellow.
- Clinopyroxene - 0-2%; < 1 mm; euhedral, dark green.

GROUNDMASS: Glassy to partly crystalline.

VESICLES: 20-30%; < 1 cm; round to elongate; random distribution; rare pyrite and gray or green coating.

COLOR: Gray (2.5Y 4/0 - 5/0).

STRUCTURE: None.

ALTERATION: Very minor.

VEINS/FRACTURES: Trace; < 1 mm; mostly vertical; fractures are filled with gray (vesicle-coating) material; some have shiny fracture surfaces.

ADDITIONAL COMMENTS: Locally fine-grained, vesicular clasts entrained. Section is a continuation of 125-786B-34R-4.
### UNIT 15: PLAGIOCLASE, ORTHOPYROXENE VESICULAR DACITE (35R-2 CONTINUED)

#### Pieces 1-16

**CONTACTS:** None visible.

**PHENOCRYSTS:** Fresh.
- Plagioclase - 2-5%; <2 mm; euhedral laths and rounded; zoned.
- Orthopyroxene - 2-5%; <2 mm, some 1 cm in size; yellow; euhedral.
- Clinopyroxene - 2%; <1 mm; dark green; euhedral.

**GROUNDMASS:** Glassy to partly crystalline.

**VESICLES:** 20-30%; < 1 cm; round to elongate; randomly distributed; filled with gray or green coating; zones with calcite filled vesicles occur locally.

**COLOR:** Gray (2.5Y 4/0 - 5/0).

**STRUCTURE:** None.

**ALTERATION:** Very minor.

**VEINS/FRACTURES:** Absent.

**ADDITIONAL COMMENTS:** Continuation of 125-786B-34R-4.
UNIT 15: PLAGIOCLASE, ORTHOPYROXENE VESICULAR DACITE (35R-3 CONTINUED)

Pieces 1-4

CONTACTS: None visible.

PHENOCRYSTS:
- Plagioclase - 5-8%; < 3 mm; euhedral laths and rounded; zoned crystals.
- Orthopyroxene - 2-5%; < 2mm; subhedral; yellow.
- Clinopyroxene - 2%; < 1 mm; dark green.

GROUNDMASS: Glassy to partly crystalline.

VESICLES:
- 20%; < 5 mm; round to elongate; randomly distributed; gray coating.

COLOR: Gray (2.5Y 4/0 - 5/0).

STRUCTURE: None.

ALTERATION: Very minor.

VEINS/FRACTURES: Trace; < 1 mm; sub-vertical; shiny fracture surface, possibly chlorite?

ADDITIONAL COMMENTS: Smaller vesicles towards bottom of section. Continuation of 125-786B-34R-4.
UNIT 15: PLAGIOCLASE-ORTHOPYROXENE DACITE (35R-4 CONTINUED)

Pieces 1-11B

CONTACTS: None visible.

PHENOCRYSTS: Plagioclase and clinopyroxene are fresh.
- Plagioclase: 5%; <2 mm; euhedral laths and rounded crystals.
- Orthopyroxene: 2%; <3 mm; yellow; prismatic; altering to serpentine.
- Clinopyroxene: trace; <1 mm; dark green; equant.

GROUNDMASS: Fine crystalline, contains plagioclase.

VESICLES: 10%; <0.1 mm; round to parallel, elongate; random distribution; light gray coating; some elongation directions dip at a shallow angle, possibly caused by flow.

COLOR: Greenish gray (5G 6/1).

STRUCTURE: None.

ALTERATION: Very little.

VEINS/FRACTURES: Trace; <0.1 mm; vertical; chlorite on fracture surface.

ADDITIONAL COMMENTS: Continuation of 125-786B-34R-4.
UNIT 15: ORTHOPYROXENE, PLAGIOCLASE BONINITE
(36R-1 CONTINUED)

Pieces 1-17

CONTACTS: None visible.

PHENOCRYSTS: Orthopyroxene and olivine are altered; olivine is absent at top but becomes more abundant at below 80-cm level.

Plagioclase - 5-10%; < 3 mm; euhedral laths and prisms.

Orthopyroxene - 10-15%; < 1 cm; yellow; prismatic; altering to serpentine.

Olivine - 0-3%; < 1 mm; completely altered to red specks with white cellular structure.

GROUNDMASS: Glassy with abundant plagioclase; more crystalline below 80-cm level.

VESICLES: 10-15%; < 1 cm; round; large ones concentrated in zones; light-green or gray coating, some filled with calcite.

COLOR: Greenish to bluish gray (5G 5/1 TO 5BG 4/1).

STRUCTURE: Fractured.

ALTERATION: Olivine and orthopyroxene are altered to serpentine and oxides.

VEINS/FRACTURES: 0-5%; up to 5 mm; random orientation; locally strongly fractured; fractures are filled with chlorite, some calcite and another white mineral, and contain pyrite cubes.

ADDITIONAL COMMENTS: The top of this section (1-80 cm) is a continuation of 786B-34R-4.
UNIT 15: PLAGIOCLASE, ORTHOPYROXENE, OLIVINE BONINITE (37R-1 CONTINUED)

Pieces 1-12D

CONTACTS: Differential alteration contact in Piece 2.

PHENOCRYSTS: Orthopyroxene and olivine are altered.
- Plagioclase - 5-8%; <2 mm; euhedral laths and rounded crystals.
- Orthopyroxene - 10-15%; <1 cm; yellow prisms; inclusions of equant, altered olivine.
- Olivine -(<1 mm; altered to red and white material.
- Clinoptyroxene - trace; <1 mm; dark green; euhedral.

GROUNDMASS: Fine crystalline, plagioclase-rich.

VESICLES: 3-5%; <3mm; round to elongate; in zones; coated with greenish gray material, some filled with calcite.

COLOR: Dark greenish gray (5G 4/1) in Pieces 1 and 2, changing to dark reddish-gray (5R 4/1 - 4/2) in Piece 2 and continuing through Piece 12D.

STRUCTURE: Fractures.

ALTERATION: Orthopyroxene and olivine are altered to serpentine and calcite.

VEINS/FRACTURES: 2%; < 5 mm; randomly oriented; filled with chlorite and/or white minerals, including calcite.

ADDITIONAL COMMENTS: Continuation from 125-786B-34R-4.
UNIT 15: PLAGIOCLASE, ORTHOPYROXENE, OLIVINE BONINITE (37R-2 CONTINUED)

Pieces 1-6

CONTACTS: Horizontally oriented contact with chilled margin in Piece 6.

PHENOCRYSTS:
- Plagioclase - 5-8%; <2 mm; euhedral laths and rounded crystals.
- Orthopyroxene - 10-15%; <1 cm; yellow prisms; inclusions of equant altered olivine.
- Olivine - 3%; <1 mm; altered to red and white material.
- Clinopyroxene - trace; <1 mm; dark green; euhedral.


VESICLES: 3-5%; <3 mm; rounded to elongate; in zones; coated with greenish gray material; some filled with calcite.

COLOR: Dark greenish gray (5G 4/1) to dark reddish gray (5R 4/1 - 4/2).

STRUCTURE: Fractures.

ALTERATION: Orthopyroxene and olivine are altered to serpentine and calcite.

VEINS/FRACTURES: 2%; <5 mm; randomly oriented; filled with chlorite and/or white minerals, including calcite.

ADDITIONAL COMMENTS: Continuation from 125-786B-34R-4.

UNIT 15: PLAGIOCLASE ANDESITE

Pieces 6-9

CONTACTS: Chilled margin in Piece 6.

PHENOCRYSTS:
- Plagioclase - 5-10%; <1 mm; euhedral.

GROUNDMASS: Glassy.

VESICLES: Trace; <1 mm; collapsed; randomly distributed.

COLOR: Gray green (5G 4/1).

STRUCTURE: None.

ALTERATION: Glass is altered along fractures.

VEINS/FRACTURES: Microfractures in glass, probably from quench.
UNIT 15: PLAGIOCLASE, ORTHOPYROXENE ANDESITE

Pieces 1-22

CONTACTS: Glass fragment of chilled margin in Piece 1.

PHENOCRYSTS:
- Plagioclase - 5-10%; <1 mm; euhedral laths.
- Orthopyroxene - 2%; <1 mm; euhedral; yellow to brown; prismatic.

GROUNDMASS: Glassy.

VESICLES: 15%; <1 cm; round in Pieces 2-5, elongate otherwise; randomly distributed; with bluish gray coating.

COLOR: Dark green (5G 4/1) in altered areas, blue gray (5B 6/1 to 5/1) when fresh.

STRUCTURE: Brecciation in Piece 1-22 with the exception of Piece 10.

ALTERATION: Altered in brecciated areas to chlorite-bearing mineralogy.

VEINS/FRACTURES: Absent.

ADDITIONAL COMMENTS: Clasts in breccia are very glassy; probably fragmented during flow; glass-rich portions are orthopyroxene free; breccia contains pyrite.
UNIT 15: PLAGIOCLASE, ORTHOPYROXENE ANDESITE

Pieces 1-27

CONTACTS: None.

PHENOCRYSTS:
- Plagioclase - 5%; <1 mm; euhedral laths.
- Orthopyroxene - 2%; <1 mm; euhedral; yellow.

GROUNDMASS: Glassy, locally plagioclase-rich.

VESICLES: 5-15%; < 1 cm; round to elongate; grouped by size and shape in zones; local bluish-gray coating.

COLOR: Blue gray (5B 6/1 to 5/1).

STRUCTURE: None.

ALTERATION: Minor.

VEINS/FRACTURES: n/a; < 0.2 mm; n/a; white material in fractures.

ADDITIONAL COMMENTS: Pyrite in vugs.
UNIT 16: BRECCIATED TWO-PYROXENE ANDESITE

Pieces 1-19

CONTACTS: Piece 3 has a boundary between glassy material and crystalline rock; several pieces have contacts between rock of differing vesicularity and grain size; Pieces 14-19 have an oxidized matrix of mafic rock.

PHENOCRYSTS: Glomerocrysts of orthopyroxene, clinopyroxene and plagioclase occur throughout.
- Clinopyroxene - 3%; <0.5 mm; euhedral, elongate.
- Orthopyroxene - 2%; <0.5 mm; euhedral, equant.
- Plagioclase - 3-5%; <0.5 mm; euhedral, tabular.
- Magnetite - trace; <0.2 mm; euhedral.

GROUNDMASS: Altered glass and fine-grained crystalline matrix, predominantly plagioclase.

VESICLES: 1-5%; <1 mm to 4 mm; oval to round, jagged; locally concentrated; some local alignment is present especially in Pieces 4, 17, 18.

COLOR: Very dark gray to olive-gray (5Y 3/1 to 5/2); oxidized matrix is dusky red (2.5YR 3/2).

STRUCTURE: Autobrecciated; clasts and matrix are of similar composition.

ALTERATION: Pyrite is present throughout this section as both disseminated and crystalline phases and occurs along veins associated with zeolites; glass and matrix is moderately to strongly chloritized.

VEINS/FRACTURES: <1%; <1 mm wide; random; filled with white zeolite and/or quartz and, occasionally, sulfide.

ADDITIONAL COMMENTS: This rock type continues in 39R-3.
UNIT 16: BRECCIATED TWO-PYROXENE ANDESITE (39R-2 CONTINUED)

Pieces 1-3

CONTACTS: Sharp between matrix and clasts.

PHENOCRYSTS: Glomerocrysts of orthopyroxene, clinopyroxene and plagioclase in the clasts.
- Clinopyroxene - 3%; <0.5 mm; euhedral, elongate.
- Orthopyroxene - 2%; <0.5 mm; euhedral, equant.
- Plagioclase - 3-5%; <0.5 mm; euhedral, tabular.
- Magnetite - trace; <0.2 mm; euhedral.

GROUNDMASS: Clast matrix contains altered glass and fine-grained crystals predominantly of plagioclase.

VESICLES: 1-3%; <1 mm to 4 mm; oval-round, jagged; locally concentrated; some local alignment is present.

COLOR: Very dark gray to olive gray (5Y 3/1 to 5/2); oxidized breccia matrix is dusky red (2.5YR 3/2).

STRUCTURE: Autobrecciated; clasts and matrix are of similar composition.

ALTERATION: Pyrite is present throughout this section as both disseminated and crystalline phases along veins associated with zeolites; glass and matrix are moderately to strongly chloritized.

VEINS/FRACTURES: <1%; <1 mm; random orientation; filled with white zeolite and/or quartz and some sulfide.

ADDITIONAL COMMENTS: This rock type is a continuation of the overlying Section 39R-2.
UNIT 16: BRECCIATED TWO-PYROXENE ANDESITE

Pieces 1-10

CONTACTS: Sharp between matrix and clasts.

PHENOCRYSTS:
- Plagioclase - 3-5%; <0.5; euhedral, tabular.
- Clinopyroxene - 3%; <0.5; euhedral, elongate.
- Orthopyroxene - 2%; <0.5; euhedral, equant.
- Magnetite - trace; <0.2; euhedral.

GROUNDMASS:
- Clast matrix contains altered glass and fine-grained crystals predominantly of plagioclase.

VESICLES:
- 1-3%; <1 mm; oval-round, jagged; locally concentrated; some local alignment is present.

COLOR:
- Very dark gray to olive gray (5Y 3/1 to 5/2); oxidized breccia matrix is dusky red (2.5YR 3/2).

STRUCTURE:
- Autobrecciated; clasts and matrix are of similar composition.

ALTERATION:
- Pyrite is present throughout this section as both disseminated and crystalline phases and along veins associated with zeolites; glass and matrix are moderately to strongly chloritized.

VEINS/FRACTURES:
- <1%; <1 mm; random; filled with white zeolite and/or quartz and some sulfide.

ADDITIONAL COMMENTS:
- This rock type is a continuation of the overlying Section 39R-3; flow indicated by 1) shard orientation parallel to clast boundaries, 2) preferred shear orientation to clasts and 3) trails of smaller fragments behind clasts.

UNIT 17: GLASSY TWO-PYROXENE BASALT

Pieces 11 and 14

CONTACTS:
- Pieces are chilled margins.

PHENOCRYSTS:
- Plagioclase - <1%; <0.9mm; laths.
- Clinopyroxene - <1%; <0.5mm; euhedral, tabular.
- Orthopyroxene - trace; <0.5 mm; euhedral, tabular.

GROUNDMASS:
- Predominately glassy with quenched Plagioclase laths.

VESICLES:
- None visible.

COLOR:
- Dark gray (N 4/).

STRUCTURE:
- Massive.

ALTERATION:
- Minor chlorite; pyroxenes appear to be partially altered.

VEINS/FRACTURES:
- None visible.

UNIT 17: OLIVINE PHYRIC BASALT

Pieces 11-15

CONTACTS:
- None visible.

PHENOCRYSTS:
- Olivine - 7-10%; <4 mm; euhedral tabular; altered to iron oxides and carbonate; contain spinel inclusions.
- Clinopyroxene - 3-5%; <0.5 mm; euhedral tabular.
- Plagioclase - 10%; <0.5 mm; euhedral tabular.

GROUNDMASS:
- Very fine-grained with Plagioclase laths in glass; variably altered to chlorite, clay, zeolite and carbonate.

VESICLES:
- 1-2%; 2-6 mm; elongate; dip at 30 degrees; in Pieces 15D - 15G, vesicles are elongate <12 mm long; in Pieces 15A and 15B, the vesicles are <4 mm in length, decreasing in size upwards.

COLOR:
- Bluish gray (5B 5/1).

STRUCTURE:
- Massive.

ALTERATION:
- Pervasive alteration to chlorite, carbonate.

VEINS/FRACTURES:
- <1%; <5 mm width; steeply to gently dipping; carbonate-, chlorite- and iron oxide-filled.

ADDITIONAL COMMENTS:
- These pieces are continuous with 125-786B-40R-02 Pieces 15D to 15G, 0-40 cm.
UNIT 17: OLIVINE PHYRIC BASALT (CONTINUATION OF 40R-1)

Pieces 1A-1E

CONTACTS: None visible.

PHENOCRYSTS:
- Plagioclase - 10%; <0.5 mm; euhedral, tabular.
- Olinopyroxene - 3-5%; <0.5 mm; euhedral, tabular.
- Olivine - 7-10%; <4 mm; euhedral, tabular; altered to carbonate/Fe-oxide assemblage.

GROUNDMASS: Very fine-grained with plagioclase laths in glass; variably altered to chlorite, clay, zeolite and carbonate.

VESICLES: 1%; 2-3 mm; elongate; throughout; less common than in 40R-1.

COLOR: Bluish gray (5B 5/1).

STRUCTURE: Massive.

ALTERATION: Pervasive alteration to chlorite and carbonate.

VEINS/FRACTURES: <1%; <5 mm wide; steeply dipping; filled with carbonate, chlorite and Fe-oxide. Pieces 1F to 10; same rock type as all of 40R-3 and 40R-4.
UNIT 17: OLIVINE PHYRIC BASALT (CONTINUATION OF 40R-2)

Pieces 1F-10, 2-6

CONTACTS: None visible.

PHENOCRYSTS:
- Plagioclase - 10%; <0.5 mm; euhedral, tabular.
- Clinopyroxene - 3-5%; <0.5 mm; euhedral, tabular.
- Olivine - 7-10%; <4 mm; euhedral, tabular, altered to Fe-oxide, carbonate assemblage; contains spinel inclusions.

GROUNDMASS: Very fine-grained with plagioclase laths in glass; variably altered to chlorite, clay, zeolite and carbonate.

VESICLES: 1%; 2 mm; elongate to round; throughout, locally concentrated.

COLOR: Blush gray (5B 5/1).

STRUCTURE: Massive.

ALTERATION: Pervasive chlorite and carbonate.

VEINS/FRACTURES: <1%; <5 mm wide; steeply dipping; filled with chlorite and Fe-oxide.

ADDITIONAL COMMENTS: These pieces are continuous with those above (40R-2) and below (40R-4).
UNIT 17: OLIVINE PHYRIC BASALT (40R-3 CONTINUED)

Pieces 1-4

CONTACTS: None visible.

PHENOCRYSTS:
- Plagioclase - 10%; <0.5 mm; euhedral, tabular.
- Clinopyroxene - 3-5%; <0.5 mm; euhedral, tabular.
- Olivine - 7-10%; <4 mm; euhedral, tabular.

GROUNDMASS: Very fine-grained with plagioclase laths in glass, variably altered to chlorite, clay, zeolite, and carbonate.

VESICLES: 1-2%; <1-3; elongate to round; throughout; filled with carbonate.

COLOR: Bluish gray (5B 5/1).

STRUCTURE: Massive.

ALTERATION: Pervasive alteration by chlorite and carbonate; olivine phenocrysts altered to Fe-oxide/carbonate assemblage.

VEINS/FRACTURES: <1%; <5 mm; steeply dipping; filled with chlorite and Fe-oxide assemblage.

ADDITIONAL COMMENTS: These pieces are a continuation of 40R-3.
UNIT 18: ANDESITE BRECCIA

Pieces 1-4

CONTACTS: None visible.

PHENOCRYSTS:
- Plagioclase - 10%; <2 mm; euhedral, tabular.
- Clinopyroxene - 7%; <4 mm; euhedral, elongate.
- Orthopyroxene - 5%; <1 mm; euhedral, equant.

GROUNDMASS: Fine-grained to glassy with pyroxene and feldspar laths.

VESICLES: 3-7%; 1-4 mm; elongate, ragged; throughout, locally concentrated.

Miaroles: Coalesce locally into pipe-like structures.

COLOR: Dusky green matrix (10G 3/2) and dark gray clasts (2.5Y 4/0).

STRUCTURE: Brecciated.

ALTERATION: Matrix is pervasively altered to chlorite.

VEINS/FRACTURES: <1-2%; 1-3 mm; random, often sub-parallel to the core; filled with white, zeolitic material.

ADDITIONAL COMMENTS: Clasts are 1 mm to 6 cm (average 1 cm) maximum dimension and poorly-sorted; matrix contains scattered vugs with a partial fill of fine-grained, white, non-carbonate mineral (zeolite?) and silt-sized vitrics rich in microlites.
UNIT 18: ANDESITE BRECCIA

Pieces 1-15

CONTACTS: None visible.

PHENOcéRSTS:
- Plagioclase - 10%; <2 mm; euhedral, tabular.
- Clinopyroxene - 7%; <4 mm; euhedral, elongate.
- Orthopyroxene - 5%; <1 mm; euhedral, equant.

GRUNDMASS: Fine-grained to glassy with pyroxene and feldspar laths.

VESICLES: 3-7%; 1-4 mm; elongate, ragged; throughout, locally concentrated; coalesce locally into pipe-like structures.

COLOR: Dusky green (10G 3/2) matrix and dark gray (2.5Y 4/0) clasts.

STRUCTURE: Brecciated.

ALTERATION: Matrix is pervasively altered to chlorite.

VEINS/FRACTURES: <1-2%; 1-3 mm wide; random, often sub-parallel to the core; filled with white, zeolitic material.

ADDITIONAL COMMENTS: Clasts are 1 mm to 6 mm in maximum dimension; a continuation of Section 41R-1.
UNIT 18: ANDESITE BRECCIA

Pieces 1 and 5-9

CONTACTS: None visible.

PHENOCRYSTS:
- Plagioclase - 10%; <2 mm; euhedral, tabular.
- Clinopyroxene - 7%; <4 mm; euhedral, elongate.
- Orthopyroxene - 5%; <1 mm; euhedral, euhedral.

GROUNDMASS: Fine-grained to glassy with pyroxene and feldspar laths.

VESICLES: 3-7%; 1-4 mm; elongate, ragged; throughout, locally concentrated; coalesce locally into pipe-like structures.

COLOR: Dusky green (10G 3/1) matrix and dark gray (2.5Y 4/0) clasts.

STRUCTURE: Brecciated at top; massive after Piece 6.

ALTERATION: Matrix is pervasively altered to chlorite.

VEINS/FRACTURES: <1-2%; 1-3 mm; random, often sub-parallel to the core; filled with white, zeolitic material.

ADDITIONAL COMMENTS: The clasts sizes 1 mm - 6 cm (average 0.5 cm); a continuation of Section 41R-2.

UNIT 18: VITRIC SAND

Pieces 2-4

CONTACTS: Between Pieces 1 and 2 and 4 and 5; nature not obvious.

PHENOCRYSTS: N/A.

GROUNDMASS: N/A.

VESICLES: N/A.

COLOR: N/A.

STRUCTURE: N/A.

ALTERATION: N/A.

VEINS/FRACTURES: N/A.

ADDITIONAL COMMENTS: Piece 2 is a well-sorted vitric sand with water-escape pipes. Piece 3 is made up of an upper sand (4 cm thick, fine-grained with water-escape pipe along a micro-fault), an upper-middle sand (2.5 cm thick, coarser-grained, also with water-escape pipes), a lower-middle sand (3 cm thick, medium-grained, massive with faint laminae) and a lower sand (3 cm thick, fine- to medium-grained, structureless). Piece 4 is a silty sand with a white pumice clast.
UNIT 18: TWO-PYROXENE ANDESITE

Pieces 1-9

CONTACTS: None visible.

PHENOCRYSTS:
- Plagioclase - 10%; <2 mm; euhedral, tabular.
- Clinopyroxene - 7%; <4 mm; euhedral, elongate.
- Orthopyroxene - 5%; <1 mm; euhedral, equant.

GROUNDMASS: Fine-grained to glassy with pyroxene and feldspar laths.

VESICLES: 3-7%; 1-4 mm; elongate, ragged; throughout, locally concentrated; coalesce locally into pipe-like structures.

COLOR: Dusky green (10G 3/2) matrix and dark gray (2.5Y 4/0) clasts.

STRUCTURE: Brecciated at top.

ALTERATION: Matrix is pervasively altered to chlorite.

VEINS/FRACTURES: <1-2%; 1-3 mm; random, often sub-parallel to the core; filled with white, zeolithic material.

ADDITIONAL COMMENTS: Continuation of Section 41R-3.
UNIT 18: TWO-PYROXENE ANDESITE

Pieces 1-16

CONTACTS: None visible.

PHENOCRYSTS:
- Plagioclase - 10%; <2 mm; euhedral, tabular.
- Clinopyroxene - 7%; <4 mm; euhedral, elongate.
- Orthopyroxene - 5%; <1 mm; euhedral, equant.

GROUNDMASS: Fine-grained to glassy, with pyroxene and feldspar laths.

VESICLES: 3-7%; 1-4 mm; elongate, ragged; throughout, locally concentrated; coalesce locally into pipe-like structures.

COLOR: Greenish gray (5G 5/1).

STRUCTURE: Brecciated at top; massive after Piece 6.

ALTERATION: Matrix is pervasively altered to chlorite.

VEINS/FRACTURES: <1-2%; 1-3 mm wide; random, often sub-parallel to the core; filled with white, zeolitic material.

ADDITIONAL COMMENTS: Pieces 1-6 are brecciated with clasts of the mafic rock described above and are a continuation of Section 41R-4.
UNIT 19: TWO-PYROXENE, OLIVINE, BEARING ANDESITE

Pieces 1-17

CONTACTS: None visible.

PHENOCRYSTS: Glomerocrysts of pyroxene and plagioclase.
- Plagioclase - 5%; <1.5 mm; euhedral laths.
- Clinopyroxene - 4%; 1 mm; euhedral, tabular.
- Orthopyroxene - 6%; 0.7 mm; euhedral, equant.
- Olivine - trace; <1.5 mm; euhedral, elongate

GROUNDMASS: Fine-grained to glassy with feldspar laths.

VESICLES: 2-5%; <1 -3 mm; elongate, irregular; throughout

COLOR: Greenish gray (5B 8/1).

STRUCTURE: Massive.

ALTERATION: Minor, pervasive chlorite and hematite alteration; hematite alteration of olivine and some orthopyroxene phenocrysts.

VEINS/FRACTURES: <1%; 1-2 mm wide; sub-parallel to core axis; only present in Piece 1; filled with green, amorphous material (chlorite?).
UNIT 19: TWO-PYROXENE, OLIVINE-BEARING ANDESITE
(CONTINUATION OF 42R-2)

Pieces 1-10

CONTACTS: None visible.

PHENOCRYST: Glomerocrystals of pyroxene and plagioclase.
- Plagioclase - 5%; <1.5 mm; equant laths.
- Clinopyroxene - 4%; 1 mm; euhedral, tabular.
- Orthopyroxene - 6%; 0.7 mm; euhedral, equant, minor alteration to hematite.
- Olivine - trace; <1.5 mm; euhedral, elongate.

GROUNDMASS: Fine-grained to glassy with feldspar laths

VESICLES: 1-5%; 1-3 mm; elongate, ragged; throughout; locally aligned similar to pipe vesicles and locally concentrated.

COLOR: Greenish gray (5BG 6/1).

STRUCTURE: Massive.

ALTERATION: Minor, pervasive chlorite and hematite alteration; hematite alteration of olivine phenocrysts.

VEINS/FRACTURES: <1%; 1-3 mm; sub-parallel to core axis; only in Piece 10, especially Piece 10F.

ADDITIONAL COMMENTS: This section is a continuation of 42R-1 through 42R-2.
UNIT 19: TWO-PYROXENE, OLIVINE BEARING ANDESITE (CONTINUATION OF 42R-3)

Pieces 1-4

CONTACTS: None visible.

PHENOCHRYS: Glomerocrysts of pyroxene and plagioclase.
Plagioclase - 5%; <1.5 mm; equant laths.
Clinopyroxene - 4%; 1 mm; euhedral, equant.
Orthopyroxene - 6%; 0.7 mm; euhedral, equant.
Olivine - trach; <1.5 mm; euhedral, elongate.

GROUNDMASS: Fine-grained to glassy with feldspar laths.
VESICLES: 2-4%; 1-5 mm; elongate, ragged; throughout, locally concentrated; some are filled with Fe-oxide and some with carbonate.

COLOR: Greenish gray (5BG 6/1).

STRUCTURE: Massive.
ALTERATION: Minor pervasive chlorite and hematite alteration; hematite alteration of olivine and some orthopyroxene phenocrysts.

ADDITIONAL COMMENTS: This section is a continuation of Section 42R-3.

UNIT 19: TWO-PYROXENE, OLIVINE BEARING ANDESITE

Pieces 5-8

CONTACTS: None visible.

PHENOCHRYS: Glomerocrysts of pyroxene and plagioclase.
Plagioclase - 5%; <1.5 mm; euhedral to lath-shaped.
Orthopyroxene - 10%; <1.5 mm; euhedral, equant.
Clinopyroxene - 3-5%; <2.5 mm; euhedral, tabular.
Olivine - 1-2%; <3 mm; euhedral.

GROUNDMASS: Fine-grained to glassy with microliths of feldspar.
VESICLES: 3-5%; 1-5 mm; elongate, ragged; throughout; filled with carbonate.

COLOR: Weak red (2.5YR 5/2).

STRUCTURE: Massive.
ALTERATION: Pervasive chlorite and hematite alteration; olivine phenocrysts altering to hematite/carbonate assemblage.

VEINS/FRACTURES: <1%; <1 mm wide; subvertical; filled with carbonate.

ADDITIONAL COMMENTS: These pieces are more oxidized (redder) than overlying unit.
UNIT 19: TWO-PYROXENE, OLIVINE, PLAGIOCLASE ANDESITE (42R-4 CONTINUED)

Pieces 1-8

CONTACTS: None visible.

PHENOCRYSTS: Plagioclase with opaque inclusions.
- Plagioclase - 5-10%; <3 mm; euhedral prisms.
- Orthopyroxene - 5-8%; <3 mm; yellow; subhedral.
- Clinopyroxene - 5-8%; <3 mm; dark-green; subhedral.
- Olivine - 2%; <2 mm; altered to hematite and carbonate.

GROUNDMASS: Glassy with abundant microcrystalline magnetite.
VESICLES: 2-5%; <2 mm; round; random distribution.
COLOR: Gray to weak red (N 5/0 - 2.5YR 5/2).
STRUCTURE: Massive.
ALTERATION: Magnetite from groundmass gives red hematite stains; olivine is completely altered.
VEINS/FRACTURES: Trace; <0.5 mm; random orientation; fractures have chlorite on surface; some calcite present.
ADDITIONAL COMMENTS: Strike-slip slickensides in chlorite on fracture surface in Pieces 6 and 7.
UNIT 19: TWO-PYROXENE, PLAGIOCLASE ANDESITE

Pieces 1-12

CONTACTS: None visible.

PHENOCRYSTS:
- Plagioclase - 10-15%; <3 mm; euhedral.
- Orthopyroxene - 10-15%; <3 mm; yellow; subhedral.
- Clinopyroxene - 5-10%; <3 mm; dark-green; subhedral.
- Olivine - trace; <1 mm.

GROUNDMASS: Glassy with less magnetite than in 43R-1.

VESICLES: 5%; <2 mm; round to irregular; random distribution.

COLOR: Dark greenish gray (5GY 4/1 - 5G 4/1) locally reddish.

STRUCTURE: Massive.

ALTERATION: Orthopyroxene is altered to serpentine; olivine is altered to hematite and carbonate.

VEINS/FRACTURES: Trace; < 2 mm; random orientation; filled with calcite.

ADDITIONAL COMMENTS: Piece 1 is similar rock type to 43R-1.
UNIT 19: META-ANDESITE

Pieces 1-23

CONTACTS: None visible.

PHENOCLYSTS:
  Clinopyroxene - 5%; <2 mm; subhedral.

GROUNDMASS: Altered glass and plagioclase.

VESICLES: 0-1%; <4 mm; round; locally present.

COLOR: Greenish gray (5GY 5/1).

STRUCTURE: Massive.

ALTERATION: Rock is pervasively altered to very low grade mineralogy.

VEINS/FRACTURES: Trace; < 0.3 mm; sub-vertical; filled with calcite.

ADDITIONAL COMMENTS: Probably sparsely phytic, clinopyroxene andesite;
  more clinopyroxene below 90 cm (Pieces 15-23).
UNIT 19: META-ANDESITE

Pieces 1-2

CONTACTS: None visible.

PHENOCRYSTS:
- Clinopyroxene - 10-15%; <3 mm; euhedral; light green.

GROUNDMASS: Altered glass and plagioclase.

VESICLES: Trace; 1-2 mm; round; locally present.

COLOR: Greenish gray (10Y 5/1).

STRUCTURE: Massive.

ALTERATION: Pervasively altered to very low grade mineral assemblage.

VEINS/FRACTURES: Absent.

ADDITIONAL COMMENTS: Continuation of 125-786B-44R-1, 90-140 cm.

UNIT 1: TWO-PYROXENE, PLAGIOCLASE, OLIVINE BRECCIATED ANDESITE

Piece 3

CONTACTS: Not visible.

PHENOCRYSTS:
- Plagioclase - 10-15%; < 3 mm; euhedral.
- Orthopyroxene - 3-5%; <3 mm; euhedral; yellow.
- Clinopyroxene - 5-10%; <3 mm; euhedral; dark-green.
- Olivine - trace; <1 mm; altered to red spots.

GROUNDMASS: Glassy with plagioclase crystals.

VESICLES: 2%; <2 mm; flattened; randomly distributed.

COLOR: Dark green (5BG 4/1) with light green (10Y 6/6) and red streaks from alteration.

STRUCTURE: Massive.

ALTERATION: Glass alters to green-colored product.

VEINS/FRACTURES: Trace; < 0.2 mm; sub-vertical; probably filled with chlorite and zeolite.
UNIT 19: TWO-PYROXENE, PLAGIOCLASE, OLIVINE
ANDESITE-BRECCIA (44R-2 CONTINUED)

Pieces 1-16

CONTACTS: One visible.

PHENOCHRYSYSTS: Fresh.
- Plagioclase - 10-15%; <2 mm; euhedral.
- Orthopyroxene - 10%; <3 mm; yellow; euhedral, equant.
- Clinopyroxene - 5%; <2 mm; dark-green; columnar.
- Olivine - trace; <2 mm; altered to red product.

GROUNDMASS: Glassy with some plagioclase crystals.

VESICLES: 5-8%; <4 mm, some 1 cm in size; round to elongate; randomly distributed; blue coating.

COLOR: Dark bluish gray (5B 4/1) to greenish yellow (5Y 7/4) in brecciated zones.

STRUCTURE: Brecciated.

ALTERATION: Breccia matrix is altered to yellow-green product.

VEINS/FRACTURES: Absent.

ADDITIONAL COMMENTS: Oligomictic breccia; continuation of 125-786B-44R-2 10cm; Pieces 5, 7 are single fragments without breccia matrix; matrix-dominated from Piece 8-12.
UNIT 19: TWO-PYROXENE, PLAGIOCLASE, OLIVINE ANDESITE BRECCIA

Pieces 1-21

CONTACTS: None visible.

PHENOCRYSTS: Fresh.
- Plagioclase - 10%; <2 mm; euhedral.
- Orthopyroxene - 5%; <3 mm; yellow; equant; euhedral.
- Clinopyroxene - 10%; <2 mm; dark green; columnar.
- Olivine - trace; <2 mm; altered to red product.

GROUNDMASS: Glassy with some plagioclase crystals.

VESICLES: 5-8%; <4 mm; some 1 cm in size; round to elongate; randomly distributed; blue coating.

COLOR: Dark bluish gray (5B 4/1) to greenish yellow (5Y 7/4) in brecciated zones.

STRUCTURE: Brecciated.

ALTERATION: Breccia matrix is altered yellow green product.

VEINS/FRACTURES: Absent.

ADDITIONAL COMMENTS: Oligomictic breccia; continuation of 125-786B-44-2, 10 cm; Piece 4-7 and 14-19 are single fragments without breccia matrix; Pieces 20 and 21 are vuggy.
125-786B-46R-2
UNIT 19: TWO-PYROXENE, PLAGIOCLASE, OLIVINE
ANDESITE BRECCIA

Pieces 1-18

CONTACTS: None visible.

PHENOCRYSTS: Fresh.
- Plagioclase - 10%; <2 mm; euhedral.
- Orthopyroxene - 5%; <3 mm; yellow; equant.
- Clinopyroxene - 10%; <2 mm; dark green; columnar.
- Olivine - trace; <2 mm.

GROUNDMASS: Glassy with some plagioclase crystals.

VESICLES: 5-8%; <4 mm, some 1 cm in size; round and elongate; randomly distributed; blue coating.

COLOR: Dark bluish gray (5B 4/1) to greenish yellow (5Y 7/4) in brecciated zones.

STRUCTURE: Brecciated.

ALTERATION: Breccia matrix is altered yellow-green product; olivine phenocryst is altered to red product.

VEINS/FRACTURES: Absent.

ADDITIONAL COMMENTS: Oligomictic breccia; continuation of 125-786B-44-2 10cm; Piece 6 a single fragment without breccia matrix.
UNIT 19: TWO-PYROXENE, PLAGIOCLASE, OLIVINE ANDESITE BRECCIA

Pieces 1-3

CONTACTS: None visible.

PHENOCRYSTS: Fresh.

- Plagioclase: 10%; <2 mm; euhedral.
- Orthopyroxene: 5%; <3 mm; yellow; equant.
- Clinopyroxene: 10%; <2 mm; dark green; columnar.
- Olivine: trace; <2 mm; altered to red product.

GROUNDMASS: Glassy with some plagioclase crystals.

VESICLES: 5-8%; <4 mm, some 1 cm in size; round and elongate; randomly distributed; blue coating.

COLOR: Dark bluish gray (5B 4/1) to greenish yellow (5Y 7/4) in brecciated zones.

STRUCTURE: Brecciated.

ALTERATION: Breccia matrix is altered yellow-green product.

VEINS/FRACTURES: Absent.

ADDITIONAL COMMENTS: Oligomictic breccia; continuation of 125-786B-44-2, 10 cm; Piece 3 contains an orthopyroxene-rich pyroxenite xenolith.
UNIT 19: TWO-PYROXENE, PLAGIOCLASE, OLIVINE ANDESITE BRECCIA (46R-3 CONTINUED).

Pieces 1-21

CONTACTS: None visible.

PHENOCRYSTS: Fresh in unaltered glassy rock portions.
- Plagioclase - 10%; <2 mm; euhedral.
- Orthopyroxene - 5-10%; <2 mm; subhedral.
- Clinopyroxene - 5-10%; <2 mm; subhedral.
- Olivine - trace; <1 mm.

GROUNDMASS: Glassy with plagioclase crystals; green, chlorite-rich in breccia matrix.

VESICLES: 5-20%; variable (1-10 mm); round to elongate; random within each fragment; bluish coating.

COLOR: Dark bluish gray (5B 4/1) to greenish yellow (5Y 7/4).

STRUCTURE: Brecciated.

ALTERATION: Breccia matrix is altered to chlorite-bearing product, clasts are fresh with locally altered rims; olivine phenocrysts altered to reddish product.

VEINS/FRACTURES: Absent.

ADDITIONAL COMMENTS: Continuation of 125-786B-45R-1; oligomictic breccia.
UNIT 19: TWO-PYROXENE, PLAGIOCLASE ANDESITE BRECCIA (47R-1 CONTINUED)

Pieces 1-3

CONTACTS: None visible.

PHENOCRYSTS: Fresh in unaltered glassy rock portions.
- Plagioclase - 10%; <2 mm; euhedral.
- Orthopyroxene - 5-10%; <2 mm; subhedral.
- Clinopyroxene - 5-10%; <2 mm; subhedral.
- Olivine - trace; <1 mm.

GROUNDMASS: Glassy with plagioclase crystals; green, chlorite-rich in breccia matrix.

VESICLES: 5-20%; variable (1-10 mm); round to elongate; random within each fragment; bluish coating.

COLOR: Dark bluish gray (5B 4/1) to greenish yellow (5Y 7/4).

STRUCTURE: Breccia matrix is altered to chlorite-bearing product, clasts are fresh with locally altered rims; olivine phenocrysts altered to reddish product.

ALTERATION: Brecciated.

VEINS/FRACTURES: Absent.

ADDITIONAL COMMENTS: Continuation of 125-786B.45R-1; oligomictic breccia.
UNIT 19: TWO-PYROXENE, PLAGIOCLASE ANDESITE BRECCIA

Pieces 1-11

CONTACTS: None visible.

PHENOCRYSTS: Fresh in unaltered glassy rock portions.
- Plagioclase: 10%; <2 mm; subhedral.
- Orthopyroxene: 5-10%; <2 mm; subhedral.
- Clinopyroxene: 5-10%; <2 mm; subhedral.
- Olivine: trace; <1 mm; altered to reddish product.

GROUNDMASS: Glassy with plagioclase crystals; green, chlorite-rich in breccia matrix.

VESICLES: 5-20%; variable (1-10 mm); round to elongate; randomly distributed; blue coating.

COLOR: Matrix is pale green (5G 6/2); clasts are gray (N 6/) to dark gray (N4/ to 5Y 4/1).

STRUCTURE: Brecciated.

ALTERATION: Breccia matrix is altered to chlorite-bearing product; clasts are fresh with locally-altered rims.

VEINS/FRACTURES: Absent.

ADDITIONAL COMMENTS: Continuation of 125-786B-45R-1. The amount of matrix increases toward the bottom of the section and rare, different clast lithologies are present (probably welded tuffs).
UNIT 19: TWO-PYROXENE, PLAGIOCLASE ANDESITE BRECCIA (47R-1 CONTINUED)

Pieces 1-17

CONTACTS: None visible.

PHENOCRYSTS: Fresh in glassy unaltered rock portions.
- Plagioclase - 10%; <2 mm; euhedral.
- Orthopyroxene - 5-10%; <2 mm; subhedral.
- Clinopyroxene - 5-10%; <2 mm; subhedral.
- Olivine - trace; <1 mm.

GROUNDMASS: Glassy with plagioclase crystals; green, chlorite-rich in breccia matrix.

VESICLES: 5-20%; variable (1-10 mm); round to elongate; randomly distributed; bluish coating.

COLOR: Pale green (5G 6/2) matrix, clasts are gray (N 4/) to dark gray (5Y 4/1).

STRUCTURE: Brecciated.

ALTERATION: Breccia matrix is altered to chlorite-bearing product, clasts are fresh with locally altered rims; olivine phenocrysts altered to reddish product.

VEINS/FRACTURES: 0%; 0; 0.

ADDITIONAL COMMENTS: Continuation of 125-786B-45R-1. Below 83 cm (Piece 11) the section is pervasively fractured and oxidized along the fractures; identical mineralogy.
UNIT 19: TWO-PYROXENE ANDESITE BRECCIA

Pieces 1-5

CONTACTS: None visible.

PHENOCRYSTs: For most clasts:
- Plagioclase - 5-10%; <2 mm; euhedral.
- Orthopyroxene - 2-5%; <2 mm; subhedral.
- Clinopyroxene - 2-5%; <2 mm; subhedral.

GROUNDMASS: Clasts have glassy to very fine-grained groundmass with plagioclase microliths and are pervasively altered; greenish alteration in matrix.

VESICLES: 1-15%; 0.1-10 mm; some flattened and aligned; variable distribution; bluish white coating to vesicles.

COLOR: Pale green (5G 6/2) matrix; clasts are mainly gray, 10YR 2/1 in freshest and 10YR 4/1 in most altered examples; a few clasts are reddish brown (5YR 6/4).

STRUCTURE: Breccia matrix is altered to green and white minerals; glass in clasts altered to clay minerals, and some, but not all, have alteration rims at their margins.

ALTERATION: Absent.

ADDITIONAL COMMENTS: Smaller clasts are less vesicular, finer-grained and more highly altered; clasts range in size from 2 mm to 6 cm in longest dimension; larger clasts are subangular-rounded, and smaller clasts are rounded; vitric matrix.
UNIT 19: TWO-PYROXENE ANDESITE BRECCIA

Pieces 1-5

CONTACTS: None visible.

PHENOCRYSTS: For most clasts:
- Plagioclase: 5-10%; <2 mm; euhedral.
- Orthopyroxene: 3-5%; <2 mm; subhedral.
- Clinopyroxene: 2-3%; <2 mm; subhedral.

GROUNDMASS: Clasts have glassy to very fine-grained groundmass with plagioclase microliths and are pervasively altered.

VESICLES: 1-15%; variable distribution; within and between clasts 1-10 mm; some flattened and aligned; bluish-white coating to vesicles.

COLOR: Pale green (5G 6/2) matrix; clasts are mainly gray, 10YR 2/1 in freshest and 10YR 4/1 in most altered; a few clasts are reddish brown (10R 4/8).

STRUCTURE: N/A

ALTERATION: Breccia matrix is altered to green and white minerals; glass in clasts altered to clay minerals, and some, but not all, have alteration rims.

VEINS/FRACTURES: Absent.

ADDITIONAL COMMENTS: Smaller clasts are less vesicular, finer-grained and more highly altered; clasts range in size from 2 mm to 6 cm in longest dimension; larger clasts are subangular-rounded, and smaller clasts are rounded; more red clasts towards the base of the section; vitric matrix.
UNIT 19: TWO-PYROXENE ANDESITE BRECCIA

Pieces 1-9

CONTACTS: None visible.

PHENOCRYSTS: For most clasts:
- Plagioclase - 5-10%; <2 mm; euhedral.
- Orthopyroxene - 2-5%; <2 mm; subhedral.
- Clinopyroxene - 2-5%; <2 mm; subhedral.

GROUNDMASS: Clasts have glassy to very fine-grained groundmass with plagioclase microliths and are pervasively altered.

VESICLES: 1-15%; 0.1-10 mm; flattened and aligned; variable distribution within clasts; bluish white coating to vesicles.

Miareoles: some

COLOR: Red brown (10R 4/4) in matrix; clasts vary enormously in color to give most shades of gray to green; a few clasts are red brown.

STRUCTURE: N/A

ALTERATION: Clasts are red brown, breccia matrix is altered to red brown oxides and clays; clasts show pervasively low-grade alteration.

VEINS/FRACTURES: Absent.

ADDITIONAL COMMENTS: Smaller clasts are less vesicular, finer-grained and more highly altered; clasts range in size from 2 mm to 6 cm in longest dimension; larger clasts are subangular-rounded, and smaller clasts are rounded; vitric matrix.
### UNIT 19: TWO-PYROXENE ANDESITE BRECCIA

#### Pieces 1-13

**CONTACTS:** None visible.

**PHENOCRYSTS:** For clasts.
- Plagioclase - 5-10%; <2 mm; subhedral.
- Orthopyroxene - 2-5%; <2 mm; subhedral.
- Clinopyroxene - 2-5%; <2 mm; subhedral.

**GROUNDMASS:** Glassy clasts have very fine-grained groundmass and are variably but pervasively altered.

**VESICLES:** 1-15%; 0.1-10 mm; flattened and aligned; variable distribution within clasts; bluish white coating to vesicles.

**Miaroles:** Some.

**COLOR:** Grayish green (10G 4/2) to dusky yellowish-green (10G 3/2) matrix; clasts are mainly gray, (10YR 5/1) in freshest and (10YR 4/1) in most altered examples; a few clasts are reddish-brown (10R 4/8).

**STRUCTURE:** N/A

**ALTERATION:** Breccia matrix is altered to green and white minerals; clasts exhibit low-grade alteration and some have altered margins.

**VEINS/FRACTURES:** One irregular fracture with white mineral on fracture walls.

**ADDITIONAL COMMENTS:** Smaller clasts are less vesicular, finer-grained and more highly altered; clasts range in size from 2 mm upwards; vitric matrix.
UNIT 19: TWO-PYROXENE ANDESITE BRECCIA

Pieces 1-16

CONTACTS: None visible.

PHENOCRYSTS: For clasts:
- Plagioclase - 5-10%; <2 mm; euhedral.
- Orthopyroxene - 2-5%; <2 mm; subhedral.
- Clinopyroxene - 2-5%; <2 mm; subhedral.

GROUNDMASS: Clasts are pervasively altered, and have a very fine-grained to glassy groundmass with plagioclase microliths.

VESICLES: 1-15%; 0.1-10 mm; flattened and aligned; variable distribution within clasts; bluish white coating to vesicles.

Miaroles: Some.

COLOR: Grayish green (10G 4/2) to dusky yellowish-green matrix; clasts are mainly gray, (10YR 2/1) in freshest and (10YR 4/1) in most altered examples; a few clasts are reddish (10R 4/8).

STRUCTURE: N/A.

ALTERATION: Breccia matrix is altered to green and white minerals which show a pervasive low-grade alteration; clasts have moderately fresh interiors, and some have alteration rims.

VEINS/FRACTURES: Absent.

ADDITIONAL COMMENTS: Smaller clasts are less vesicular, finer-grained and more highly altered; clasts range in size from 2 mm to 6 cm in longest dimension; vitric matrix (no detrital component).
UNIT 19: TWO-PYROXENE ANDESITE

Pieces 1-7

CONTACTS: None visible.

PHENOCRYSTS: For clasts.
- Plagioclase - 5-10%; <2 mm; euhedral.
- Orthopyroxene - 2-5%; <2 mm; subhedral.
- Clinopyroxene - 2-5%; <2 mm; subhedral.

GROUNDMASS: Clasts have a very fine-grained to glassy groundmass that shows pervasive alteration.

VESICLES: 1-15%; 1-10 mm; some flattened and aligned; variable distribution within clasts; bluish white lining.

COLOR: Grayish green (10G 4/2) to dusky yellowish green (10GY 3/2) matrix; clasts are mainly gray (10YR 4/1 to 6/1).

STRUCTURE: N/A.

ALTERATION: Breccia matrix altered to green and white alteration products; clasts show pervasive low-grade alteration, some have alteration rims.

VEINS/FRACTURES: Absent.

ADDITIONAL COMMENTS: Smaller clasts are less vesicular, finer-grained and more highly altered; clasts range in size from 2 mm to 4 cm in largest dimension; larger clasts are subangular-rounded; matrix is vitric (no detrital component).
UNIT 19: TWO-PYROXENE ANDESITE BRECCIA

Pieces 1-20

CONTACTS: None visible.

PHENOGRSTS: For clasts. Plagioclase - 50%; <2 mm; euhedral. Orthopyroxene - 2-5%; <2 mm; subhedral. Clinopyroxene - 2-5%; <2 mm; subhedral.

GROUNDMASS: Clasts have glassy to very fine-grained groundmass with plagioclase microliths and are pervasively altered.

VESICLES: 1-15%; 0.1-10 mm; some flattened and aligned; variable distribution within clasts; bluish white coating to vesicles.

COLOR: Grayish green (10G 4/2) to dusky yellowish green (10GY 3/2) matrix; clasts are mainly gray, (10YR 2/1), in freshest and (10YR 4/1) in most altered examples.

STRUCTURE: N/A.

ALTERATION: Breccia matrix is altered to green and white minerals; clasts show pervasive low-grade alteration and some have alteration rims.

VEINS/FRACTURES: Absent.

ADDITIONAL COMMENTS: Smaller clasts are less vesicular, finer-grained and more highly altered; clasts range in size from 2 mm to 11 cm in longest dimension; larger clasts are subangular-rounded, and smaller clasts are rounded; vitric matrix (no detrital component).
UNIT 19: TWO-PYROXENE ANDESITE BRECCIA

Pieces 1-5

CONTACTS: None visible.

PHENOCRYSTS: For clasts.
- Plagioclase - 5-10%; <2 mm; euhedral.
- Orthopyroxene - 2-5%; <2 mm; subhedral.
- Clinopyroxene - 2-5%; <2 mm; subhedral.

GROUNDMASS: Clasts have very fine-grained to glassy groundmass and are pervasively altered.

VESICLES: 1-15%; 0.1-10 mm; some flattened and aligned; variable within clasts; bluish white lining.

COLOR: Grayish green (10G 4/2) to dusky yellowish green (10GY 3/2) matrix; clasts are mainly gray (10YR 2/1), in least altered to (10YR 4/1) in most altered examples.

STRUCTURE: N/A.

ALTERATION: Breccia matrix altered to green and white minerals; clasts show pervasive low-grade alteration and some have alteration rims.

VEINS/FRACTURES: Absent.

ADDITIONAL COMMENTS: Smaller clasts are less vesicular, finer-grained and more highly-altered; clasts range in size from 2 mm to 6 cm in longest dimension; largest clasts are subangular-rounded; vitric matrix (no detrital component).
UNIT 19: BONINITE BRECCIA

Pieces 1-9

CONTACTS: None visible.

PHENOCRYSTs: For clasts.
- Plagioclase - 3-5%; <2 mm; euhedral.
- Orthopyroxene - 5-10%; <2 mm; euhedral.
- Clinopyroxene - 3-5%; <2 mm; subhedral.

GROUNDMASS: Clasts have a very fine-grained to glassy groundmass that shows pervasive alteration.

VESICLES: 1-15%; 1-10 mm; some flattened and aligned; variable distribution within clasts; bluish white lining.

COLOR: Grayish green (10G 4/2) to dusky yellowish green (10GY 3/2) matrix; clasts are mainly gray (10YR 4/1 to 6/1).

STRUCTURE: N/A.

ALTERATION: Breccia matrix altered to green and white alteration products; clasts show pervasive low-grade alteration and some have alteration rims.

VEINS/FRACTURES: Absent.

ADDITIONAL COMMENTS: Smaller clasts are less vesicular, finer-grained and more highly altered; clasts range in size from 2 mm to 6 cm in largest dimension; larger clasts are subangular-rounded; matrix is vitric (no detrital component).
UNIT 19: BONINITE BRECCIA

Pieces 1-12

CONTACTS: None visible.

PHENOCRYSTS: For clasts.
   Plagioclase - 3-5%; <2 mm; euhedral.
   Orthopyroxene - 5-10%; <2 mm; subhedral.
   Clinopyroxene - 3-5%; <2 mm; subhedral.

GROUNDMASS: Clasts have a very fine-grained to glassy groundmass that shows pervasive alteration.

VESICLES: 1-15%; 1-10 mm; some flattened and aligned; variable distribution within clasts; some have bluish white lining, others are filled with greenish matrix material.

COLOR: Grayish green (10G 4/2) to dusky yellowish green (10GY 3/2) matrix; clasts are mainly gray (10YR 4/1 to 6/1).

STRUCTURE: N/A.

ALTERATION: Breccia matrix altered to green and white alteration products; clasts show pervasive low-grade alteration and some have alteration rims.

VEINS/FRACTURES: Absent.

ADDITIONAL COMMENTS: Smaller clasts are less vesicular, finer-grained and more highly altered; clasts range in size from 5 mm to 6 cm in largest dimension; larger clasts are subangular-rounded; matrix is vitric (no detrital component).
UNIT 19: BONINITE BRECCIA

Pieces 1-3

CONTACTS: None visible.

PHENOCRYSTS: For clasts:
- Plagioclase - 3-5%; <2 mm; euhedral.
- Orthopyroxene - 5-10%; <2 mm; subhedral.
- Clinopyroxene - 3-5%; <2 mm; subhedral.

GROUNDMASS: Clasts have a very fine-grained to glassy groundmass that shows pervasive alteration.

VESICLES: 1-15%; 1-10 mm; some flattened and aligned; variable distribution within clasts; some have bluish white lining, others are filled with greenish matrix material.

COLOR: Grayish green (10G 4/2) to dusky yellowish green (10GY 3/2) matrix; clasts are mainly gray (10YR 4/1).

STRUCTURE: N/A.

ALTERATION: Breccia matrix altered to green and white alteration products; clasts show pervasive low-grade alteration and some have alteration rims.

VEINS/FRACTURES: Absent.

ADDITIONAL COMMENTS: Smaller clasts are less vesicular, finer-grained and more highly altered; clasts range in size from 2 mm to 6 cm in largest dimension; larger clasts are subangular-rounded; matrix is vitric (no detrital component).
UNIT 19: BONINITE BRECCIA

Pieces 1-13

CONTACTS: None visible.

PHENOCRYSTS: For clasts.
- Plagioclase - 3-5%; <2 mm; euhedral.
- Orthopyroxene - 5-10%; <2 mm; subhedral.
- Clinopyroxene - 3-5%; <2 mm; subhedral.

GROUNDMASS: Clasts have a very fine-grained to glassy groundmass that shows pervasive alteration.

VESICLES: 1-15%; 1-10 mm; some flattened and aligned; variable distribution within clasts; carbonate and white zeolite filling.

COLOR: Dark gray green (5G 3/4 - 5G 4/4) matrix; clasts mainly dark gray to dark bluish gray (N 4 to 5B 4/1).

STRUCTURE: N/A.

ALTERATION: Breccia matrix altered to green and white alteration products; clasts show pervasive low-grade alteration and some have alteration rims.

VEINS/FRACTURES: Absent.

ADDITIONAL COMMENTS: Clasts range in size from 2 mm to 6 cm in largest dimension; matrix is vitric and porous with 1-2% grain-interstitial pores from 0.5 mm to 5 mm; pores have a lining of pale-green and creamy-white zeolite.
UNIT 19: BONINITE BRECCIA

Pieces 1-9

CONTACTS: None visible.

PHENOCRYSTS: For clasts.
    Plagioclase - 3-9%; <2 mm; euhedral.
    Orthopyroxene - 5-10%; <2 mm; subhedral.
    Clinopyroxene - 3-5%; <2 mm; subhedral.

GROUNDMASS: Clasts have a very fine-grained to glassy groundmass that shows pervasive alteration.

VESICLES: 1-15%; 1-10 mm; some flattened and aligned; variable distribution among clasts; filled with carbonate and white zeolite; parallel or concentric layers of zeolite (translucent-white-eggshell blue) fill some vesicles.

COLOR: Dark gray-green (5G 3/4 - 5G 4/4) matrix; clasts are mainly dark gray to dark bluish gray (N 4/ to 5B 4/1).

STRUCTURE: N/A.

ALTERATION: Breccia matrix altered to green and white alteration products; clasts show pervasive low-grade alteration and some have alteration rims.

VEINS/FRACTURES: Absent.

ADDITIONAL COMMENTS: Smaller clasts are less vesicular, finer-grained and more highly altered; clasts range in size from 2 mm to 6 cm in largest dimension; larger clasts are subangular-rounded; matrix is vitric (no detrital component).
UNIT 19: BONINITE BRECCIA

Pieces 1-7

CONTACTS: None visible.

PHENOCRYSTS: For clasts:
  - Plagioclase - 3-5%; <2 mm; euhedral.
  - Orthopyroxene - 5-10%; <2 mm; subhedral.
  - Clinopyroxene - 3-5%; <2 mm; subhedral.

GROUNDMASS: Clasts have a very fine-grained to glassy groundmass that shows pervasive alteration.

VESICLES: 1-15%; 1-10 mm; some flattened and aligned; variable distribution among clasts; bluish white lining.

COLOR: Dark gray green (5G 3/4) matrix; clasts are dark bluish gray to black (10YR 5/1 to 10YR 2/1).

STRUCTURE: N/A.

ALTERATION: Breccia matrix altered to green and white alteration products; clasts are pervasively altered and some have alteration rims.

VEINS/FRACTURES: Absent.

ADDITIONAL COMMENTS: Clasts range in size from 1 mm to 5 cm in largest dimension; matrix is vitric (no detrital component); the relative proportion of matrix to clasts is less than in previous cores and the distance between clasts is 1-3 mm; long axes of the clasts may be aligned with an apparent dip of 35 degrees; some clasts break up parallel to possible foliation.
UNIT 19: BONINITÉ BRECCIA

Pieces 1-8

CONTACTS: None visible.

PHENOCRYSTS: For clasts.
- Plagioclase - 3-5%; <2 mm; euhedral.
- Orthopyroxene - 5-10%; <2 mm; subhedral.
- Clinopyroxene - 3-5%; <2 mm; subhedral.

GROUNDMASS: Clasts have a very fine-grained to glassy groundmass that shows pervasive alteration.

VESICLES: 1-15%; 1-10 mm; some flattened and aligned; variable distribution among clasts; whitish carbonate and zeolite lining or filling.

COLOR: Dark gray green (5G 3/4) matrix; clasts are dark bluish gray to black (10YR 5/1 - 10YR 2/1).

STRUCTURE: N/A.

ALTERATION: Breccia matrix altered to green and white alteration products; some have clasts show pervasive low-grade alteration and some have alteration rims.

VEINS/FRACTURES: Absent.

ADDITIONAL COMMENTS: Smaller clasts are less vesicular, finer-grained and more highly altered; clasts range in size from 1 mm to 11 cm in largest dimension; larger clasts are subangular - rounded; matrix is vitric (no detrital component).
UNIT 19: BONINITE BRECCIA

Pieces 1-6

CONTACTS: None visible.

PHENOCRYSTIS: For clasts.
- Plagioclase - 3-5%; <2 mm; euhedral.
- Orthopyroxene - 5-10%; <2 mm; subhedral.
- Clinopyroxene - 3-5%; <2 mm; subhedral.

GROUNDMASS: Clasts have a very fine-grained to glassy groundmass that shows pervasive alteration.

VESICLES: 1-15%; 1-10 mm; some flattened and aligned; variable distribution within clasts; whitish lining and filling.

COLOR: Dark gray green (5G 3/4) matrix; clasts are dark gray to black (10YR 4/1 to 7.5YR 2/1).

STRUCTURE: N/A.

ALTERATION: Breccia matrix altered to green and white alteration products; clasts show pervasive low-grade alteration and some have alteration rims.

VEINS/FRACTURES: Absent.

ADDITIONAL COMMENTS: Smaller clasts are less vesicular, finer-grained and more highly altered; clasts range in size from 2 mm to 4.5 cm in largest dimension; larger clasts are subangular-rounded; matrix is vitric (no detrital component); but contains sand-sized fragments; the relative proportion of matrix to clasts decreases down section.
UNIT 19: BONINITITE BRECCIA

Pieces 1-12

CONTACTS: None visible.

PHENOCRYSTS: For clasts.
  Plagioclase - 3-5%; <2 mm; euhedral.
  Orthopyroxene - 5-10%; 2 mm; subhedral.
  Clinopyroxene - 3-5%; 2 mm; subhedral.

GROUNDMASS: Clasts have a very fine-grained to glassy groundmass that show pervasive alteration.

VESICLES: 1-15%; 1-10 mm; some flattened and aligned; variable distribution within clasts; whitish lining and filling.

COLOR: Dark gray green (5G 3/4) matrix; clasts are mainly dark gray to black 10YR 4/1 to 7.5YR 2/0.

STRUCTURE: N/A.

ALTERATION: Breccia matrix altered to green and white alteration products; clasts show pervasive low-grade alteration and some have alteration rims.

VEINS/FRACTURES: Absent.

ADDITIONAL COMMENTS: Smaller clasts are less vesicular, finer-grained and more highly altered; clasts range in size from 2 mm to 4.5 cm in largest dimension; larger clasts are subangular-rounded; matrix is vitric (no detrial component), but contains sand-sized fragments.
UNIT 19: BONINITE BRECCIA

Pieces 1-7

CONTACTS: None visible.

PHENOCRYSTS: For clasts.
- Plagioclase - 3-5%; <2 mm; euhedral.
- Orthopyroxene - 5-10%; <2 mm; subhedral.
- Clinopyroxene - 3-5%; <2 mm; subhedral.

GROUNDMASS: Clasts have a very fine-grained to glassy groundmass that shows pervasive alteration.

VESICLES: 1-15%; 1-10 mm; some flattened and aligned; variable distribution within clasts; bluish white lining and filling.

COLOR: Dark gray green (10G 4/2) matrix; clasts are mainly dark gray to black (10YR 4/1 to 7.5YR 2/0).

STRUCTURE: N/A.

ALTERATION: Breccia matrix altered to green and white alteration products; clasts show pervasive low-grade alteration and some have alteration rims.

VEINS/FRACTURES: Absent.

ADDITIONAL COMMENTS: Smaller clasts are less vesicular, finer-grained and more highly altered; clasts range in size from 2 mm to 4.5 cm in largest dimension; larger clasts are subangular-rounded; matrix is vitric (no detrital component) and contains sand-sized fragments.
UNIT 19: TWO-PYROXENE, PLAGIOCLASE BONINITE BRECCIA

Pieces 1A-14C

CONTACTS: None visible.

PHENOCRYSTS:
- Plagioclase - 2-5%; <2 mm; euhedral.
- Orthopyroxene - 10%; <3 mm; yellow; subhedral.
- Clinopyroxene - 5%; <2 mm; dark-green; subhedral.

GROUNDMASS: Glassy to partly altered in clasts; chlorite-rich along cracks.

VESICLES: 5-20%; <3 mm, locally 1 cm diameter; round to elongate; sorted by size; blue coating.

COLOR: Gray (N 5/) where fresh; greenish gray (5G 5/2 - 6/2) and white where altered.

STRUCTURE: Brecciated to intensely fractured.

ALTERATION: Along fractures to green and creamy-white products.

VEINS/FRACTURES: Strongly fractured.

ADDITIONAL COMMENTS: Oligomictic breccia.
UNIT 19: TWO-PYROXENE, PLAGIOCLASE BONINITE BRECCIA

Pieces 1-13

CONTACTS: None visible.

PHENOCRYSTS:
- Plagioclase - 2-5%; <2 mm; euhedral.
- Orthopyroxene - 10%; <3 mm; yellow; subhedral.
- Clinopyroxene - 5%; <2 mm; dark green, subhedral.

GROUNDMASS: Glassy to partly altered in clasts; chlorite-rich along cracks.

VESICLES: 5-20%; <3 mm, loosely 1 cm; round to elongate; sorted by size; blue coating.

COLOR: Gray (N 5/) where fresh, greenish gray (5G 5/2-6/2) and white where altered.

STRUCTURE: Brecciated to intensely fractured.

ALTERATION: Along fractures to green and creamy-white products.

VEINS/FRACTURES: Strongly fractured.

ADDITIONAL COMMENTS: Oligomictic breccia; the amount of altered matrix is increasing from Section 1; Pieces 8C and 10 are fresh clasts.
UNIT 19: TWO-PYROXENE, PLAGIOCLASE BONINITE BRECCIA

Pieces 1-10

CONTACTS: None.
PHENOCRYSTS: Glomerocyrsts of plagioclase and orthopyroxene.
   Plagioclase - trace; <2 mm; euhedral.
   Orthopyroxene - 15-20%; <3 mm; yellow; subhedral.
   Clinopyroxene - 5%; <2 mm; dark green; subhedral.
GROUNDMASS: Glassy to partly altered in clasts; chlorite-rich along cracks.
VESICLES: 5-20%; <3 mm, locally 1 cm; rounded to elongate; sorted by size; blue coating.
COLOR: Gray (N 5/5) where fresh; greenish gray (5G 5/2 - 6/2) and white where altered.
STRUCTURE: Brecciated to intensely fractured.
ALTERATION: Along fractures to green and creamy-white product.
VEINS/FRACTURES: Strongly fractured.
ADDITIONAL COMMENTS: Oligomictic breccia; native copper is present in the fresh glass in Piece 4 and Piece 8B; glassy groundmass contains some plagioclase.
UNIT 19: TWO-PYROXENE, PLAGIOCLASE BONINITE BRECCIA

Pieces 1-4

CONTACTS: None.

PHENOCRYSTS: Glomerocrysts of plagioclase and orthopyroxene.
- Plagioclase: trace; <2; euhedral.
- Orthopyroxene: 15-20%; <3; yellow; subhedral.
- Clinopyroxene: 5%; <2; dark green; subhedral.

GROUNDMASS: Glassy to partly altered in clasts; chlorite-rich along cracks.

VESICLES: 5-20%; <3mm, locally 1 cm; rounded to elongate; sorted by size; blue coating.

COLOR: Gray (N 5/) where fresh; greenish gray (5G 5/2 - 6/2) and white where altered.

STRUCTURE: Brecciated to intensely fractured.

ALTERATION: Along fractures to green and creamy-white product.

VEINS/FRACTURES: Strongly fractured.

ADDITIONAL COMMENTS: Continued from 125-786B-55R-3.
UNIT 19: BONINITE BRECCIA

Pieces 1-4

CONTACTS: None.

PHENOCRYSTS:
- Orthopyroxene - 10-15%; <3 mm; yellow; euhedral.
- Cr-spinel - trace; <0.1 mm; black; euhedral.

GROUNDMASS:
- Devitrified glass; contains plagioclase.

VESICLES:
- 0-5%; <2 mm; locally 1 cm; round; sorted by size; filled with clay.

COLOR:
- Dark gray (N 4/) to light greenish gray (5GY 7/1) and grayish green (5G 4/2); the fresh material is dark gray.

STRUCTURE:
- Breccia, probably pillow fragments, some showing in situ fractures infilled with finer-grained debris.

ALTERATION:
- Differentially altered.

VEINS/FRACTURES:
- Trace; <1 mm wide; random; filled with zeolitic material.

ADDITIONAL COMMENTS:
- A trace of copper is present.
UNIT 19: BONINITÉ BRECCIA

Pieces 1A-1F

CONTACTS: None visible.

PHENOCRYSTS:
- Orthopyroxene - 10-15%; < 3 mm; yellow; euhedral.
- Cr-spinel - trace; <0.1 mm; black; euhedral.

GROUNDMASS: Devitrified glass, contains plagioclase.

VESICLES: 0-5%; < 2 mm, locally 1 cm; round; sorted by size; filled with clay.

COLOR: Dark gray (n Al) when fresh; light greenish gray (5GY 7/1) and grayish green (5G 4/2) where altered.

STRUCTURE: Breccia; individual fragments up to 30 cm in diameter.

ALTERATION: Differentially altered.

VEINS/FRACTURES: Trace; <1 mm; random; filled with zeolite and chlorite.

ADDITIONAL COMMENTS: Continuation of 125-786B-56R-1.
UNIT 19: BONINITE BRECCIA

Pieces 1A-1H

CONTACTS: None.

PHENOCRYSTs:
- Orthopyroxene - 10-15%; <3 mm; yellow; euhedral.
- Cr-spinel - trace; <0.1 mm; black; euhedral.

GROUNDMASS: Devitrified glass, contains plagioclase.

VESICLES: 0-5%; <2 mm, locally 1 cm; round; sorted by size; filled with clay.

COLOR: Dark gray (N 4) when fresh; light greenish gray (5GY 7/1) and grayish green (5G 4/2) where altered.

STRUCTURE: Breccia; individual fragments up to 15 cm in size.

ALTERATION: Differentially altered.

VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: Continuation of 125-786B-56R-1.
UNIT 19: BONINITE BRECCIA

Pieces 1-8

CONTACTS: None.

PHENOCRYSTS:
- Orthopyroxene - 10-15%; <3 mm; yellow; euhedral.
- Cr-spinel - trace; <0.1 mm; black; euhedral.

GROUNDMASS: Devitrified glass, contains plagioclase.

VESICLES: 0-5%; <2 mm, locally 1 cm; rounded; sorted by size; filled with clay.

COLOR: Dark gray (N 4/) where fresh; light greenish gray (5G 7/1) and grayish green (5G 4/2).

STRUCTURE: Breccia; probably pillow fragments with individual fragments up to 20 cm in size.

ALTERATION: Glass altered to clays.

VEINS/FRACTURES: Absent.

ADDITIONAL COMMENTS: Continuation of 125-786B-56R-1; slickensides indicating horizontal and vertical motion in fracture zone from Piece 2 to Piece 7.
UNIT 19: BONINITE BRECCIA

Pieces 1-4

CONTACTS: None.

PHENOCRYSTS:
- Orthopyroxene - 10-15%; <3 mm; yellow; euhedral.
- Cr-spinel - trace; <0.1 mm; black; euhedral.

GROUNDMASS: Devitrified glass, contains plagioclase.

VESICLES: 0-5%; <2 mm, locally 1 cm; rounded; sorted by size; filled with clay.

COLOR: Same as previous section.

STRUCTURE: Breccia; individual fragments up to 15 cm in size.

ALTERATION: Glass altered to clay.

VEINS/FRACTURES: Absent.

ADDITIONAL COMMENTS: Continuation of 125-786B-56R-1.
UNIT 19: BONINITE BRECCIA

Pieces 1-5

COMMENTS: Continuation of 125-786B-56R-1.
UNIT 20: BONINITIC HYALOCLASTITE SAND

Pieces 1A-1C

CONTACTS: None.
ADDITIONAL COMMENTS: The unit is a fining-upward sandstone containing mm-to cm-sized lithic and vitric fragments of glassy margins of boninite as well as single crystals of orthopyroxene. The unit exhibits basal graded bedding.

UNIT 21: BONINITE

Pieces 1C - 1G

CONTACTS: Between overlying boninite hyaloclastite sand and this flow.

PHENOCRYSTS: Orthopyroxene occurs as isolated crystals and glomerocrystic patches, rarely with clinopyroxene.
- Orthopyroxene - 3-10%; <1.5 mm; euhedral, tabular, with spinel inclusions.
- Clinopyroxene - trace; <0.3 mm; deep green; euhedral equant.

GROUNDMASS: Fine-grained to glassy with microlites of feldspar.

VESICLES: 0-15%; <8 mm long; elongate-ovoid to irregular; concentrated towards fragment boundaries; filled with fibrous white zeolites.

COLOR: Dark greenish gray (5BG 4/1) to dark brown (7.5YR 3/4).

STRUCTURE: Partially fragmented pillow rims; interiors mostly massive.

ALTERATION: Variable; oxidized towards margins of fragments; possible chlorite and Fe-oxide.

VEINS/FRACTURES: <4 mm wide; random; filled with zeolite and amorphous green phase (zeolite?, altered glass?); also patches or cavities filled in the same manner.

ADDITIONAL COMMENTS: Appears to be pillow fragment at base of hyaloclastitic, boninitic sand.
UNIT 21: BONINITE PILLOWS AND BONINITIC HYALOCLASTITIC SAND (CONTINUED FROM 57R-1)

Pieces 1-4G

CONTACTS: Between hyaloclastite sand and pillows in Pieces 2 and 4.

PHENOCRYSTS: Glomerocrysts of orthopyroxene and sparse clinopyroxene, and isolated orthopyroxene.
- Orthopyroxene - 3-10%; <1.5 mm; euhedral, with spinel inclusions.
- Clinopyroxene - trace; <0.3 mm; euhedral, equant.

GROUNDMASS: Fine-grained to glassy with microtites of feldspar; variably altered.
- Orthopyroxene - 3-10%; <1.5 mm; euhedral, with spinel inclusions.
- Clinopyroxene - trace; <0.3 mm; euhedral, equant.

VESICLES: 0-15%; <8 mm long; elongate-ovoid to irregular; concentrated at fragment boundaries; often filled with white zeolite and green amorphous altered glass (or zeolite?).

COLOR: Dark greenish gray (5BG 4/1) to dark brown (7.5YR 3/4).

STRUCTURE: Pillow lavas and brecciated hyaloclastite overlying pillow lavas.

ALTERATION: Zeolites and Fe-oxide filled (altered clays) veins and cavities.

VEINS/FRACTURES: 1-2%; 1-4 mm; random; some large (1 cm) diameter elongate cavities are present filled with Fe-oxide and zeolite.

ADDITIONAL COMMENTS: Continuation of 125-786B-57R-1.
UNIT 21: BONINITE PILLOWS AND HYALOCLASTITE
(CONTINUED FROM 57R-2)

Pieces 4H-4M

CONTACTS: Between hyaloclastite sand and pillows in Pieces 4K and 4J.

PHENOCRYSTs: Orthopyroxene occurs as isolated crystals and glomerocrysts with sparse clinopyroxene.
Orthopyroxene - 3-10%; <1.5 mm; euhedral tabular; with spinel inclusions.
Clinopyroxene - trace; <0.3 mm; euhedral, equant; deep green.

GROUNDMASS: Fine-grained to glassy with microcrysts of feldspar; variably altered.

VESICLES: 0-15%; 1-6 mm; round to elongate; irregular; concentrated in fracture boundary 4I-4L; filled with white and green zeolite, appear concentrated at pillow boundaries.

COLOR: Dark greenish gray (5BG 4/1) to dark brown (7.5YR 3/4).

STRUCTURE: Massive to pillow-brecciated.

ALTERATION: Zeolite, Fe-oxide alteration of vein filling; chlorite in the groundmass.

VEINS/FRACTURES: 1-2%; 1-3 mm wide; random orientation; veins filled with zeolite and larger fractures (up to 1 cm) also zeolite-filled.

ADDITIONAL COMMENTS: Continuation of 125-786B-57R-2.
UNIT 21: BONINITE PILLOWS AND HYALOCLASTITE
(CONTINUED FROM 57R-3)

Pieces 4N-4V

CONTACTS: Between boninite pillows and hyaloclastite in Pieces 4O, 4U.

PHENOCRYSTS: Orthopyroxenes occur as glomerocrysts with and without
clinopyroxenes, and as isolated crystals.
Orthopyroxene - 6-10%; <1.5 mm; euhedral, tabular, with occasional spinel inclusions.
Clinopyroxene - trace; <0.3 mm; euhedral, equant.

GROUNDMASS: Fine-grained to glassy with microlites of feldspar; variably altered.
VESICLES: 0-20%, 0-7 mm long; elongate to round; concentrated at fragment boundaries;
filled with white and light-green zeolite.
COLOR: Dark greenish gray (5BG 4/1) to dark brown (7.5YR 3/4).
STRUCTURE: Massive to pillow lava and brecciated pillows.
ALTERATION: Zeolites alteration as vesicle and fracture filling.
VEINS/FRACTURES: 1-2%; 1-3 mm wide; random; filled with white and green zeolite.
ADDITIONAL COMMENTS: Continuation of 125-786B-57R-1.
UNIT 21: BONINITIC PILLOWS AND HYALOCLASTITE
(57R-4 CONTINUED)

Pieces 1A-1D

CONTACTS: No distinct contacts visible.

PHENOCRYSTs: Glomerocrysts of orthopyroxene with and without clinopyroxene.
Orthopyroxene - 5-10%; <1.5 mm; euhedral, tabular, some with spinel inclusions.
Clinopyroxene - trace; <0.3 mm; euhedral, equant.

GROUNDMASS: Fine-grained to glassy with microlites of feldspar; variably altered.
VESICLES: 0-7%; 1-3 mm; round to elongate; concentrated at pillow rims; filled with white
zeolite; vesicles concentrated just below glassy pillow rims.

COLOR: Dark greenish gray (5BG 4/1) to dark brown (7.5YR 3/4).

STRUCTURE: Pillow structure with minor brecciation.
ALTERATION: Zeolites and Fe-oxide alteration fill vesicles, veins, fractures; minor chlorite
in groundmass.

VEINS/FRACTURES: 1-4%; 1-4 mm wide; random, irregular; locally concentrated at
fragment boundaries.

ADDITIONAL COMMENTS: Continuation of 125-786B-57R-4.
UNIT 21: BONINITIC PILLOWS AND HYALOCLASTITE
(CONTINUED FROM 57R-5)

Pieces 1E-1N

CONTACTS: Between hyaloclastite and pillow in Pieces 1H to 11.

PHENOCRYSTS: Glomerocrysts of orthopyroxene with and without clinopyroxene.
Orthopyroxene - 5-10%; <1.5 mm; euhedral, tabular.
Clinopyroxene - trace; <0.5 mm; euhedral.

GROUNDMASS: Very fine-grained to glassy with microlites of feldspar; variably altered.

VESICLES: 0-25%; <6 mm; ovoid-irregular; concentrated in pillow fragment; filled with fibrous white zeolite.

COLOR: Matrix hyaloclastite is dark gray green (5G 3/2); clasts are dark bluish gray (5B 4/1);
interior of pillow fragment is reddish brown (5YR 4/4).

STRUCTURE: Hyaloclastite breccia.

ALTERATION: Extensive green alteration, possibly zeolitic and smectitic.

VEINS/FRACTURES: 2-3%; <8 mm; random; filled with altered glass; some filling by
ferromanganese red fine-grained porcellaneous sediment (yellowish red 5YR 4/6).

ADDITIONAL COMMENTS: Continuation of 125-786B-57R-5.
UNIT 21: BONINITIC PILLOWS AND HYALOCLASTITE
(CONTINUED FROM 57R-6)

Pieces 10-4

CONTACTS: Between hyaloclastite and pillow in Pieces 3 and 4.

PHENOCRYSTS: Glomerocrysts of orthopyroxene with and without clinopyroxene.
   Orthopyroxene - 5-10%; <1.5 mm; euhedral, tabular.
   Clinopyroxene - trace; <0.5 mm; euhedral.

GROUNDMASS: Very fine-grained to glassy with microlites of feldspar; variably altered.

VESICLES: 0-15%; <7 mm; avoid-irregular; concentrated at pillow rims; filled with fibrous white zeolite.

COLOR: Matrix: dark gray green (5G 3/2); clasts: dark bluish gray (5B 4/1); pillow interior: greenish gray (5G 5/1).

STRUCTURE: Hyaloclastite breccia.

ALTERATION: Extensive green alteration, possibly zeolitic and smectitic.

VEINS/FRACTURES: 2%; <2-4 mm; random; filled with altered glass and microfragments.

ADDITIONAL COMMENTS: Interstices between some clasts filled with ferromanganese red fine-grained porcellaneous sediment (yellowish red 5YR 4/6); continuation of 125-786B-57R-6.
UNIT 21: BONINITIC PILLOW AND HYALOCLASTITE
(CONTINUATION OF 57R-7)

Pieces 1-3

CONTACTS: Between pillows and hyaloclastite in Pieces 2A, B, G, I.

PHENOCRYSTS: Glomerocrysts of orthopyroxene and clinopyroxene.
- Orthopyroxene - 3-7%; <1.5 mm; elongate, euhedral; inclusions of spinel.
- Clinopyroxene - trace; <0.3 mm; equant to elongate.

GROUNDMASS: Fine-grained to glassy with microfissures of feldspar; variably altered.

VESICLES: 0-25%; 1-7 mm; round to elongate, ragged; locally concentrated; some are filled with white fibrous to fine-grained zeolite; some are unfilled; Piece 1 and 2C-F are very vesicular, up to 25%, 6-7 mm wide.

COLOR: Light gray (5Y 7/1) to dark greenish gray (5G 4/1).

STRUCTURE: Massive to hyaloclastite.

ALTERATION: Zeolites, chlorite in the groundmass; minor hematite staining and veining especially in Piece 2.

VEINS/FRACTURES: 0-2%; 0.5-3 mm wide; random orientation; filled with dark green amorphous and white crystalline zeolite.

ADDITIONAL COMMENTS: Continuation of 125-786B-57R-1.
UNIT 21: BONINITIC HYALOCLASTITE, MINOR PILLOW LAVAS (CONTINUATION OF 58R-1)

Pieces 1-7

CONTACTS: Piece 1 only contact between pillow rind and hyaloclastite.

PHENOCRYSTS: Glomerocrystals of orthopyroxene with and without clinopyroxene.
- Orthopyroxene - 3-5%; 0.5-1.5 mm; elongate, euhedral to subhedral.
- Clinopyroxene - 1%; 0.5 mm; equant, euhedral.

GROUNDMASS: Hyaloclastite; fine- to medium-grained; variably altered.

VESICLES: 0-3%; 1-2 mm; round; Pieces 1 and 3F only; filled with white, fine-grained to fibrous zeolites; vesicles occur only at pillow-hyaloclastite interface.

COLOR: Grayish green (5G 6/2).

STRUCTURE: Hyaloclastite.

ALTERATION: Zeolites in vesicles and fractures, minor chlorite in groundmass.

VEINS/FRACTURES: 1-2%; fractures 2-15 mm; random; filled with amorphous green material and, rarely, white zeolite.

ADDITIONAL COMMENTS: Continuation of 125-786B-58R-1.
UNIT 21: BONINITIC PILLOW AND HYALOCLASTITE

Pieces 1-5E

CONTACTS: In Pieces 3 - 5 between pillow and hyaloclastite.

PHENOCRYSTS: Glomerocrystals of orthopyroxene with and without clinopyroxene.
- Orthopyroxene - 3-5%; 0.5-1.5 mm; elongate, euhedral.
- Clinopyroxene - <1%; <0.5 mm; equant, euhedral.

GROUNDMASS: Fine-grained to glassy with feldspar microclites; variably altered.

VESICLES: 0-15%; <4 mm; ovoid; concentrated at pillow rims; filled with fibrous white zeolite.

COLOR: Matrix: Dark gray green (5BG 4/1); pillow core dark gray (5Y 4/1) to dusky red (10R 3/4).

STRUCTURE: Fragmented pillow and hyaloclastite.
ALTERATION: Pervasive green alteration in matrix, possibly zeolitic and smectitic.

VEINS/FRACTURES: <2%; <3 mm; random; filled with altered glass, zeolite and ferromanganese, extremely fine-grained sediment (yellowish red 5YR 4/8).

ADDITIONAL COMMENTS: Continuation of 125-786B-58R-2.
UNIT 21: BONINITIC PILLOWS AND HYALOCLASTITE

Pieces 1A-1L

CONTACTS: In Pieces 1D-E and 1H between pillows and hyaloclastite.

PHENOCRYSTS: Glomerocrysts of orthopyroxene with and without clinopyroxene.
Orthopyroxene - 3-5%; 0.5-1.5 mm; elongate, euhedral.
Clinopyroxene - trace; <0.5 mm; equant, euhedral.
GROUNDMASS: Fine-grained to glassy with feldspar microlites in pillow; variably altered.
VESICLES: 0-15%; <15 mm; ovoid-very irregular; concentrated near pillow rims; some filled
with fibrous white zeolite.
COLOR: Matrix: Dark gray green (5BG 4/1); pillow interior: greenish gray (5GY 6/1).
STRUCTURE: Massive to fragmented pillow in hyaloclastite.
ALTERATION: Pervasive green alteration in matrix, possibly zeolitic and smectitic.
VEINS/FRACTURES: <3%; <10 mm; random; filled with altered glass, zeolite and some
with very fine-grained ferromanganese sediment (yellowish red 5YR 4/6).
ADDITIONAL COMMENTS: Continuation of 125-786B-58R-3.
UNIT 21: BONINITIC PILLOW AND HYALOCLASTITE BRECCIA

Pieces 1-5D

CONTACTS: In 1B and 5B between pillows and hyaloclastite.

PHENOCRYSTS: Glomerocrysts of orthopyroxene as well as isolated phases
- Orthopyroxene - 3-7%; 0.3-1.5 mm; elongate, euhedral.
- Clinopyroxene - trace; <0.3 mm; equant, euhedral.

GROUNDMASS: Fine-grained to glassy with feldspar microlites in the pillows; variably altered.

VESICLES: 0-25%; <4 mm; ovoid; concentrated near pillow rims; filled with fibrous white zeolite.

COLOR: Matrix is dark gray (5GY 4/1) to dark greenish gray (5BG 4/1); pillow interior is greenish gray (5Y 4/1).

STRUCTURE: Massive to fragmented pillow in hyaloclastite.

ALTERATION: Pervasive green alteration in matrix; zeolitic and trace carbonate in pillow interiors.

VEINS/FRACTURES: Trace; <2 mm; random; filled with altered glass and possibly zeolite;
- <10 mm irregular pockets with angular boundaries filled with ferromanganese, very fine-grained sediment (dark reddish brown 2.5YR 3/4).

ADDITIONAL COMMENTS: Continuation of 125-796B-58R-4.
UNIT 21: BONINITIC HYALOCLASTITE AND PILLOW FRAGMENTS

Pieces 1A-1G

CONTACTS: In Pieces 1F and 1G between exterior of pillow fragment and hyaloclastite.

PHENOCRYSTS: Glomerocrystic orthopyroxene occurs with and without clinopyroxene. Orthopyroxene - 3-8%; <3 mm; euhedral, elongate. Clinopyroxene - trace; <0.3 mm; euhedral, equant.

GROUNDMASS: Fine-grained to glassy with feldspar microlites in pillow fragments; variably altered.

VESICLES: 0-20%; <6 mm; ovoid; concentrated near pillow fragment rims; filled with white fibrous zeolite.

COLOR: Matrix is dark gray (5BG 4/1) to dark greenish gray (5G 4/1); pillow fragment interiors are dark grayish brown (10YR 4/2).

STRUCTURE: Hyaloclastite and fragmental.

ALTERATION: Pervasive green alteration in matrix; zeolitic and trace carbonate in pillow fragments.

VEINS/FRACTURES: <1%; <2 mm; random; filled with altered glass and white zeolite; large irregular fractures/pockets filled with ferromanganese, very fine-grained sediment (dark reddish brown 10YR 4/2).

ADDITIONAL COMMENTS: Continuation of 125-786B-59R-01.
## UNIT 21: BONINITIC PILLOW AND HYALOCLASTITE

**Pieces 1-9G**

**CONTACTS:** In Pieces 9A and 9E between pillow and hyaloclastite.

**PHENOCRYSTS:** Glomerocrystic orthopyroxene occurs with and without clinopyroxene.
- Orthopyroxene - 3-10%; <3 mm; euhedral, elongate.
- Clinopyroxene - trace; <0.2 mm; euhedral, equant.

**GROUNDMASS:** Fine-grained to glassy with feldspar microlites in pillow; variably altered.

**VESICLES:** 0-15%; <15 mm; ovoid; concentrated near pillow rims; filled with white fibrous zeolite.

**COLOR:** Matrix is dark gray (5B 4/1) to dark greenish gray (5G 4/1); pillow interior and fragments are greenish gray (5GY 6/1).

**STRUCTURE:** Hyaloclastite and massive pillow.

**ALTERATION:** Pervasive green alteration of matrix possibly zeolitic and smectitic.

**VEINS/FRACTURES:** Trace; <1 mm; random; filled with altered glass and zeolite.

**ADDITIONAL COMMENTS:** Pieces 1-8 are isolated pillow fragments; continuation of 125-786B-59R-02.
UNIT 21: BONINITIC HYALOCLASTITE

Pieces 1A-1B

CONTACTS: None visible.
PHENOCRYSTS: None.
GROUNDMASS: Altered glass with orthopyroxene (<3 mm in size) and zeolite.
VESICLES: 0-10%; <2 mm; ovoid; concentrated in pillow fragment; filled with fibrous white zeolite.
COLOR: Dark greenish gray (5G 4/1).
STRUCTURE: Hyaloclastite breccia.
ALTERATION: Pervasive green alteration by zeolite and smectite.
VEINS/FRACTURES: Trace; <1 mm; irregular; filled with altered green glass.
ADDITIONAL COMMENTS: Continuation of 125-786B-59R-3 hyaloclastite matrix.
UNIT 21: TWO-PYROXENE BASALTIC ANDESITE

Piece 1

CONTACTS: None visible.
PHENOCRYSTS:
- Plagioclase - <8%; <0.5 mm; euhedral, tabular.
- Orthopyroxene - <5%; <0.4 mm; euhedral, equant.
- Clinopyroxene - <2%; <0.4 mm; euhedral, equant.
GROUNDMASS: Fine-grained to glassy with plagioclase microlites.
VESICLES: 2%; 0.3-1.5 mm; pipe-shaped; toward edge of piece; empty.
COLOR: Gray (5Y 6/1).
STRUCTURE: Massive.
ALTERATION: Pervasive slight chloritization.
ADDITIONAL COMMENTS: First appearance of phenocryst plagioclase down-hole since 125-786B-55R-3; may be dike or sill.

UNIT 21: HYALOCLASTITE AND BONINITIC PILLOW AND HYALOCLASTITE

Pieces 2A-2F

CONTACTS: In Pieces 2A, 2B and 2E between pillow and hyaloclastite.
PHENOCRYSTS: Glomerocrystic orthopyroxene occurs with and without clinopyroxene.
- Orthopyroxene - 4-8%; <2 mm; euhedral to subhedral, equant.
- Clinopyroxene - <1%; <1 mm; euhedral, equant.
GROUNDMASS: Fine-grained to glassy with feldspar microlites in pillow; variably altered.
VESICLES: 5-15%; <1 cm; ovoid; random; filled with white fibrous zeolite and calcite.
COLOR: Matrix is dark gray (5B 4/1) to dark greenish gray (5G 4/1); pillow interior and fragments are greenish gray (5GY 6/1).
STRUCTURE: Hyaloclastite and massive pillow.
ALTERATION: Pervasive green alteration of matrix.
VEINS/FRACTURES: Trace; <1 mm; random; filled with calcite and zeolite.
ADDITIONAL COMMENTS: Continuation of 125-786B-59R-4.
UNIT 21: ORTHOPYROXENE ANDESITE BRECCIA

Pieces 1A-1E

CONTACTS: None visible.

PHENOCRYSTS: Pyroxenes are fresh in breccia matrix.
Orthopyroxene - 10%; <3 mm; pale-yellow; euhedral; glomerocrystic.
Spinel - trace; <0.05 mm; included in orthopyroxene, black.

GROUNDMASS: Breccia matrix contains chlorite and clays; clasts contain devitrified and altered glass.

VESICLES: 0-5%; < 8 mm; elongate to round; in clasts only; filled with white material, which differs from the swelling clay.

COLOR: Matrix is dark grayish green (5G 4/1); clasts are bluish-gray (5B 4/1 - 5/1).

STRUCTURE: Hyaloclastite.

ALTERATION: Glass is pervasively altered; phenocrysts are often partially altered to serpentine in clasts.

VEINS/FRACTURES: Trace; <1 mm; random orientation; clasts are fractured.

ADDITIONAL COMMENTS: Hyaloclastitic pillow breccia of andesitic lava.
UNIT 21: ORTHOPYROXENE ANDESITE BRECCIA

Pieces 1A-1G

CONTACTS: None visible.

PHENOCRYSTS: Pyroxenes are fresh in breccia matrix, often altered to serpentine in clasts.
Orthopyroxene - 10%; <3 mm; pale yellow; euhedral; glomerocrystic.
Spinel - trace; <0.05 mm; included in orthopyroxene; black (not Cr-rich).

GROUNDMASS: Breccia matrix contains chlorite and clays; clasts contain devitrified and altered glass.
VESICLES: 0-5%; <8 mm; elongate to rounded; in clasts only; are filled with white material that differs from the swelling clay.

COLOR: Matrix is dark grayish green (5G 4/1); clasts are bluish green-gray (5B 4/1 -5/1).

STRUCTURE: Hyaloclastite.
ALTERATION: Glass is pervasively altered.

ADDITIONAL COMMENTS: Hyaloclastic pillow breccia of andesitic lava.
UNIT 21: ORTHOPYROXENE ANDESITE BRECCIA

Pieces 1A-1G

CONTACTS: None visible.

PHENOCRYSTS: Pyroxenes are fresh in breccia matrix, often partially altered to serpentine in clasts.
- Orthopyroxene - 10%; <3 mm; pale yellow; euhedral; glomerocrystic.
- Spinel - trace; <0.05 mm; included in orthopyroxene; black (not Cr-rich).

GROUNDMASS: Breccia matrix contains chlorite and clays; clasts contain divitrified and altered glass.

VESICLES: 0-5%; <8 mm; elongate to round; in clasts only; filled with white material that differs from the swelling clay.

COLOR: Matrix is dark grayish green (5G 4/1); clasts are bluish green-gray (5B 4/1 - 5/1).

STRUCTURE: Hyaloclastite.

ALTERATION: Glass is pervasively altered.

VEINS/FRACTURES: Trace; <0.1 mm; randomly oriented; clasts are fractured.

ADDITIONAL COMMENTS: Hyaloclastitic pillow breccia of andesitic lava.
UNIT 21: ORTHOPYROXENE ANDESITE BRECCIA

Pieces 1A-1F

CONTACTS: None visible.

PHENOCRYSTS: Pyroxenes are fresh in breccia matrix, often partially altered to serpentine in clasts.
Orthopyroxene - 10%; <3 mm; pale yellow; euhedral; glomerocrystic.
Spinel - trace; <0.05 mm; included in orthopyroxene, black (not Cr-rich).

GROUNDMASS: Breccia matrix contains chlorite and clays; clasts contain divitrified and altered glass.

VESICLES: 0-5%; <8 mm; elongate to rounded; in clasts only are filled with white material that is different from the swelling clay.

COLOR: Matrix is dark grayish green (5G 4/1); clasts are bluish green-gray (5B 4/1 -5/1).

STRUCTURE: Hyaloclastite.

ALTERATION: Glass is pervasively altered.

VEINS/FRACTURES: Trace; <0.1 mm; randomly oriented; clasts are fractured.

ADDITIONAL COMMENTS: Hyaloclastic pillow of andesitic lava; this section is more matrix-rich than previous sections.
UNIT 21: ORTHOPYROXENE ANDESITE BRECCIA

Pieces 1-4

CONTACTS: None visible.

PHENOCRYSTS: Pyroxenes are fresh in breccia matrix, often partially altered to serpentine clasts.
Orthopyroxene - 10%; <3 mm; pale yellow; euhedral; glomerocrystic.
Spinel - trace; <0.05 mm; included in orthopyroxene, black (not Cr rich).

GROUNDMASS: Breccia matrix contains chlorite and clays; clasts contain divitrified and altered glass.

VESICLES: 0-5%; <8 mm; elongate to rounded; in clasts only; filled with white material that is different from the swelling clay.
COLOR: Matrix is dark grayish green (5G 4/1); clasts are bluish green-gray (5B 4/1 - 5/1) and, rarely, red (2.5 YR 5/8).

STRUCTURE: Hyaloclastite.
ALTERATION: Glass is pervasively altered.

VEINS/FRACTURES: Trace; <0.1 mm; randomly oriented; clasts are fractured.

ADDITIONAL COMMENTS: Hyaloclastitic pillow breccia; of andesitic lava; continuation of 125-786B-60R-05.
UNIT 21: ORTHOPYROXENE ANDESITE BRECCIA (60R-6 CONTINUED)

Pieces 1A-1E

CONTACTS: None visible.

PHENOCRYSTS: Pyroxenes are fresh in breccia matrix, often partially altered in serpentine clasts.
Orthopyroxene - 5%; <3 mm; pale yellow; euhedral.
Spinel - trace; <0.05 mm; included in orthopyroxene; black (not Cr-rich).

GROUNDMASS: Breccia matrix contains strongly altered glass with orthopyroxene crystals; clasts contain altered glass.

VESICLES: 0-10%; <4 mm; round to elongate; uniform size within clasts; filled with white material.

COLOR: Matrix is dark greenish gray (5G 4/1); clasts are gray (N 5/) and weak red to red (10R 5/3 - 5/6).

STRUCTURE: Brecciated.

ALTERATION: Pervasive alteration of glasses to chlorite.

VEINS/FRACTURES: Trace; <0.1 mm; random orientation; fracturing along clast rims.

ADDITIONAL COMMENTS: Continuation of 125-786B-60R-1; more reddish material, clasts are absent below 90 cm.
UNIT 21: ORTHOPYROXENE ANDESITE SAND

Pieces 1A-1D

CONTACTS: None visible.

PHENOCRYSTS:
- Orthopyroxene - 3-5%; <2 mm; euhedral.

GROUNDMASS: N/A.

VESICLES: N/A.

COLOR: Dark greenish-gray (5GY 4/1).

STRUCTURE: N/A.

ALTERATION: Local oxidation to dark red material.

VEINS/FRACTURES: N/A.

ADDITIONAL COMMENTS: Continuation of 61R-1.
UNIT 21: ORTHOPYROXENE ANDESITE SANDSTONE

Pieces 1A-1C

CONTACTS: None visible.

PHENOCRYSTS:
- Orthopyroxene - 3-5%; <2 mm; euhedral.

GROUNDMASS: N/A.

VESICLES: Trace; <1 mm; round to elongate; in clasts.

COLOR: Dark greenish gray (5GY 4/1)

STRUCTURE: N/A.

ALTERATION: Local oxidation to dark red material; alteration of glass to chlorite.

VEINS/FRACTURES: N/A.

ADDITIONAL COMMENTS: Continuation of 61R-1.
UNIT 21: ORTHOPYROXENE ANDESITE SANDSTONE
(61R-3 CONTINUED)

Piece 1

CONTACTS: None present.
PHENOCRYSTS:
Orthopyroxene - 3-5%; <2 mm; euhedral.
GROUNDMASS: N/A.
VESICLES: N/A.
COLOR: Dark greenish gray (5GY 4/1).
STRUCTURE: N/A.
ALTERATION: N/A.
VEINS/FRACTURES: Slickensides in bottom of Piece 1 have reddish coloration at the surface.

UNIT 22: RHYOLITE

Pieces 2-8

CONTACTS: None visible.
PHENOCRYSTS:
Plagioclase is altered.
Plagioclase - 5%; <3 mm; euhedral laths.
Magnetite - trace; <0.1 mm; euhedral.
GROUNDMASS: Altered to serpentine and clay.
VESICLES: 5%; <2 mm; elongate; randomly distributed.
COLOR: Gray (2.5Y 5/0).
STRUCTURE: N/A.
ALTERATION: Along fractures; ground mass is pervasively altered.
VEINS/FRACTURES: 1%; <2 mm; shallow dipping, but variable orientation; calcite in fractures; reddish oxide rims present.
125-786B-61R-5

UNIT 22: RHYOLITE  (CONTINUATION OF 61R-4)

Pieces 1-15

CONTACTS: None visible.

PHENOCRYSTS:
- Plagioclase - 5%; <3 mm; euhedral laths.
- Magnetite - trace; <0.1 mm; euhedral.

GROUNDMASS: Altered to serpentine and clay.

VESICLES: 1%; <2 mm; strongly elongate; randomly distributed; some filled with greenish serpentine.

COLOR: Gray (2.5Y 5/0).

STRUCTURE: N/A.

ALTERATION: Pervasive alteration.

VEINS/FRACTURES: 1%; <2 mm; generally between 20-60 degree dips; calcite and some red staining along fractures.

ADDITIONAL COMMENTS: Continuation of 125-786B-61R-04.
UNIT 22: RHYOLITE (61R-5 CONTINUED)

Pieces 1A-1D, 5-7

CONTACTS: Gradational contact from rhyolite to sediment at 10-30 cm; the rhyolite becomes fractured near the contact (brecciation); fracture surfaces are slickensided at 25-35 cm; Pieces 5, 6, and 7 are rhyolite again.

PHENOCRYSTS:
- Plagioclase - 5%; <3 mm; euhedral laths.
- Magnetite - trace; <0.1 mm; euhedral.

GROUNDMASS: Altered to serpenite and clay.

VESICLES: 1%; <2 mm; strongly elongate; randomly distributed; some filled with greenish serpentine.

COLOR: Gray (2.5Y 5/0).

ALTERATION: Pervasively altered.

VEINS/FRACTURES: 1%; <2 mm; randomly oriented.

UNIT 23: SHEAR-ZONE BRECCIA AND SANDSTONE

Pieces 2-4

CONTACTS: N/A.

PHENOCRYSTS: N/A.

GROUNDMASS: N/A.

VESICLES: N/A.

COLOR: N/A.

STRUCTURE: N/A.

ALTERATION: N/A.

VEINS/FRACTURES: N/A.

ADDITIONAL COMMENTS: Fractured bluish-gray clay that contains brecciated rhyolite clasts. The clay overlies a clay-rich vitric silt containing predominantly quartz and feldspar along with pyroxene.
UNIT 24: BONINITE/TWO-PYROXENE ANDESITE

Pieces 1-5C

CONTACTS: Piece 2 contains contact between brecciated hyaloclastite and fine-grained boninite; Piece 4B contains contact between fine-grained, altered boninite pillow and very fine-grained intrusive andesite vein 2-3 cm wide, which continues below Piece 4B.

PHENOCHRYS: Two-pyroxene glomerocrystals, up to 5 mm long, are common
Orthopyroxene - 4-10%; 0.75-2 mm; euhedral, elongate; inclusions of spinel.
Clinopyroxene - 2-4%; <0.75 mm; euhedral, equant; black.

GROUNDMASS: Fine-grained, altered.

VESICLES: 0-5%; 2-6 mm; round to irregular; concentrated at Pieces 3B, 4C and 5A; filled with white, fibrous to fine-grained zeolite.

COLOR: Bluish gray to greenish gray (5B 5/1 to 5G 5/1).

STRUCTURE: Brecciated in Pieces 1 and 2A; massive but cut by veins and containing chilled margin.

ALTERATION: Zeolite-filled vesicles and veins; groundmass is moderately chloritized and altered to amorphous clays.

VEINS/FRACTURES: <1%; 1-3 mm wide; random; filled with white zeolites, red oxidized sediments and, rarely, carbonate.

ADDITIONAL COMMENTS: Contact between boninite pillows and andesite intrusion. Andesitic dike in Piece 4B is sulfide-bearing.
UNIT 24: BONINITE/TWO-PYROXENE ANDESITE PILLOWS AND HYALOCLASTITE

Pieces 1 - 16

CONTACTS: In Piece 1B, between pillow rim and hyaloclastite breccia.

PHENOCRYSTS: Glomerocrysts of orthopyroxene and clinopyroxene with rare spinel inclusions.
- Orthopyroxene: 5-9%; 0.8-1.5 mm; elongate, euhedral to subhedral.
- Clinopyroxene: 4-7%; <0.8 mm; euhedral, equant.
- Plagioclase: 2-5%; 0.3-0.5 mm; euhedral tabular.

GROUNDMASS: Fine-grained to glassy with sparse microhells of plagioclase; variably altered.

VESICLES: 0-17%; 2-6 mm; elongate to irregular; not present in Pieces 1B-3A; filled with white fibrous-amorphous zeolite and, rarely, carbonate.

COLOR: Bluish gray to greenish gray (5B 5/1 to 5G 5/1).

STRUCTURE: Brecciated in Pieces 1-3C; massive but highly vesicular in remainder of core.

ALTERATION: Pervasive clay and chlorite alteration of glass and fine-grained matrix.

VEINS/FRACTURES: <1%; 1-2 mm wide; random; filled with carbonate and zeolite and, rarely, hematite-altered sediment.

ADDITIONAL COMMENTS: Fine filaments of red ferromanganese sediment, particularly in hyaloclastite breccia.
UNIT 24: BONITE/TWO-PYROXENE ANDESITE PILLOWS AND HYALOCLASTITE

Pieces 1-6

CONTACTS: Normal to brecciated contact with sediment in Piece 7 (06 cm).

PHENOCRYSTS: Sparse glomerocrysts of orthopyroxene and clinopyroxene;
Orthopyroxene to clinopyroxene ratio decreases down-section.
Orthopyroxene - 8-12%; 0.8-2.5 mm; elongate; euhedral to subhedral; some with
spinel inclusions.
Clinopyroxene - 3-12%; <1 mm; equant to elongate; euhedral; mode increases down
section.

GROUNDMASS: Fine- to medium-grained, with microcrysts of plagioclase and, possibly,
orthopyroxene euhedral crystals.

VESICLES: 0-5%; 2-7 mm; round to elongate; concentrated in Piece 1; filled with white
fibrous to finely crystalline zeolite and rare carbonate.

COLOR: Bluish gray to greenish gray (5B 5/1 to 5G 5/1).

STRUCTURE: Massive, sparsely to moderately phyric.

ALTERATION: Pervasive in groundmass to chlorite and some clay.

VEINS/FRACTURES: <1-2%; veins: 1-3 mm; fractures up to 2 cm; random; filling is
primarily hematite- and altered sediment for the fractures and zeolite with sparse carbonate in
the veins.

ADDITIONAL COMMENTS: This is a continuation of 125-786B-62-2.

UNIT 25: VITRIC SILT AND HYALOCLASTITE BRECCIA

Pieces 7-14

CONTACTS: N/A.

PHENOCRYSTS: N/A.

GROUNDMASS: N/A.

VESICLES: N/A.

COLOR: Red jasper and greenish gray (5G 5/1).

STRUCTURE: Breccia; cauliflower-texture in jasper vitric sediment.

ALTERATION: Pervasive to chlorite and clay minerals.

VEINS/FRACTURES: N/A.

ADDITIONAL COMMENTS: Piece 7 shows jasper with fine laminae in swirling and
anastomosing pattern with irregular clasts of hyaloclastite breccia. Not certain whether
Pieces 7-14 should have been assigned to Unit 24 or to Unit 25.
125-786B-63R-1

UNIT 25: META-TWO-PYROXENE ANDESITE

Piece 1

CONTACTS: None visible.

PHENOCRYSTS: Glomerocryst of clinopyroxene and orthopyroxene.
- Orthopyroxene: 2-4%; 0.5-1.5 mm; euhedral-elongate.
- Clinopyroxene: 4-7%; 0.5-2.0 mm; euhedral.

GROUNDMASS: Fine-grained; composed of 60% feldspar, 40% pyroxene.

VESICLES: None.

COLOR: Greenish gray (5G 5/2).

ALTERATION: Pervasive chloritization; some fresh cores of pyroxenes remain.

VEINS/FRACTURES: 3-4 mm wide vugs; random; vugs filled with pale green and white stubby prismatic zeolite and chlorite.

UNIT 25: CATACLASTIC ANDESITE

Pieces 2-4

CONTACTS: None visible.

PHENOCRYSTS: Strings of ortho- and clinopyroxene together with plagioclase as fragmented crystals; proportions difficult to estimate.

GROUNDMASS: Very fine-grained.

VESICLES: None.

COLOR: Gray (5Y 6/1).

ALTERATION: Chloritic.

VEINS/FRACTURES: Trace; <0.2 mm; indeterminable; filled with chlorite.

ADDITIONAL COMMENTS: These pieces are strongly sheared and brecciated forming an indurated cataclasite.

UNIT 25: META-TWO-PYROXENE XENOLITH-BEARING ANDESITE

Pieces 5-9

CONTACTS: None visible.

PHENOCRYSTS: Orthopyroxene is pervasively chloritized; clinopyroxene is variably altered. Pyroxenes occur in glomerocrystic patches.
- Orthopyroxene: 5-8%; <1.5 mm; euhedral; equant.
- Clinopyroxene: >3%; 1.5-0.5 mm; subhedral.

GROUNDMASS: Fine-grained, consisting of about 35% plagioclase and 65% pyroxene.

VESICLES: 15-20%; <5 mm; round-ovoid; throughout; filled with zeolite and chlorite.

COLOR: Dark gray (N 4/) to light greenish gray (5G 7/1).

STRUCTURE: Shearing prominent in Pieces 8 and 9A, dipping at 70 degrees and showing normal faulting.

ALTERATION: Pervasive chloritic alteration.

VEINS/FRACTURES: Trace; <1 mm; random; filled with clay and zeolite.

ADDITIONAL COMMENTS: Angular-subrounded xenoliths (1-10 cm long) of vesicular, two-pyroxene andesite (pervasively chloritized; color is greenish gray, 5G 5/2); the xenoliths are of similar appearance to those in 125-786B-62R-3.

UNIT 25: CATACLASTIC ANDESITE

Pieces 10-14

CONTACTS: None visible.

PHENOCRYSTS: Orthopyroxene and clinopyroxene are present but proportions are difficult to determine.

GROUNDMASS: Very fine-grained.

VESICLES: None.

COLOR: Light greenish gray (10Y 6/1).

STRUCTURE: Tectonic lenses from fault gouge; pervasive shearing dips at 65 degrees and indicates normal brittle faulting.

ALTERATION: Chloritic.

VEINS/FRACTURES: None.
UNIT 25: CATACLASTIC ANDESITE

Pieces 1-8

CONTACTS: None visible.

PHENOCRYSTS: Orthopyroxene and clinopyroxene are present but proportions are difficult to determine.

GROUNDMASS: Very fine-grained.

VESICLES: None.

COLOR: Greenish gray (10Y 8/1).

STRUCTURE: Strongly sheared fabric; subvertical.

ALTERATION: Chloritic.

VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: Continuation of Section 125-786B-063R-01.

UNIT 26: META-TWO-PYROXENE ANDESITE

Pieces 9-11

CONTACTS: None visible.

PHENOCRYSTS: Orthopyroxene is pervasively chloritized, clinopyroxene variably altered. Pyroxenes occur in glomerocytic patches and as isolated crystals.

Orthopyroxene - 8-10%; 3-1.5 mm; equant-euhedral.

Clinopyroxene - 2-4%; 2.5-0.5 mm; subhedral.

GROUNDMASS: Fine-grained, consisting of about 35% plagioclase and 65% pyroxene.

VESICLES: 5-10%; <2 mm; round aequid.; throughout; filled with zeolite, carbonate and chlorite.

COLOR: Dark gray (N 4.5) to light greenish gray (5G 7/1).

STRUCTURE: Massive.

ALTERATION: Variable chloritic alteration.

VEINS/FRACTURES: Trace; <1 mm; random; filled with clay and zeolite.

ADDITIONAL COMMENTS: Possible xenoliths of vesicular two-pyroxene andesite or variable alteration defining color changes in pieces.

UNIT 26: META-RHYOLITE

Piece 12

CONTACTS: None visible.

PHENOCRYSTS: Orthopyroxene completely chloritized.

Plagioclase - trace; <0.5 mm; euhedral lath.

Clinopyroxene - 8-10%; <0.5 mm; euhedral.

Orthopyroxene - <2%; <0.3 mm; equant-elongate.

GROUNDMASS: Very fine-grained; altered.

VESICLES: 2%; <3 mm; elongate; aligned; filled with zeolite

COLOR: Black (7.5YR 2/0).

STRUCTURE: Flow-banded, dipping at 55 degrees.

ALTERATION: Chloritic.

VEINS/FRACTURES: None.

UNIT 25: META-DACITE

Pieces 13 and 14

CONTACTS: None visible.

PHENOCRYSTS: Orthopyroxene is completely replaced leaving a carbonate-chlorite-filled vug.

Plagioclase - 5%; <1.5 mm; euhedral, tabular.

Orthopyroxene - 1-2%; 1-2 mm; euhedral.

GROUNDMASS: Fine-grained; variably altered; disseminated pyrite.

VESICLES: 5%; <5 mm; elongate-irregular; throughout; quartz and sulfide coating on some vesicle walls.

COLOR: Gray (2.5YR 8/0).

STRUCTURE: Massive.

ALTERATION: Chloritic.

VEINS/FRACTURES: Trace; <0.1 mm; random; filled with zeolite.
UNIT 26: META-TWO-PYROXENE ANDESITE

Piece 15

CONTACTS: None visible.

PHENOCRYSTS: Mostly occur as isolated phases; pervasively altered.
- Plagioclase - 2-3%; 0.5-1.5 mm; equant laths.
- Orthopyroxene - 10-12%; 1.5-2.5 mm; euhedral, equant.
- Clinopyroxene - 2-5%; 0.5-1.5 mm; euhedral, equant.
- Magnetite - 0.5-1%; 0.1-0.3 mm; equant, cubic.

GROUNDMASS: Fine-grained; 40-50% feldspar, 40-50% pyroxene.

COLOR: Greenish gray (5G 5/1).

STRUCTURE: Massive.

ALTERATION: Pervasive lower greenschist facies assemblage of albite after plagioclase, chlorite after orthopyroxene; includes disseminated pyrite and mesh-texture of hematite veining.

VESICLES/FRACTURES: Trace; <1 mm; sub-vertical; filled with carbonate.

UNIT 26: META-TWO-PYROXENE ANDESITE

Piece 16

CONTACTS: None visible.

PHENOCRYSTS: Orthopyroxene is pervasively chloritized, clinopyroxene variably altered; pyroxenes occur in glomerocrystic patches.
- Orthopyroxene - 6-10%; 1.5-3 mm; euhedral.
- Clinopyroxene - 2-4%; 2.5-0.5 mm; subhedral.

GROUNDMASS: Fine-grained to very fine-grained, consisting of about 35% plagioclase and 65% pyroxene.

VESICLES: 2%; <1 mm; round to ovoid; throughout; filled with zeolite, carbonate and chlorite.

COLOR: Dark gray (N 4).

STRUCTURE: Massive.

ALTERATION: Pervasive chloritic.

VESICLES/FRACTURES: None.

ADDITIONAL COMMENTS: Looks like host from Pieces 5-9 from 125-786B-63R-1.
UNIT 26: META-ORTHOPYROXENE ANDESITE

Pieces 1-23

CONTACTS: None visible.

PHENOCRYSTS: Primary mineralogy altered to lower greenschist facies assemblage (albite-chlorite).
- Plagioclase - 3-5%; 0.2-0.8 mm; subhedral-euhedral.
- Orthopyroxene - 1-2%; <3 mm; euhedral, elongate.

GROUNDMASS: Fine-grained; <2% dusty euhedral magnetite disseminated throughout.

VESICLES: 10%; <15 mm; pipe-shaped; evenly distributed; some filled with carbonate, chlorite and white zeolite; strongly aligned, dipping at 60 degrees.

COLOR: Dark gray (2.5Y 4/3).

STRUCTURE: Massive.

ALTERATION: Variable chloritization of orthopyroxene and albitization of plagioclase.

VEINS/FRACTURES: None.
UNIT 26: META-ORTHOPYROXENE ANDESITE

Pieces 1-17

CONTACTS: None visible.

PHENOCRYST: Primary mineralogy altered to lower greenschist facies assemblage.

- Plagioclase: 3-5%; 0.2-0.8 mm; subhedral-euhedral.
- Orthopyroxene: 1-2%; <3 mm; euhedral, elongate.

GROUNDMASS: Fine-grained; <2% dusty euhedral magnetite disseminated throughout.

VESICLES: 0-15%; <20 mm; pipe-shaped; concentrated in Pieces 1-14; dipping at 30-60 degrees.

COLOR: Dark gray (2.5Y 4/0).

STRUCTURE: Massive.

ALTERATION: Variable chloritization of orthopyroxene and albitization of plagioclase.

VEINS/FRACTURES: Trace; <0.5 mm; subhorizontal; filled with carbonate.

ADDITIONAL COMMENTS: Continuation of 125-786B-64R-1.
UNIT 26: META-ORTHOPYROXENE ANDESITE

Pieces 1-14

CONTACTS: None visible.

PHENOCRYSTS: Primary mineralogy altered to lower greenschist facies assemblage.
Plagioclase - 3-5%; 0.2-0.5 mm; subhedral-euhedral.
Orthopyroxene - 1-2%; <2 mm; euhedral, elongate.

GROUNDMASS: Very fine-grained; <2% dusty euhedral magnetite disseminated throughout.

VESICLES: Trace; <2 mm; elongate; concentrated in Pieces 8B-14; filled with carbonate.
COLOR: Greenish gray (5G 6/1 to 5BG 5/1).

STRUCTURE: Massive.

ALTERATION: Variable chloritization of orthopyroxene and albitionization of plagioclase.

VEINS/FRACTURES: Trace; <0.3 mm wide; subvertical; filled with carbonate.

ADDITIONAL COMMENTS: Continuation of 125-786B-64R-2; on the basis of the absence of vesicles, this is probably a dike.
UNIT 26: CHLORITE-ALBITE ROCK

Pieces 1-7

CONTACTS: Contact with lower, metadacite dike is exposed in Piece 8; some black-colored dacite seems to have intruded into overlying rock; no chilled margin or vesicle-free rock at contact.

PHENOCRYSTS: Absent.


VESICLES: Absent.

COLOR: Greenish gray (5G 6/1).

STRUCTURE: Massive.

ALTERATION: Probably meta-andesite.

VEINS/FRACTURES: Absent.

ADDITIONAL COMMENTS: Continuation of 125-786B-64R-3.

UNIT 26: META-DACITE

Pieces 8-18

CONTACTS: Chlorite albite rock inclusion in Piece 18.

PHENOCRYSTS:

- Plagioclase - 2%; <2 mm; euhedral.
- Clinopyroxene - trace; <3 mm; euhedral; black; altering to chlorite.
- Magnetite - trace; <0.1 mm; euhedral.

GROUNDMASS: Very fine-grained; albitic, chlorite.

VESICLES: 10%; <2 mm; irregular; randomly distributed; filled with hexagonal, colorless, transparent flakes and dark red flakes or pyrite.

COLOR: Gray (N 5/).

STRUCTURE: Absent.

ALTERATION: Meta-dacite.

VEINS/FRACTURES: Absent.
UNIT 26: META-DACITE

Pieces 1-22

CONTACTS: None visible.

PHENOCRYSTS:
- Plagioclase - 2%; <2 mm; euhedral.
- Clinopyroxene - trace; <3 mm; euhedral, black, altering to chlorite.
- Magnetite - trace; <0.1 mm; euhedral.

GROUNDMASS: Very fine-grained, albite and chlorite.

VESICLES: 10%; <2 mm; irregular; randomly distributed; filled with hexagonal, colorless, transparent flakes and dark red flakes or pyrite.

COLOR: Gray (N 5).

STRUCTURE: Absent.

ALTERATION: Meta-dacite.

VEINS/FRACTURES: Absent.
UNIT 26: META-DACITE

Pieces 1-10

CONTACTS: None visible.

PHENOCRYSTS:
- Plagioclase - 2%; <2 mm; euhedral.
- Clinopyroxene - trace; <3 mm; euhedral, black, altering to chlorite.
- Magnetite - trace; <0.1 mm; euhedral.

GROUNDMASS: Very fine-grained, albite and chlorite.

VESICLES: 10%; <2 mm; irregular; randomly distributed; filled with hexagonal, transparent, colorless flakes and dark red flakes or pyrite.

COLOR: Gray (N 5).

STRUCTURE: Absent.

ALTERATION: Meta-dacite.

VEINS/FRACTURES: Absent.
UNIT 26: META-ANDESITE TO DACITE

Pieces 1-18

CONTACTS: None.

PHENOCRYSTS:
- Plagioclase - 5%; <2 mm; euhedral laths.

GROUNDMASS:
- Fine-grained, altered to chlorite.

VESICLES:
- 0-5%; <2 mm; elongate; appear locally in some pieces.

COLOR:
- Light gray (N 7/).

STRUCTURE:
- Massive.

ALTERATION:
- Altering to chlorite and albite.

VEINS/FRACTURES:
- None.

ADDITIONAL COMMENTS:
- Continuation of 125-786B-65R-3. Local round chlorite inclusions with complex white and green rims.
UNIT 26: META-ANDESITE TO DACITE

Pieces 1-17

CONTACTS: None visible.

PHENOCRYSTS:
- Plagioclase - 5%; <2 mm; euhedral laths.

GROUNDMASS: Fine-grained, altering to chlorite and albite.

VESICLES: 0-5%; <2 mm; elongate; in some pieces; rare.

COLOR: Light gray (N 7).

STRUCTURE: Massive.

ALTERATION: Altering to chlorite and albite.

VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: Continuation of 125-786B-65R-3.
UNIT 26: META-DACITE TO ANDESITE

Pieces 1-20

CONTACTS: None visible.

PHENOCRYSTs:
Plagioclase - 5%; <2 mm; euhedral laths.

GROUNDMASS: Fine-grained, altering to chlorite and albite.

VESICLES: 0-5%; <2 mm; elongate; in some pieces; rare.

COLOR: Light gray (N7)

STRUCTURE: Massive.

ALTERATION: Altering to chlorite and albite.

VEINS/FRACTURES: Absent.

ADDITIONAL COMMENTS: Continuation of 125-786B-66R-2.
UNIT 27: META-PYROXENE ANDESITE

Pieces 1, 3 - 8

CONTACTS: None visible.
PHENOCRYSTS: Pyroxene and feldspar occur as glomerocrysts and as isolated phases; orthopyroxene is pervasively chloritized.
Plagioclase - 5%; <1 mm; euhedral, tabular.
Orthopyroxene - 3%; <3 mm; euhedral, equant.
Clinopyroxene - trace; <0.5 mm; euhedral, tabular.
Magnetite - trace; <0.2 mm; euhedral.
GROUNDMASS: Fine-grained; feldspathic.
VESICLES: 1-10%; n/a; elongate; variable; vesicle walls are coated with quartz.
COLOR: Greenish gray (SBG 6/1).
STRUCTURE: Massive.
ALTERATION: Chloritization of pyroxene and some albitionization of feldspar.
VEINS/FRACTURES: None.

UNIT 27: OLIVINE-BEARING BONINITE

Piece 2

CONTACTS: None visible.
PHENOCRYSTS: Pyroxene and plagioclase occur as isolated phases and as glomerocrystic patches; olivine is completely altered to a carbonate and Fe-oxide assemblage.
Orthopyroxene - 8-15%; <2 mm; euhedral, equant.
Clinopyroxene - 5-10%; <1.5 mm; equant, tabular.
Olivine - 3%; <2 mm; euhedral.
Plagioclase - 5%; <1.5 mm; euhedral, tabular.
GROUNDMASS: Fine-grained to glassy with variable alteration.
VESICLES: None.
COLOR: Weak red (5R 4/2).
STRUCTURE: Massive.
ALTERATION: Some Fe-staining.
VEINS/FRACTURES: None.
ADDITIONAL COMMENTS: First reappearance of olivine downhole.

UNIT 27: BONINITE

Pieces 9-11

CONTACTS: None visible.
PHENOCRYSTS: Clinopyroxene is variably chloritized; olivine completely replaced by a chlorite-carbonate assemblage.
Orthopyroxene - 8-12%; <3 mm; euhedral, elongate.
Clinopyroxene - trace; <0.5 mm; euhedral, equant.
Olivine - 1%; <2 mm; euhedral, with spinel inclusions.
GROUNDMASS: Fine-grained, rich in pyroxene and feldspar.
VESICLES: None.
COLOR: Dark greenish gray (5G 4/1).
STRUCTURE: Massive.
ALTERATION: Some chloritic alteration of olivine, clinopyroxene and groundmass.
VEINS/FRACTURES: Trace; <3 mm wide; dipping at 45 degrees; filled with carbonate.
ADDITIONAL COMMENTS: Some slickensides on base of Piece 11, partly coated with carbonate.
UNIT 28: META-TWO-PYROXENE ANDESITE

Pieces 1A-1B

CONTACTS: None visible.

PHENOCRYSTS: Highly altered to chlorite, carbonate and albite.
- Clinopyroxene - 3-6%; <2 mm; equant, euhedral; altered to chlorite.
- Orthopyroxene - 5-10%; <1.5 mm; equant to elongation, euhedral; altered to chlorite.
- Feldspar - trace; <0.5 mm; euhedral tabular, altered to chlorite.

GROUNDMASS: Fine-grained; altered to chlorite and carbonate.

VESICLES: None.

COLOR: Greenish gray (5G 5/1).

STRUCTURE: Massive.

ALTERATION: Highly altered to chlorite with subordinate amounts of carbonate and albite.

VEINS/FRACTURES: <1%; 1-2 mm; dip at 30 to 60 degrees to core axis; filled with carbonate and sulfide (pyrite, possibly chalcopyrite).
UNIT 28: META-TWO-PYROXENE ANDESITE (68R-1 CONTINUED)

Piece 1A

CONTACTS: None visible.

PHENOCRYSTS: Highly altered to chlorite, carbonate and albite.
- Clinopyroxene - 3-6%; <2 mm; equant to elongate, altered to chlorite.
- Orthopyroxene - 5-10%; <1.5 mm; equant to elongate, euhedral; altered to chlorite.
- Feldspar - trace; <0.5 mm; euhedral, tabular; altered to chlorite.

GROUNDMASS: Fine-grained; holocrystalline; variably altered to chlorite and carbonate.

VESICLES: None.

COLOR: Greenish gray (5G 5/1).

STRUCTURE: Massive.

ALTERATION: Highly altered to chlorite with subordinate amounts of carbonate and albite.

VEINS/FRACTURES: <1%; <1-2 mm wide; 30-60 degrees to core axis; filled with carbonate and sulfide.

ADDITIONAL COMMENTS: Continuation of 125-786B-68R-1
UNIT 28: META-TWO-PYROXENE ANDESITE (69R-1 CONTINUED)

Pieces 1B-1G

CONTACTS: None visible.

PHENOCRYSTS: Highly altered to chlorite, carbonate and albite.
- Clinopyroxene - 3-6%; <2 mm; equant, euhedral; altered to chlorite.
- Orthopyroxene - 5-10%; <1.5 mm; equant to elongate, euhedral; altered to chlorite.
- Feldspar - trace; <0.5 mm; euhedral, tabular; altered to chlorite/albite.

GROUNDMASS: Fine-grained; holocrystalline; altered to chlorite and carbonate.

VESICLES: None.

COLOR: Greenish gray (5G 5/1).

STRUCTURE: Massive.

ALTERATION: Extensive-pervasive, to chlorite, carbonate and albite.

VEINS/FRACTURES: <1%; 1-2 mm; 30-60 degrees to core axis.

ADDITIONAL COMMENTS: Rock is a continuation of the Interval 125-786B-69R-1 to 125-786B-69R-2.
125-786B-69R-3

UNIT 28: META-TWO-PYROXENE ANDESITE (69R-2 CONTINUED)

Pieces 1H-1L

CONTACTS: None.

PHENOCRYSTS: Highly altered to chlorite with subordinate amounts of carbonate and albite.
- Clinopyroxene - 3-6%; <2 mm; equant, euhedral; altered.
- Orthopyroxene - 5-10%; <1.5 mm; equant to elongate, euhedral; altered.
- Feldspar - trace; <0.5 mm; euhedral, tabular; altered.

GROUNDMASS: Fine-grained, holocrystalline; altered to chlorite and carbonate.

VESICLES: None.

COLOR: Greenish gray (5G 5/1).

STRUCTURE: Massive.

ALTERATION: Pervasive, extensive, to chlorite with subordinate amounts of carbonate and albite.

VEINS/FRACTURES: <1%; 1-2 mm wide; 30-60 degrees to core axis; filled with carbonate and sulfides.

ADDITIONAL COMMENTS: Rock is a continuation of 125-786B-68R-1 to 69R-2.
UNIT 28: META-TWO PYROXENE ANDESITE (69R-3 CONTINUED)

Pieces 1M-1P

CONTACTS: None visible.

PHENOCRYSTS: Highly altered to chlorite with carbonate and albite.
- Orthopyroxene - 3-6%; <2 mm; equant, euhedral; altered.
- Clinopyroxene - 5-10%; <1.5 mm; equant to elongate, euhedral; altered.
- Feldspar - trace; <0.5 mm; euhedral, tabular; altered.

GROUNDMASS: Fine-grained, holocrystalline.

VESICLES: None.

COLOR: Greenish gray (5G 5/1).

STRUCTURE: Massive.

ALTERATION: Extensive, pervasive, to an assemblage of chlorite with subordinate amounts of carbonate and albite.

VEINS/FRACTURES: 1c: <1-2 mm wide; 30-60 degrees to core axis; filled with carbonate and sulfide.

ADDITIONAL COMMENTS: Rock is a continuation of 125-786B-68R-1.
125-786B-69R-5

UNIT 28: META-TWO-PYROXENE ANDESITE (69R-4 CONTINUED)

Pieces 1Q-1U

CONTACTS: None.

PHENOGRYSTS: Variably altered; less altered; more plagioclase-phyric zone at 12 cm.
Clinopyroxene - 3-6%; <1.5 mm; equant, euhedral.
Orthopyroxene - 5-7%; <1.8 mm; equant to elongate, euhedral.
Feldspar - 1-2%; <0.5 mm; 1-2 mm; elongate, equant.
Spinel - <1%; <0.1 mm; equant, usually as inclusions in pyroxene, also in groundmass.

GROUNDMASS: Fine-grained, holocrystalline; altered to chlorite.

VESICLES: None.

COLOR: Greenish gray (5G 5/1) to grayish green (5G 6/2).

STRUCTURE: Massive; finer-grained midway through section; less veining.

ALTERATION: Chlorite and minor carbonate; pervasive, variable.

VEINS/FRACTURES: <1%; 1-3 mm; random; filled with carbonate and minor sulfide;
some fractures 1-2 cm long and 5-6 mm wide filled with carbonate.

ADDITIONAL COMMENTS: Rock is a continuation of 125-786B-68R-1 to 69R-4.
UNIT 28: META-TWO-PYROXENE ANDESITE

Pieces 1-8C

CONTACTS: None visible.

PHENOCRYSTS: Variably altered to chlorite and carbonate.
- Clinopyroxene - 3-6%; <2 mm; euhedral; altered.
- Orthopyroxene - 5-10%; <1.5 mm; equant to elongate; altered.
- Plagioclase - 1%; <1 mm; tabular, elongate.
- Magnetite - trace; <0.25 mm; equant.

GROUNDMASS: Fine-grained, holocrystalline; microcrysts of plagioclase and pyroxene.

PHENOCRYSTIC MATRIX:
- Clinopyroxene - 3-6%; <2 mm; euhedral; altered.
- Orthopyroxene - 5-10%; <1.5 mm; equant to elongate; altered.
- Plagioclase - 1%; <1 mm; tabular, elongate.
- Magnetite - trace; <0.25 mm; equant.

STRUCTURE: Massive; Piece 6 broken into multiple fragments, possibly caused by faulting.

ALTERATION: Pervasive, to chlorite and carbonate.

VESICLES/FRACTURES: 1%; 1-2 mm wide in zone 1.5 cm wide; sub-perpendicular; filled with carbonate and sulfide; the wide zone contains anastomosing sulfide with subordinate amounts of carbonate; large vug 2 cm long in Piece 5, lined with euhedral quartz crystals and sulfide.

ADDITIONAL COMMENTS: This is a continuation of 125-786B-68R-1 to 69R-5.
UNIT 28: META-TWO-PYROXENE ANDESITE (69R-6 CONTINUED)

Pieces 1-4

CONTACTS: None visible.

PHENOCRYSTS: Variably altered to chlorite and carbonate.
- Clinopyroxene - 3-6%; <2 mm; euhedral, equant; altered.
- Orthopyroxene - 5-10%; <1.5 mm; equant to elongate; altered.
- Felspar - 1%; <1 mm; tabular, elongate; altered.
- Magnetite - trace; <0.25 mm; equant.

GROUNDMASS: Fine-grained, holocrystalline; plagioclase and pyroxene microcrysts.

VESICLES: None.

COLOR: Greenish gray (5G 5/1).

STRUCTURE: Massive; Piece 4 multiple fragments, may be due to faulting; slickensides and pyrite veining are present.

ALTERATION: Chlorite and carbonate; pervasive.

VEINS/FRACTURES: <1%; 1-4 mm; 30-45 degrees to core axis; filled with carbonate and sulfide and a later episode of carbonate; Piece 4 has a vug 1 cm wide, filled with quartz and sulfide crystals with later-stage carbonate.

ADDITIONAL COMMENTS: This rock is a continuation of 125-796B-68R-1 to 69R-6.
UNIT 28: META-TWO-PYROXENE ANDESITE (69R-7 CONTINUED)

Pieces 1A-1G

CONTACTS: None visible.

PHENOCRYSTS: Varibly altered to carbonate and chlorite, glomerocrysts of pyroxene.
- Clinopyroxene - 5-7%; <2 mm; euhedral
- Orthopyroxene - 7-10%; <1.5 mm; euhedral to elongate, euhedral; variably altered
- Feldspar - 1-2%; <1-2 mm; elongate, tabular; euhedral

GROUNDMASS: Fine-grained, holocrystalline; altered to chlorite and carbonate.

COLOR: Greenish gray (5G 5/1)

STRUCTURE: Massive

ALTERATION: Variable intensity; pervasive; chlorite and carbonate.

ADDITIONAL COMMENTS: The rock type is a continuation of the 125-786B-67R-1 to 69-7.
UNIT 28: META-TWO-PYROXENE ANDESITE (70R-1 CONTINUED)

Pieces 1A-1K, 2

CONTACTS: None visible.

PHENOCRYSTS: Variably altered to chlorite and carbonate, glomerocrysts of pyroxene.
- Clinopyroxene - 5-8%; 1-2 mm; equant, euhedral, altered.
- Orthopyroxene - 3-5%; <1.5 mm; elongate, euhedral.
- Feldspar - 1%; <2 mm; tabular, euhedral.
- Magnetite - trace; <0.25 mm; equant.

GROUNDMASS: Fine-grained, holocrystalline; microcrysts of plagioclase and pyroxene.

COLOR: Greenish gray (95G 5/1).

STRUCTURE: Massive.

ALTERATION: Pervasive, variable, chlorite and carbonate.

VESICLES: None.

VEINS/FRACTURES: 1-2%; 2 mm by 8-12 mm fractures; at 45 degrees to core axis; filled with chlorite, appear to be tension gashes.

ADDITIONAL COMMENTS: Rock is a continuation of 25-786B-67R-1 to 70R-1.
UNIT 28: META-TWO-PYROXENE ANDESITE (70R-2 CONTINUED)

Pieces 1-17

CONTACTS: None visible.

PHENOCRYSTS: Variably altered with carbonate, glomerocrysts and intersertal texture.
- Clinopyroxene - 7-10%; <2 mm; equant to elongate, euhedral; altered.
- Orthopyroxene - 3-5%; <1.5 mm; elongate, euhedral; altered.
- Feldspar - <1%; 1 mm; elongate, tabular; altered.
- Magnetite - trace; <0.25 mm; equant.

GROUNDMASS: Fine-grained, holocrystalline, microcrysts of feldspar and pyroxene.

VESICLES: None.

COLOR: Greenish gray (5G 5/1).

STRUCTURE: Massive; Pieces 1 and 4 are composed of many fragments; Piece 3 is very altered and appears brecciated.

ALTERATION: Pervasive; chlorite and carbonate.

VEINS/FRACTURES: 1%; 1-2 mm wide; random; filled with carbonate and sulfide; also unfilled fractures.

ADDITIONAL COMMENTS: Rock is a continuation of 125-786B-67R-1 to 70R-2.
UNIT 28: META-TWO-PYROXENE ANDESITE (70R-3 CONTINUED)

Pieces 1-8

CONTACTS: None visible.

PHENOCRYSTS: Altered to chlorite and carbonate; glomerocrysts of pyroxene.

- Clinopyroxene: 7-10%; 1-2 mm; equant to elongate, euhedral; altered; magnetite inclusions.
- Orthopyroxene - 4-7%; <1.5 mm; elongate, euhedral; altered; magnetite inclusions.
- Feldspar - <1%; <1-2 mm; tabular, altered.
- Magnetite - <1%; 0.25 mm; equant.

GROUNDMASS: Fine-grained, holocrystalline; altered to chlorite and carbonate.

VESICLES: None.

COLOR: Greenish gray (5G 5/1).

STRUCTURE: Massive.

ALTERATION: Chlorite and carbonate; pervasive.

VESINS/FRACTURES: <1%; 1-2 mm; random; filled with carbonate and sulfide.

ADDITIONAL COMMENTS: Rock is a continuation of 125-786B-67R-1 to 70R-4.
UNIT 29: ANDESITE STOCK WORK ZONE

Pieces 1-2

CONTACTS: None visible.

PHENOCRYSTS: Pyroxene and plagioclase are extensively altered.
- Plagioclase - 2-3%; <2 mm; euhedral laths.
- Pyroxene - 8-10%; <2 mm; subhedral.

GROUNDMASS: Fine-grained, holocrystalline; granular; totally altered.

VESICLES: None.

COLOR: Host andesite: greenish gray (5BG 6/1) to dark greenish gray (10Y 5/2); more altered stock work is light gray (10YR 7/1).

STRUCTURE: Stockwork breccia with clasts <10 cm in size (auto brecciation).

ALTERATION: Pervasive chloritization, sulfidation, argillic alteration.

VEINS/FRACTURES: 10-20%; <30 mm; predominantly sub-vertical & horizontal; multiple generations of fill; wall-rock reaction increases from 5 to 25 mm downhole; veins filled with sulfides, clays and epidote.

ADDITIONAL COMMENTS: This section represents an argillaceous zone in a mineralized stockwork.

UNIT 29: ALTERED-MINERALIZED CATACLASTITE

Piece 3

CONTACTS: None visible.

PHENOCRYSTS: Rock is completely altered: no primary minerals remain.

GROUNDMASS: Clay, epidote, sulfide.

VESICLES: None.

COLOR: Light greenish gray (5B 7/1).

STRUCTURE: Cataclasite.

ALTERATION: Argillic.

VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: Disseminated sulfides, <1.5%, in cubic morphology.
UNIT 29: ANDESITE STOCKWORK

Pieces 1, 5, 7-11

CONTACTS: None visible.

PHENOCRYSTS: Pyroxene and plagioclase extensively altered. Plagioclase: 2-4%; <1.5 mm; euhedral laths. Pyroxene: 5-10%; <2 mm; euhedral, tabular.

GROUNDMASS: Fine-grained, holocrysaline; granular; totally altered.

VESICLES: 0-5%; <5 mm; elongate; irregular; coating of pyramidal quartz and sulfide in some vesicles.

COLOR: Host andesite is greenish gray (5BG 6/1) to dark greenish gray (10Y 5/2); more altered stockwork is light gray (10YR 7/1).

STRUCTURE: Stockwork breccia with clasts <7 cm in size (autobrecciation).

ALTERATION: Pervasive argillic, chloritic, silicic and sulfidation (disseminated 0.5% pyrite cubes).

VEINS/FRACTURES: 10-40%; <20 mm; stockwork; in Pieces 7-11, wall-rock alteration decreases downhole; from 1 - 5 mm width.

ADDITIONAL COMMENTS: Continuation of stockwork in 125-786B-71R-1.

UNIT 29: ARGILLITIZED-MINERALIZED STOCKWORK

Pieces 2-4, 6

CONTACTS: None visible.

PHENOCRYSTS: Pieces are completely altered; no primary minerals remain.

GROUNDMASS: Clay, epidote, quartz and sulfide.

VESICLES: None.

COLOR: Greenish gray (5B 7/1).

STRUCTURE: Cataclasite.

ALTERATION: Argillic.

VEINS/FRACTURES: None.

ADDITIONAL COMMENTS: Disseminated sulfides <1%; 0.1 mm; throughout.
UNIT 29: CLINOPYROXENE PLAGOCLASE BASALT CATACLASTITE (CONTINUATION OF 71R-2)

**Contact:**
None visible.

**Phenocrysts:**
- Plagioclase - 4%; <2 mm; completely altered to clays.
- Clinopyroxene - 8%; <1.5 mm; completely altered to chlorite.

**Groundmass:** Fine-grained; completely altered to albite/chlorite; contains disseminated pyrite.

**Vesicles:** Absent.

**Color:** Light gray to gray (7.5YR 7/0 - 6/0).

**Structure:** Cataclastic.

**Alteration:** Ground to clay in fracture zones; pyroxene and plagioclase phenocrysts and groundmass are extensively altered to clay and chlorite.

**Veins/Fractures:** 15%; locally fractured; randomly oriented; some zones are entirely pulverized; interval from 0-110 cm is intensely fractured.

**Additional Comments:** Continuation of 125-786B-71R-1; clasts range from 0.5 to 8 cm.
125-786B-71R-4

UNIT 30: CLINOPYROXENE PLAGIOCLASE BASALT
CATACLASTITE (CONTINUATION OF 71R-2)

Pieces 1-9

CONTACTS: None visible.

PHENOCRYSTS:
- Plagioclase - 3-5%; <1.5 mm; completely altered to clays except in Pieces 6, 7 and 9.
- Clinopyroxene - 8%; <1.5 mm; completely altered to chlorite except in Pieces 6, 7 and 9.

GROUNDMASS: Fine-grained; completely altered to albite/chlorite, contains disseminated pyrite.

VESICLES: Absent.

COLOR: Light gray to gray (7.5YR 7/0-6/0) and very dark gray (2.5YR 3/0) when fresh.

STRUCTURE: Cataclastic.

ALTERATION: Extensively altered to clay, albite, and chlorite except for Pieces 6, 7, and 9.

VEINS/FRACTURES: NA; <0.1 mm; randomly oriented; fractured in Pieces 2-5 and in Piece 8.

ADDITIONAL COMMENTS: Continuation of 125-786B-71R-3.
UNIT 30: CLINOPYROXENE-OLIVINE BASALT
(CONTINUATION OF 71R-4)
CLINOPYROXENE-PLAGIOCLASE BASALT

Pieces 1-3

CONTACTS: None visible.

PHENOCLYSTS: Extensively altered to albite/chlorite.
- Plagioclase - 2-3%; <1.5 mm; altered to clay.
- Clinopyroxene - 5-8%; <2 mm; altered to chlorite, some fresh.
- Olivine - 2%; <3 mm; altered to white calcite with a green chlorite/serpentine rim.

GROUNDMASS: Fine-grained, completely altered to chlorite.

VESICLES: Absent.

COLOR: Gray to dark greenish gray.

STRUCTURE: Massive.

ALTERATION: Extensively altered.

VEINS/FRACTURES: Some pyrite and calcite in veins and fractures.

ADDITIONAL COMMENTS: Continuation of 125-786B-71R-4.
UNIT 30: CLINOPYROXENE-OLIVINE BASALT

Pieces 1-15

CONTACTS: None visible.

PHENOCRYSTS: Extensively altered.

- Plagioclase - 1-2%; <1.5 mm; altered to clay.
- Clinopyroxene - 5-8%; <2 mm; altered to chlorite, locally fresh.
- Olivine - 2%; <2 mm; altered to white calcite with a green chlorite/serpentine rim.

GROUNDMASS: Fine-grained, completely altered to chlorite and albite.

VESICLES: Absent.

COLOR: Gray to dark greenish gray (5BG 4/1).

STRUCTURE: Massive.

ALTERATION: Extensively altered.

VESI/SFRACTURES: Pieces 1, 2, and 15 are fractured and altered; chlorite and calcite in fracture surfaces.

ADDITIONAL COMMENTS: Continuation of 125-786B-71R-5.
UNIT 30: CLINOPYROXENE-PLAGIOCLASE BASALT
(CONTINUATION OF 72R-1)

Pieces 1-13

CONTACTS: None visible.

PHENOCRYSTS: Extensively altered.
   Plagioclase - 5%; <1.5 mm; altered to clay.
   Clinopyroxene - 5%; <2 mm; altered to chlorite, some fresh.
   Olivine - 2%; <2 mm; altered to calcite and chlorite/serpentine.

GROUNDMASS: Fine-grained, completely altered to chlorite/calcite.

VESICLES: Absent.

COLOR: Gray to dark greenish gray.

STRUCTURE: Massive.

ALTERATION: Extensively altered to chlorite/albite.

VEINS/FRACTURES: Strongly brecciated areas contain abundant disseminated pyrite, locally pulverized to clays.

ADDITIONAL COMMENTS: Continuation of 125-786B-72R-1
125-786A-12X-01 (140-142 cm)  
**SITE 786**

**ROCK NAME:** Basalt

**GRAIN SIZE:**

**TEXTURE:** Porphyritic

**PRIMARY MINERALOGY**

<table>
<thead>
<tr>
<th>PHENOCRYST</th>
<th>PERCENT</th>
<th>SIZE (mm)</th>
<th>COMPOSITION</th>
<th>MORPHOLOGY</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Olivine</td>
<td>&lt;1</td>
<td>1-1.4</td>
<td>Equant</td>
<td>Subhedral-subhedral</td>
<td>90% altered to clays.</td>
</tr>
<tr>
<td>Plagioclase</td>
<td>2-3</td>
<td>0.2-1.3</td>
<td>Subhedral-subhedral</td>
<td>Twinned.</td>
<td></td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>3-5</td>
<td>0.2-1.2</td>
<td>Subhedral-subhedral</td>
<td>Twinned.</td>
<td></td>
</tr>
<tr>
<td>Spinel</td>
<td>&lt;1</td>
<td>0.05-0.1</td>
<td>Subhedral</td>
<td>Roudned to equant and subhedral.</td>
<td></td>
</tr>
</tbody>
</table>

**GROUNDMASS**

| Glass      | 75-85%  | N/A       | N/A         | 100% altered. |
| Plagioclase| <1-4    | 0.01-0.05 | Lath, quench |

**SECONDARY MINERALOGY**

| Clays      | 80-90%  | Glass and quench plagioclase | Brown, amorphous, pervasive. |
| Clinoenstatite| <1-1    | Glass, veins | Red-brown, opaque, amorphous. |

**VESICLES/CAVITIES**

| Vesicles   | 7-10    | Throughout 0.1-13 | Some zeolite | Oval-ragged |

**COMMENTS:** Clinoenstatite up to 3 mm of clinopyroxene and clinopyroxene plus plagioclase. No piece # given.

125-786A-12X-CC (24-26 cm)  
**SITE 786**

**ROCK NAME:** Monogenetic pyroclastic rock

**GRAIN SIZE:** 0.01-4 mm

**TEXTURE:** Hyalo-ophitic texture, glomerophytic

**PRIMARY MINERALOGY**

<table>
<thead>
<tr>
<th>PHENOCRYST</th>
<th>PERCENT</th>
<th>SIZE (mm)</th>
<th>COMPOSITION</th>
<th>MORPHOLOGY</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Olivine</td>
<td>&lt;1</td>
<td>1-1.4</td>
<td>Equant</td>
<td>Subhedral-subhedral</td>
<td>Olivine partly replaced by carbonate.</td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>&lt;2-3</td>
<td>0.05-1</td>
<td>Subhedral-subhedral</td>
<td>2V=60 degrees.</td>
<td></td>
</tr>
<tr>
<td>Spinel</td>
<td>&lt;1</td>
<td>0.01-0.1</td>
<td>Subhedral-subhedral</td>
<td>Spinel is included in olivine.</td>
<td></td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>10-10</td>
<td>0.05-1.5</td>
<td>Bronzite</td>
<td>2V=-80 degrees, compositional zoning in some crystals, glomerophytic texture.</td>
<td></td>
</tr>
</tbody>
</table>

**GROUNDMASS**

| Glass      | 35-40%  | 80-85%    | N/A         | Partly fresh. |
| Clinopyroxene| Trace  | Trace 0.01-0.05 | Subhedral  | Augite, showing prismatic shape (see comments). |
| Orthopyroxene| Trace  | Trace 0.01-0.05 | Subhedral  | Showing prismatic shape. |
| Plagioclase| 1-1     | 0.01-0.05 | Subhedral   | Existing in the glass. |

**SECONDARY MINERALOGY**

| Carbonate | 40-45%  | Olivine, glass | Dark brown clays are replacing olivine and glass. |

**VESICLES/CAVITIES**

| Vesicles   | 30-40%  | Random 0.02-1 | Clay | Round | Vesicles are partly filled by clay and carbonate. |

**COMMENTS:** Olivine crystals contain euhedral Cr-spinel and are surrounded by reaction rim of orthopyroxene. Clinopyroxene-olivine-orthopyroxene basaltic andesite magma was quenched and fragmented, then lithic fragments and matrix are made from the same rock. Matrix is more altered than lithic part, the glass of which is very fresh. Clinopyroxenes in groundmass are both Ca-rich and Ca-poor, or augite and "clinoenstatite", respectively. No piece # given. **GROUNDMASS:** Low-Ca-clinopyroxene; 1-2%; 0.01-0.05 mm; subhedral; equals clinoenstatite, showing lamellae twin.
**125-786A-13X-CC (27-29 cm)**

**OBSERVER:** JOH  
**WHERE SAMPLED:** Izu-Bonin outer-arc high

**ROCK NAME:** Orthopyroxene-phric high-magnesian basalt

**GRAIN SIZE:**

**TEXTURE:** Glomerophyric

<table>
<thead>
<tr>
<th>PRIMARY MINERALOGY</th>
<th>PERCENT PRESENT</th>
<th>PERCENT ORIGINAL (mm)</th>
<th>COMPOSITION</th>
<th>MORPHOLOGY</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHENOCRYSTs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td></td>
<td>Subhedral</td>
<td>In glomerocryst with orthopyroxene.</td>
</tr>
<tr>
<td>Spinel</td>
<td>Trace</td>
<td>Trace 0.01</td>
<td></td>
<td>Euhedral-subhedral</td>
<td>Frequently as glomerocrysts; spinel inclusions in rounded crystals.</td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>12-17</td>
<td>15-20 0.1-1.5</td>
<td></td>
<td>Subhedral</td>
<td></td>
</tr>
</tbody>
</table>

**GROUNDMASS**

| Glass               | 35-40           | 40-45 N/A            | N/A         |            | Colorless, high relief. |
| Plagioclase         | 10-12           | 12-15 0.02-0.15      | Quenched, needles |          |          |

**SECONDARY REPLACING/ MINERALOGY**

| Clays               | 35-45           | Glass matrix         |            |            |          |
| Carbonate           | 7-10            | Vesicles, veins      |            |            |          |
| Chlorite            | 2-5             | Glass, pyroxene      |            |            |          |

**VESICLES/ CAVITIES**

| Vesicles           | >10             | Throughout 0.1-0.5   | Carbonate  | Oval       |          |

**COMMENTS:** Rock is a breccia of moderately phric, orthopyroxene-rich glassy andesite fragments in a chloritized clay matrix. No piece # given.

**125-786A-14X-CC (7-8 cm)**

**OBSERVER:** JOH  
**WHERE SAMPLED:** Izu-Bonin outer-arc high

**ROCK NAME:** Orthopyroxene-phric boninite

**GRAIN SIZE:** 0.1-2 mm

**TEXTURE:** Moderately phric

<table>
<thead>
<tr>
<th>PRIMARY MINERALOGY</th>
<th>PERCENT PRESENT</th>
<th>PERCENT ORIGINAL (mm)</th>
<th>COMPOSITION</th>
<th>MORPHOLOGY</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHENOCRYSTs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spinel</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td></td>
<td>Subhedral</td>
<td>Mostly low birefringence.</td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>5-7</td>
<td>7-10 0.1-2</td>
<td>Euhedral-subhedral</td>
<td>Random distribution, except for concentration in glomerocrysts.</td>
<td></td>
</tr>
</tbody>
</table>

**GROUNDMASS**

| Glass               | 0               | 70-85 N/A            | N/A         | No quench phases visible. |          |

**SECONDARY REPLACING/ MINERALOGY**

| Clays               | 65-75           | Glass                |            | Brown-gray, amorphous, pervasive throughout matrix and many phenocrysts. |
| Carbonate           | 10-12           | Vesicles             |            | White, radiating crystals. |
| Chlorite            | 15-20           | Glass, pyroxenes     |            | Light green, fine-grained, replacing matrix and especially trapped glass associated with glomerocrysts. |

**VESICLES/ CAVITIES**

| Vesicles           | 7-15            | Throughout 0.5-3     | 60%         | Round to irregular |          |

**COMMENTS:** Glomerocrystals of orthopyroxene 1-4 mm in diameter. Pervasive clay and minor chlorite and zeolite (?) alteration obscure original textural and mineralogical features. Similar to 786A-13X-2, 0-2 cm, Piece 1. No piece # given.
**SITE 786**

125-786A-14X-CC (9-10 cm)  
**OBSERVER:** JOH  
**WHERE SAMPLED:** Izu-Bonin outer-arc high

**ROCK NAME:** Brecciated two-pyroxene boninite  
**GRAIN SIZE:** Glassy, 0.2-1.5 mm  
**TEXTURE:** Moderately phyric

<table>
<thead>
<tr>
<th>PRIMARY MINERALOGY</th>
<th>PERCENT PRESENT ORIGINAL (mm)</th>
<th>COMPOSITION</th>
<th>MORPHOLOGY</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PHENOCRYST:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Olivine</td>
<td>&lt;1</td>
<td>0.5-1-5</td>
<td>Ehedral (relict)</td>
<td>90% altered; outline and small relict fragments (0.1 mm) remain.</td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>1-2</td>
<td>0.3-1</td>
<td>Ehedral-subhedral</td>
<td>Usually in glomerocrysts with orthopyroxene.</td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>7-10</td>
<td>0.2-1.5</td>
<td>Ehedral-subhedral</td>
<td>Glass inclusions, spinel inclusions, glomerocrysts.</td>
</tr>
</tbody>
</table>

**GROUNDMASS**  
| Glass | 40-60 | 70-80 | N/A | N/A |
| Plagioclase | 5-7 | 7-10 | 0.02-0.12 | Needles, quench texture |

**SECONDARY MINERALOGY**  
| MINERALOGY | PERCENT REPLACING/FILLING | COMMENTS |
| Clays | 10-15 | Glass | Light brown-yellow, amorphous, occurs with chlorite. |
| Carbonate | 15-20 | Vesicles, veins | Light yellow, white; lines vein walls. |
| Chlorite | 20-30 | Glass | Light brown-green, pleochroic, fine-grained or amorphous. |

**VESICLES/CAVITIES**  
| VESICLES | PERCENT LOCATION (mm) | FILLING | SHAPE |
| Vesicles | 12-17 | Throughout | Carbonate | Round-elongate |

**COMMENTS:** Rock may be autobrecciated-matrix material is chlorite and/or smectite-rich and appears to be crushed or altered glass as that found in the clasts. Clasts of glassy andesite set in green, altered matrix. No piece number given.

125-786A-16X-CC (25-28 cm)  
**OBSERVER:** TER  
**WHERE SAMPLED:** Izu-Bonin outer-arc high

**ROCK NAME:** Olivine-plagioclase-clinopyroxene basalt  
**GRAIN SIZE:** 0.1-3 mm  
**TEXTURE:** Hyalo-ophitic texture

<table>
<thead>
<tr>
<th>PRIMARY MINERALOGY</th>
<th>PERCENT PRESENT ORIGINAL (mm)</th>
<th>COMPOSITION</th>
<th>MORPHOLOGY</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PHENOCRYST:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Olivine</td>
<td>0</td>
<td>1</td>
<td>0.5-3</td>
<td>Ehedral-subhedral</td>
</tr>
<tr>
<td>Plagioclase</td>
<td>3</td>
<td>3</td>
<td>0.1-2</td>
<td>Ehedral</td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>5</td>
<td>5</td>
<td>0.1-0.5</td>
<td>Ehedral-subhedral</td>
</tr>
<tr>
<td>Spinel</td>
<td>Trace</td>
<td>Trace</td>
<td>0.001-0.005</td>
<td>Ehedral-subhedral</td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>3</td>
<td>3</td>
<td>0.1-2</td>
<td>Ehedral-subhedral</td>
</tr>
</tbody>
</table>

**GROUNDMASS**  
| Glass | 20-30 | 75-80 | N/A | N/A |
| Plagioclase | 10 | 15 | 0.01-0.02 | Ehedral, laths |
| Augite | 2 | 2 | 0.01-0.02 | Ehedral, prismatic |
| Orthopyroxene | 1 | 1 | 0.02-0.03 | Ehedral, prismatic |

**SECONDARY MINERALOGY**  
| MINERALOGY | PERCENT REPLACING/FILLING | COMMENTS |

**VESICLES/CAVITIES**  
| VESICLES | PERCENT LOCATION (mm) | FILLING | SHAPE |
| Vesicles | 20 | Random | None | Round |

**COMMENTS:** Glass-rich volcanic rocks. Glass is partly fresh, partly altered to clays. Olivine pseudomorph and orthopyroxene and augite make glomerophytic texture. Groundmass minerals are very fine grained, indicating quench texture. No piece # given.
**SITE 786**

125-786A-17X-CC (44-46 cm)  
**OBSERVER:** JOH  
WHERE SAMPLED: Izu-Bonin outer-arc high

**ROCK NAME:** Glassy basalt margin  
**GRAIN SIZE:** Glassy; phenocrysts (0.2-1 mm)  
**TEXTURE:** Glassy margin, sparsely phyric

<table>
<thead>
<tr>
<th>PRIMARY MINERALOGY</th>
<th>PERCENT</th>
<th>PERCENT</th>
<th>SIZE</th>
<th>COMPOSITION</th>
<th>MORPHOLOGY</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PHENOCRYSTS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plagioclase</td>
<td>&lt;1</td>
<td>1-2</td>
<td>0.1-0.4</td>
<td></td>
<td>Euhedral-subhedral</td>
<td>With magnetite/spinel inclusion.</td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>1-2</td>
<td>3-7</td>
<td>0.2-1</td>
<td></td>
<td>Euhedral-subhedral</td>
<td>Fresh, often as inclusions.</td>
</tr>
<tr>
<td>Spinel</td>
<td>Trace</td>
<td>Trace</td>
<td>&lt;0.02</td>
<td></td>
<td>Euhedral</td>
<td>75% altered to chlorite + clays.</td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>&lt;1</td>
<td>1-3</td>
<td>0.2-0.4</td>
<td></td>
<td>Subhedral</td>
<td></td>
</tr>
<tr>
<td><strong>GROUNDMASS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glass</td>
<td>10-15</td>
<td>85</td>
<td>N/A</td>
<td></td>
<td>N/A</td>
<td>Clear with quench plagioclase.</td>
</tr>
<tr>
<td>Plagioclase</td>
<td>2-5</td>
<td>3-7</td>
<td>0.01-0.1</td>
<td></td>
<td>Laths, quench</td>
<td>Tiny needles within glass.</td>
</tr>
<tr>
<td><strong>SECONDARY MINERALOGY</strong></td>
<td>PERCENT</td>
<td>FILLING</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clays</td>
<td>65-75</td>
<td>Glass</td>
<td></td>
<td></td>
<td>Brown amorphous.</td>
<td></td>
</tr>
<tr>
<td>Chlorite</td>
<td>5-7</td>
<td>Glass</td>
<td></td>
<td></td>
<td>As veins. Slight yellow-green pleochroism.</td>
<td></td>
</tr>
<tr>
<td>Prehnite</td>
<td>57-7</td>
<td>Veins</td>
<td></td>
<td></td>
<td>Abnormal birefringence for clays and some development of bow-tie structure.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>VESICLES/CAVITIES</th>
<th>PERCENT</th>
<th>LOCATION</th>
<th>FILLING</th>
<th>SHAPE</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vesicles</td>
<td>10-15</td>
<td>Throughout 0.1-1.5</td>
<td>Carbonate</td>
<td>Irregular</td>
<td>Filled with white, radiating mineral with parallel extinction; carbonate?</td>
</tr>
</tbody>
</table>

**COMMENTS:** Clay patches appear in glass-rich (relict) areas while chlorite-rich alteration is concentrated in the microphyric matrix portions. Much of the texture and primary mineralogy is obscured by alteration. Similar to 786A-14X-CC (7-8 cm).
<table>
<thead>
<tr>
<th>PRIMARY MINERALOGY</th>
<th>PERCENT PRESENT</th>
<th>PERCENT ORIGINAL (mm)</th>
<th>COMPOSITION</th>
<th>MORPHOLOGY</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phenocrysts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>Clinopyroxene</td>
<td>Euhedral</td>
<td>&gt;90% altered to clay and chlorite.</td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>&lt;1</td>
<td>&lt;0.5</td>
<td>Orthopyroxene</td>
<td>Subhedral</td>
<td>&gt;95% altered to clay and chlorite.</td>
</tr>
<tr>
<td>Groundmass</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>10-15</td>
<td>15-20</td>
<td>Clinopyroxene</td>
<td>Subhedral</td>
<td>Equant and tabular; some have quench texture.</td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>&lt;5</td>
<td>5-10</td>
<td>Orthopyroxene</td>
<td>Subhedral</td>
<td>Tabular; some have quench textures.</td>
</tr>
<tr>
<td>Spinel</td>
<td>1-2</td>
<td>1-2</td>
<td>Spinel</td>
<td>Subhedral</td>
<td>Equant.</td>
</tr>
<tr>
<td>Glass</td>
<td>&lt;10</td>
<td>75-80</td>
<td>Glass</td>
<td>Subhedral</td>
<td>Pale yellow, devitrified.</td>
</tr>
<tr>
<td>SECONDARY MINERALOGY</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minerals</td>
<td>PERCENT FILLING</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clays</td>
<td>20-30</td>
<td>Glass</td>
<td>Clays</td>
<td>Brown, clustered around vesicles.</td>
<td></td>
</tr>
<tr>
<td>Carbonate</td>
<td>1-2</td>
<td>Pyroxene, vesicles</td>
<td>Carbonate</td>
<td>Radiating, pale yellow, mixed with chlorite.</td>
<td></td>
</tr>
<tr>
<td>Zeolites</td>
<td>3-7</td>
<td>Vesicles</td>
<td>Zeolites</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chlorite</td>
<td>55-65</td>
<td>Glass</td>
<td>Chlorite</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>VESICLES/CAVITIES</th>
<th>PERCENT LOCATION</th>
<th>SIZE (mm)</th>
<th>FILLING</th>
<th>SHAPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vesicles</td>
<td>5-10</td>
<td>&lt;0.8</td>
<td>Chlorite, clay, zeolites</td>
<td>Round</td>
</tr>
</tbody>
</table>

COMMENTS: No piece # given.

<table>
<thead>
<tr>
<th>PRIMARY MINERALOGY</th>
<th>PERCENT PRESENT</th>
<th>PERCENT ORIGINAL (mm)</th>
<th>COMPOSITION</th>
<th>MORPHOLOGY</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phenocrysts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plagioclase</td>
<td>7-10</td>
<td>8-10</td>
<td>Plagioclase</td>
<td>Euhedral-rounded</td>
<td>Glass inclusions, complex twinning, normal, reverse, and oscillatory zoning.</td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>5-7</td>
<td>6-7</td>
<td>Clinopyroxene</td>
<td>Euhedral-anhedral</td>
<td>Complex twinning, glass inclusions.</td>
</tr>
<tr>
<td>Spinel</td>
<td>Trace</td>
<td>Trace</td>
<td>Spinel</td>
<td>Subhedral</td>
<td>Appear randomly distributed, may be alteration.</td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>2-3</td>
<td>2-4</td>
<td>Orthopyroxene</td>
<td>Euhedral</td>
<td>Glass inclusions.</td>
</tr>
<tr>
<td>Groundmass</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glass</td>
<td>5-65</td>
<td>75-85</td>
<td>Glass</td>
<td>N/A</td>
<td>Minor pervasive chlorite alteration.</td>
</tr>
<tr>
<td>Plagioclase</td>
<td>6-10</td>
<td>12-15</td>
<td>Plagioclase</td>
<td>Quench laths</td>
<td>Locally aligned and deflected around phenocrysts.</td>
</tr>
<tr>
<td>SECONDARY MINERALOGY</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minerals</td>
<td>PERCENT FILLING</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clays</td>
<td>20-25</td>
<td>Glass</td>
<td>Clays</td>
<td>Brown amorphous clay pervasively altering glass.</td>
<td></td>
</tr>
<tr>
<td>Chlorite</td>
<td>6</td>
<td>20-25</td>
<td>Chlorite</td>
<td>Fine-grained and pervasive lending a slight green pleochroism to the glassy matrix.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>VESICLES/CAVITIES</th>
<th>PERCENT LOCATION</th>
<th>SIZE (mm)</th>
<th>FILLING</th>
<th>SHAPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vesicles</td>
<td>5-7</td>
<td>Throughout 0.5-3</td>
<td>No</td>
<td>Elongate</td>
</tr>
</tbody>
</table>

COMMENTS: Glomerocrysts of pyroxene and plagioclase up to 4 mm in diameter; also of plagioclase only.
**SITE 786**

**125-786B-1R-01** (Piece 6, 26-28 cm)  
**OBSERVER:** JOH  
**WHERE SAMPLED:** Izu-Bonin outer-arc high  
**ROCK NAME:** Two-pyroxene-plagioclase phyric boninite  
**GRAIN SIZE:** 0.3-1.2 mm, medium  
**TEXTURE:** Moderately phyric  

<table>
<thead>
<tr>
<th>PRIMARY MINERALOGY</th>
<th>PERCENT PRESENT</th>
<th>PERCENT ORIGINAL (mm)</th>
<th>COMPOSITION</th>
<th>MORPHOLOGY</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PHENOCRYSTS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plagioclase</td>
<td>6-8</td>
<td>7-9 0.15-1.2</td>
<td></td>
<td>Euhedral-subhedral</td>
<td>Spinel inclusions, Carlsbad twinning.</td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>9-11</td>
<td>10-12 0.7-1</td>
<td></td>
<td>Euhedral-subhedral</td>
<td>Frequently twinned, spinel inclusions, glass inclusions.</td>
</tr>
<tr>
<td>Spinel</td>
<td>Trace</td>
<td>Trace 0.01</td>
<td></td>
<td>Euhedral</td>
<td></td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>2-4</td>
<td>3-5 0.3</td>
<td></td>
<td>Euhedral-subhedral</td>
<td>Spinels and glass inclusions.</td>
</tr>
<tr>
<td><strong>GROUNDMASS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glass</td>
<td>&lt;5</td>
<td>65-75 N/A</td>
<td>N/A</td>
<td></td>
<td>Devitrified.</td>
</tr>
<tr>
<td>Plagioclase</td>
<td>6-8</td>
<td>7-10 0.02-0.1</td>
<td>Laths</td>
<td></td>
<td>Usually twinned.</td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>3-5</td>
<td>4-5 0.02-0.08</td>
<td>Equant, euhedral</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SECONDARY MINERALOGY</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clays</td>
<td>60-70</td>
<td>Glass</td>
<td></td>
<td></td>
<td>Dark brown, amorphous, pervasive.</td>
</tr>
<tr>
<td>Hematite</td>
<td>Trace</td>
<td>Clinopyroxene</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**VESICLES/CAVITIES**  
<table>
<thead>
<tr>
<th>PERCENT SIZE</th>
<th>LOCATION (mm)</th>
<th>FILLING</th>
<th>SHAPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vesicles</td>
<td>7-12</td>
<td>Throughout 0.1-2</td>
<td>Oval</td>
</tr>
</tbody>
</table>

**COMMENTS:** Glomerocrysts of orthopyroxene, clinopyroxene and plagioclase are abundant.

---

**125-786B-3R-01** (Piece 2, 12-15 cm)  
**OBSERVER:** JOH  
**WHERE SAMPLED:** Izu-Bonin outer-arc high  
**ROCK NAME:** Two-pyroxene-plagioclase boninite  
**GRAIN SIZE:** 0.2-1.5 mm  
**TEXTURE:** Moderately phyric  

<table>
<thead>
<tr>
<th>PRIMARY MINERALOGY</th>
<th>PERCENT PRESENT</th>
<th>PERCENT ORIGINAL (mm)</th>
<th>COMPOSITION</th>
<th>MORPHOLOGY</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PHENOCRYSTS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plagioclase</td>
<td>4-5</td>
<td>5-7 0.2-1.2</td>
<td>N/A</td>
<td>Abundant twins, glass and spinel inclusions.</td>
<td></td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>2-5</td>
<td>3-5 0.5-1</td>
<td>Euhedral-subhedral</td>
<td>Zoned with relict rounded cores, glass and spinel inclusions.</td>
<td></td>
</tr>
<tr>
<td>Spinel</td>
<td>Trace</td>
<td>Trace 0.01-0.05</td>
<td>Euhedral</td>
<td>Deep brown, fresh glass inclusions.</td>
<td></td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>7-10</td>
<td>8-10 0.4-1.5</td>
<td>Euhedral-subhedral</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>GROUNDMASS</strong></td>
<td></td>
<td></td>
<td>N/A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glass</td>
<td>&lt;5</td>
<td>75-80 N/A</td>
<td>Laths</td>
<td>Quench crystals and needles.</td>
<td></td>
</tr>
<tr>
<td>Plagioclase</td>
<td>4-5</td>
<td>5-7 0.2-0.3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SECONDARY MINERALOGY</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clays</td>
<td>65-75</td>
<td>Glass</td>
<td></td>
<td>Brown, amorphous, pervasive.</td>
<td></td>
</tr>
<tr>
<td>Chlorite</td>
<td>1-3</td>
<td>Veins</td>
<td>Green-light yellow-brown, &lt;0.1 mm wide.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hematite</td>
<td>4-1</td>
<td>Orthopyroxene</td>
<td>Rust orange, irregular shaped patches associated with fine-grained glomerocrysts.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**VESICLES/CAVITIES**  
<table>
<thead>
<tr>
<th>PERCENT SIZE</th>
<th>LOCATION (mm)</th>
<th>FILLING</th>
<th>SHAPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vesicles</td>
<td>7-10</td>
<td>Throughout 0.1-3</td>
<td>Oval-round</td>
</tr>
</tbody>
</table>

**COMMENTS:** Glomerocrysts of orthopyroxene + or - clinopyroxene + or - plagioclase are frequent and have a bimodal grain size distribution (0.1-0.3, 0.7-1.0 mm). Clinopyroxenes are pale green in plane-polarized light (PPL) and slightly pleochroic.
### 125-786B-3R-01 (Piece 14,94-97 cm)

**OBSERVER:** JOH  
WHERE SAMPLED: Izu-Bonin outer-arc high

**ROCK NAME:** Two-pyroxene-plagioclase boninite breccia

**GRAIN SIZE:**

**TEXTURE:**

---

**PRIMARY MINERALOGY**

<table>
<thead>
<tr>
<th>MINERAL</th>
<th>PERCENT PRESENT</th>
<th>PERCENT ORIGINAL</th>
<th>SIZE (mm)</th>
<th>COMPOSITION</th>
<th>MORPHOLOGY</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plagioclase</td>
<td>1-2</td>
<td>2-3</td>
<td>0.5-1.5</td>
<td></td>
<td>Euhedral, laths</td>
<td></td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>6-8</td>
<td>7-9</td>
<td>0.4-1.5</td>
<td></td>
<td>Euhedral-subhedral</td>
<td>Glass inclusions.</td>
</tr>
<tr>
<td>Spinel</td>
<td>Trace</td>
<td>Trace</td>
<td>&lt;0.1</td>
<td></td>
<td>Equant-subhedral</td>
<td>Mainly present in groundmass.</td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>4-6</td>
<td>5-7</td>
<td>0.2-1</td>
<td></td>
<td>Subhedral</td>
<td></td>
</tr>
</tbody>
</table>

**GROUNDMASS**

<table>
<thead>
<tr>
<th>MINERAL</th>
<th>PERCENT</th>
<th>SIZE (mm)</th>
<th>LOCATION (mm)</th>
<th>FILLING</th>
<th>SHAPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glass</td>
<td>10-15</td>
<td>15-20</td>
<td>N/A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plagioclase</td>
<td>5-7</td>
<td>&lt;0.1</td>
<td></td>
<td>Light brown to light yellow.</td>
<td></td>
</tr>
</tbody>
</table>

**SECONDARY MINERALOGY**

<table>
<thead>
<tr>
<th>MINERAL</th>
<th>PERCENT</th>
<th>SIZE (mm)</th>
<th>LOCATION (mm)</th>
<th>FILLING</th>
<th>SHAPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matrix crystals</td>
<td>10-12</td>
<td>12-15</td>
<td>0.01-0.03</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**VESICLES/CAVITIES**

<table>
<thead>
<tr>
<th>MINERAL</th>
<th>PERCENT</th>
<th>SIZE (mm)</th>
<th>LOCATION (mm)</th>
<th>FILLING</th>
<th>SHAPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vesicles</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**COMMENTS:** Finely brecciated, glassy, rounded boninite clasts 0.5-6 mm in diameter set in a clay-rich matrix.

---

### 125-786B-4R-01 (Piece 12,52-54 cm)

**OBSERVER:** TER  
WHERE SAMPLED: Izu-Bonin outer-arc high

**ROCK NAME:** Two-pyroxene-plagioclase boninite

**GRAIN SIZE:** 0.05-4 mm

**TEXTURE:** Hyaloplilitic texture

---

**PRIMARY MINERALOGY**

<table>
<thead>
<tr>
<th>MINERAL</th>
<th>PERCENT PRESENT</th>
<th>PERCENT ORIGINAL</th>
<th>SIZE (mm)</th>
<th>COMPOSITION</th>
<th>MORPHOLOGY</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Olivine</td>
<td>0</td>
<td>2</td>
<td>1-4</td>
<td></td>
<td>Subhedral</td>
<td>Pseudomorphs.</td>
</tr>
<tr>
<td>Plagioclase</td>
<td>4</td>
<td>4</td>
<td>0.05-4</td>
<td></td>
<td>Ashedral-euhedral</td>
<td>Two generations.</td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>8</td>
<td>8</td>
<td>0.05-3</td>
<td>Augite</td>
<td>Euhedral-subhedral</td>
<td>Has compositional zoning. 2V=+60 degrees.</td>
</tr>
<tr>
<td>Spinel</td>
<td>Trace</td>
<td>Trace</td>
<td>0.02-0.1</td>
<td>Cr-spinel</td>
<td>Euhedral</td>
<td>Included in olivine pseudomorph.</td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>15</td>
<td>15</td>
<td>0.05-4</td>
<td>Bronzite</td>
<td>Euhedral-subhedral</td>
<td>2V=+80-85, Bushveld-type exsolution lamellae (=augite (100) lamellae) in some crystals.</td>
</tr>
</tbody>
</table>

**GROUNDMASS**

<table>
<thead>
<tr>
<th>MINERAL</th>
<th>PERCENT</th>
<th>SIZE (mm)</th>
<th>LOCATION (mm)</th>
<th>FILLING</th>
<th>SHAPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glass</td>
<td>0-67</td>
<td>N/A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plagioclase</td>
<td>2-2</td>
<td>0.005-0.01</td>
<td></td>
<td>Euhedral, laths</td>
<td></td>
</tr>
<tr>
<td>Augite</td>
<td>1-1</td>
<td>0.05-0.01</td>
<td></td>
<td>Euhedral, prismatic</td>
<td></td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>1-1</td>
<td>0.01-0.05</td>
<td></td>
<td>Euhedral, prismatic</td>
<td></td>
</tr>
</tbody>
</table>

**SECONDARY MINERALOGY**

<table>
<thead>
<tr>
<th>MINERAL</th>
<th>PERCENT</th>
<th>SIZE (mm)</th>
<th>LOCATION (mm)</th>
<th>FILLING</th>
<th>SHAPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clays</td>
<td>65-70</td>
<td>Glass, olivine</td>
<td></td>
<td>Replacing olivine and glass, brown in color.</td>
<td></td>
</tr>
<tr>
<td>Carbonate</td>
<td>1</td>
<td>Plagioclase</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Opaque</td>
<td>1</td>
<td>Glass</td>
<td></td>
<td>Glass was replaced partly by opaque minerals.</td>
<td></td>
</tr>
</tbody>
</table>

**VESICLES/CAVITIES**

<table>
<thead>
<tr>
<th>MINERAL</th>
<th>PERCENT</th>
<th>LOCATION (mm)</th>
<th>FILLING</th>
<th>SHAPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vesicles</td>
<td>20</td>
<td>Random 0.1-1-4</td>
<td>None</td>
<td>Round</td>
</tr>
</tbody>
</table>

**COMMENTS:** Some orthopyroxene grains have fine (100) augite lamellae which are common in basic plutonic rocks and are surrounded by reaction rim of clinopyroxene (augite 2V=+60 degrees). Olivine pseudomorph (now clays) contains euhedral Cr-spinel, and is surrounded by reaction rim of orthopyroxene (2V=+80(-) degrees).
**SITE 786**

**ROCK NAME:** Two-pyroxene phric andesite  
**GRAIN SIZE:** 0.2-4 mm  
**TEXTURE:** Moderately phric, glomerocrystic

### PRIMARY MINERALOGY

<table>
<thead>
<tr>
<th>PHENOCRYSTS</th>
<th>PERCENT</th>
<th>PERCENT</th>
<th>SIZE (mm)</th>
<th>COMPOSITION</th>
<th>MORPHOLOGY</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plagioclase</td>
<td>6-12</td>
<td>7-13</td>
<td>0.5-4</td>
<td></td>
<td>Euhedral</td>
<td>Some with spinel inclusions. Complex zoning: normal, reverse, oscillatory.</td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>10-20</td>
<td>11-20</td>
<td>0.2-2</td>
<td></td>
<td>Euhedral-anhedral</td>
<td>Has glass inclusions: twinning and zoning. Randomly distributed.</td>
</tr>
<tr>
<td>Spinel</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>0.01-0.1</td>
<td></td>
<td>Subhedral-anhedral</td>
<td>Has glass inclusions.</td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>1-3</td>
<td>2-4</td>
<td>0.5-1.5</td>
<td></td>
<td>Anhedral-subhedral</td>
<td></td>
</tr>
</tbody>
</table>

**GROUNDMASS**

| Glass       | 30-40   | 45-65   | N/A       |             | N/A        | Altered to clay + chlorite. |
| Plagioclase | 5-10    | 10-15   | <0.1      |             | Quench laths | Locally aligned and deflected around phenocrysts. |
| Clinopyroxene | 1-3    | 3-5     | 0.05      |             | Subhedral  | |

### SECONDARY MINERALOGY

<table>
<thead>
<tr>
<th>CLAYS</th>
<th>PERCENT</th>
<th>REPLACING/ FILLING</th>
<th>SIZE (mm)</th>
<th>SHAPE</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glass</td>
<td>25</td>
<td>Glass</td>
<td>1-4</td>
<td>Mostly elongate</td>
<td>Brown amorphous clays pervasively altering the glass and matrix material.</td>
</tr>
<tr>
<td>Chlorite</td>
<td>10</td>
<td>Glass</td>
<td>1-3</td>
<td></td>
<td>Fine-grained; slight green pleochroism.</td>
</tr>
</tbody>
</table>

### VESICLES/CAVITIES

<table>
<thead>
<tr>
<th>VESICLES/CAVITIES</th>
<th>PERCENT</th>
<th>LOCATION (mm)</th>
<th>FILLING</th>
<th>SHAPE</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vesicles</td>
<td>1-4</td>
<td>Throughout 0.3-2</td>
<td>No</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**COMMENTS:** There are glomerocrysts of plagioclase + pyroxenes up to 3 mm in diameter. There are also glomerocrysts consisting entirely of plagioclase phenocrysts. Glomerocrysts occur with and without spinels.

---

**SITE 786-58-02**  
**ROCK NAME:** Two-pyroxene andesite  
**GRAIN SIZE:** 0.5-4 mm  
**TEXTURE:** Moderately to sparsely phric

### PRIMARY MINERALOGY

<table>
<thead>
<tr>
<th>PHENOCRYSTS</th>
<th>PERCENT</th>
<th>PERCENT</th>
<th>SIZE (mm)</th>
<th>COMPOSITION</th>
<th>MORPHOLOGY</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plagioclase</td>
<td>7-12</td>
<td>8-13</td>
<td>0.8-3.7</td>
<td></td>
<td>Euhedral</td>
<td>Some with spinel inclusions. Complex zoning: normal and reverse and oscillatory.</td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>15-20</td>
<td>17-20</td>
<td>0.3-2</td>
<td></td>
<td>Euhedral-anhedral</td>
<td>Spinell and glass inclusions, also relict rounded cores and complex zoning. Often as inclusions in plagioclase and clinopyroxene.</td>
</tr>
<tr>
<td>Spinel</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>0.01-0.2</td>
<td></td>
<td>Subhedral</td>
<td>Crystals appear to have been broken from longer tabular crystals.</td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>1-3</td>
<td>2-4</td>
<td>0.8-1.7</td>
<td></td>
<td>Anhedral-subhedral</td>
<td></td>
</tr>
</tbody>
</table>

**GROUNDMASS**

| Glass       | 7-10    | 50-60   | N/A       |             | N/A        | Patches of slightly fresh glass present in a brecciated texture. |
| Plagioclase | 5-10    | 10-15   | <0.1      |             | Laths      | Small tabular microphenocrysts and quench crystals. |
| Clinopyroxene | 2-3    | 3-6     | <0.05     |             | Subhedral  | |

### SECONDARY MINERALOGY

<table>
<thead>
<tr>
<th>CLAYS</th>
<th>PERCENT</th>
<th>REPLACING/ FILLING</th>
<th>SIZE (mm)</th>
<th>SHAPE</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glass</td>
<td>30-40</td>
<td>Glass</td>
<td>2-3</td>
<td>Mostly elongate</td>
<td>Brown amorphous clays, chlorite and hematite intermix and pervasively alter the glass and matrix material. There is a second-order patchy fabric.</td>
</tr>
</tbody>
</table>

**COMMENTS:** Brown amorphous clays, chlorite and hematite intermix and pervasively alter the glass and matrix material. There is a second-order patchy fabric.

---

**COMMENTS:** Sharp boundary between fine-grained, glassy-textured rock and phric coarser-grained rock. May be mixing boundary. Plagioclase and clinopyroxene in glassy rock are small (<0.8 mm), less abundant and more altered than in coarse part. Glass is altered to hematite, chlorite and clays in both sections but more clay is present in the finer-grained portion. Glomerocrysts of two pyroxenes and plagioclase with and without spinel are present.

---

1045
**125-786B-5R-02** (Piece 7A, 53-55 cm)  
**ROCK NAME:** Pyroxene-plagioclase basalt  
**GRAIN SIZE:** 0.2-2 mm  
**TEXTURE:** Moderately phyric

<table>
<thead>
<tr>
<th>PRIMARY MINERALOGY</th>
<th>PERCENT</th>
<th>PERCENT SIZE</th>
<th>COMPOSITION</th>
<th>MORPHOLOGY</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phenocrysts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plagioclase</td>
<td>8-13</td>
<td>10-15</td>
<td>0.2-3</td>
<td>Euhedral</td>
<td>Glass inclusions, twinned, complex zoning.</td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>8-10</td>
<td>10-12</td>
<td>0.5-2</td>
<td>Euhedral-anhedral</td>
<td>Glass + spinel inclusions; complex twinning.</td>
</tr>
<tr>
<td>Spinel</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>&lt;0.2</td>
<td>Subhedral-euhedral</td>
<td>Randomly distributed.</td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>2-6</td>
<td>3-7</td>
<td>0.5-2</td>
<td>Subhedral-euhedral</td>
<td>Has glass + spinel inclusions.</td>
</tr>
<tr>
<td>Groundmass</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glass</td>
<td>&lt;2</td>
<td>65-70</td>
<td>N/A</td>
<td>Devitrified</td>
<td>Altered to clays.</td>
</tr>
<tr>
<td>Plagioclase</td>
<td>3-5</td>
<td>5-7</td>
<td>0.02-0.15</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Secondary Mineralogy**

<table>
<thead>
<tr>
<th>SECONDARY MINERALOGY</th>
<th>PERCENT</th>
<th>FILLING</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clays</td>
<td>35-45</td>
<td>Glass</td>
<td>Brown, finely disseminated, amorphous, pervasive (and yellow).</td>
</tr>
<tr>
<td>Chlorite</td>
<td>3-5</td>
<td>Glass, plagioclase</td>
<td>Light yellow to brownish green, slightly pleochroic.</td>
</tr>
</tbody>
</table>

**Vesicles/Size**

<table>
<thead>
<tr>
<th>VESICLES/CAVITIES</th>
<th>PERCENT</th>
<th>LOCATION (mm)</th>
<th>FILLING</th>
<th>SHAPE</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vesicles</td>
<td>3-5</td>
<td>Throughout 0.5-4</td>
<td>None</td>
<td>Random, Some may be voids caused irregular during thin-section making.</td>
<td></td>
</tr>
</tbody>
</table>

**COMMENTS:** Glomerocrystals of pyroxene and plagioclase, of orthopyroxene and clinopyroxene, and of only plagioclase, from 1-3 mm in diameter. At least one example of clinopyroxene jacketing orthopyroxene.

---

**125-786B-6R-01** (Piece 10, 38-40 cm)  
**ROCK NAME:** Clinopyroxene-plagioclasephyric andesite  
**GRAIN SIZE:** Fine-grained  
**TEXTURE:** Intersertal, moderately phyric

<table>
<thead>
<tr>
<th>PRIMARY MINERALOGY</th>
<th>PERCENT</th>
<th>PERCENT SIZE</th>
<th>COMPOSITION</th>
<th>MORPHOLOGY</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phenocrysts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plagioclase</td>
<td>15-20</td>
<td>20-25</td>
<td>0.2-0.4</td>
<td>Euhedral-subhedral</td>
<td>Tabular, sparse spinel inclusions, some radiating clusters.</td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>8-12</td>
<td>20-15</td>
<td>0.1-0.8</td>
<td>Subhedral-anhedral</td>
<td>Dusty pink to gray, spinel inclusions, twinning.</td>
</tr>
<tr>
<td>Spinel</td>
<td>1-2</td>
<td>1-2</td>
<td>&lt;0.02</td>
<td>Subhedral</td>
<td>Dispersed black, equant to irregular.</td>
</tr>
<tr>
<td>Groundmass</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glass</td>
<td>10-20</td>
<td>50-60</td>
<td>N/A</td>
<td>N/A</td>
<td>Brown to light green, altered to clays and chlorite.</td>
</tr>
<tr>
<td>Plagioclase</td>
<td>8-10</td>
<td>10-15</td>
<td>&lt;0.02</td>
<td>Laths</td>
<td></td>
</tr>
</tbody>
</table>

**Secondary Mineralogy**

<table>
<thead>
<tr>
<th>SECONDARY MINERALOGY</th>
<th>PERCENT</th>
<th>FILLING</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clays</td>
<td>10-15</td>
<td>Glass, plagioclase</td>
<td>Brown to dark yellow, amorphous, pervasive in glassy areas and dispersed throughout.</td>
</tr>
<tr>
<td>Chlorite</td>
<td>45-50</td>
<td>Glass, plagioclase, pyroxene</td>
<td>Pale green to yellow-brown, slightly pleochroic. Completely alters and pseudomorphs pyroxene so that only outline and interior fractures are still present. This type of alteration is present in other thin sections associated with carbonate which may have been lost due to plucking in this section.</td>
</tr>
<tr>
<td>Hematite</td>
<td>&lt;5</td>
<td>Pyroxene</td>
<td></td>
</tr>
</tbody>
</table>

**Vesicles/Size**

<table>
<thead>
<tr>
<th>VESICLES/CAVITIES</th>
<th>SIZE</th>
<th>PERCENT</th>
<th>LOCATION (mm)</th>
<th>FILLING</th>
<th>SHAPE</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vesicles</td>
<td>7-12</td>
<td>0.15-3</td>
<td></td>
<td>No</td>
<td>Round-irregular</td>
<td>There appear to be two generations of clinopyroxene - those still present and those now altered by hematite.</td>
</tr>
</tbody>
</table>

**COMMENTS:** There appear to be two generations of clinopyroxene - those still present and those now altered by hematite.
125-786B-6R-02 (Piece 23A,137-138 cm) OBSERVER: HIR WHERE SAMPLED: Izu-Bonin outer-arc high
ROCK NAME: Olivine-orthopyroxene-clinopyroxene basalt
GRAIN SIZE: 0.5-1.5 mm
TEXTURE: Glomerophyric and hyalo-ophitic texture

<table>
<thead>
<tr>
<th>PRIMARY MINERALOGY</th>
<th>PERCENT PRESENT</th>
<th>SIZE (mm)</th>
<th>COMPOSITION</th>
<th>MORPHOLOGY</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Olivine</td>
<td>0</td>
<td>1-1.5</td>
<td>Euhedral</td>
<td>Fully altered to brownish clay.</td>
<td></td>
</tr>
<tr>
<td>Plagioclase</td>
<td>&lt;1</td>
<td>0.2-0.6</td>
<td>Euhedral-subhedral</td>
<td>Twinning is common.</td>
<td></td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>5</td>
<td>0.5-1</td>
<td>Subhedral</td>
<td>Shows glomerophytic texture with orthopyroxene.</td>
<td></td>
</tr>
<tr>
<td>Spinel</td>
<td>Trace</td>
<td>0.01</td>
<td>Euhedral</td>
<td>Occurs as inclusion in olivine crystal.</td>
<td></td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>3</td>
<td>0.5-1</td>
<td>Euhedral-subhedral</td>
<td>Shows pale green to pale red pleochroism.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SECONDARY MINERALOGY</th>
<th>PERCENT FILLING</th>
<th>SIZE LOCATION (mm)</th>
<th>COMPOSITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clays</td>
<td>60-75</td>
<td>Olivine, glass vesicle</td>
<td>Brownish dusty clay replaces glass and olivine and fills in vesicles.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>VESICLES/CAVITIES</th>
<th>PERCENT LOCATION (mm)</th>
<th>FILLING</th>
<th>SHAPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vesicles</td>
<td>7-10</td>
<td>Random 0.5-5</td>
<td>Brownish clay Round</td>
</tr>
</tbody>
</table>

COMMENTS: This rock is relatively rich in olivine phenocrysts, that were fully altered to brownish clay. Clinopyroxene and orthopyroxene show glomerophytic texture.

125-786B-8R-01 (Piece 7,45-47 cm) OBSERVER: JOH WHERE SAMPLED: Izu-Bonin outer-arc high
ROCK NAME: Clinopyroxene-plagioclase phyric andesite
GRAIN SIZE: Fine-grained
TEXTURE: Glomerophytic

<table>
<thead>
<tr>
<th>PRIMARY MINERALOGY</th>
<th>PERCENT PRESENT</th>
<th>SIZE (mm)</th>
<th>COMPOSITION</th>
<th>MORPHOLOGY</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plagioclase</td>
<td>18-24</td>
<td>0.2-1</td>
<td>Euhedral-subhedral</td>
<td>Spinel inclusions, lath shaped.</td>
<td></td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>4-6</td>
<td>0.2-1</td>
<td>Subhedral-subhedral</td>
<td>Spinel inclusions, glass inclusions.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SECONDARY MINERALOGY</th>
<th>PERCENT FILLING</th>
<th>SIZE LOCATION (mm)</th>
<th>COMPOSITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clays</td>
<td>23-30</td>
<td>Glass/matrix</td>
<td>Brown, amorphous, pervasive.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>VESICLES/CAVITIES</th>
<th>PERCENT LOCATION (mm)</th>
<th>FILLING</th>
<th>SHAPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vesicles</td>
<td>10-12</td>
<td>Throughout 0.2-4</td>
<td>Elongate to equant</td>
</tr>
</tbody>
</table>

COMMENTS: Glomerocrysts of plagioclase and clinopyroxene up to 1 mm across.
ROCK NAME: Orthopyroxene-clinopyroxene andesite
GRAIN SIZE: <2 mm
TEXTURE: Glomerophyric texture

<table>
<thead>
<tr>
<th>PRIMARY MINERALOGY</th>
<th>PERCENT PRESENT</th>
<th>PERCENT ORIGINAL (mm)</th>
<th>COMPOSITION</th>
<th>MORPHOLOGY</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHENOCRYSTS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plagioclase</td>
<td>10-15</td>
<td>10-15</td>
<td>0.5-2</td>
<td>Euhedral</td>
<td>Compositional zoning and twinning are common.</td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>1-2</td>
<td>1-2</td>
<td>0.5-1</td>
<td>Euhedral</td>
<td>Compositional zoning and twinning are common.</td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>1-2</td>
<td>1-2</td>
<td>0.5-1</td>
<td>Euhedral</td>
<td>Occurs as euhedral, elongate crystal, showing relatively low birefringence.</td>
</tr>
<tr>
<td>GROUNDMASS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plagioclase</td>
<td>5-10</td>
<td>5-10</td>
<td>&lt;0.4</td>
<td>Euhedral</td>
<td>Frequently showing quenched H-shaped crystals.</td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>Trace</td>
<td>Trace</td>
<td>&lt;0.4</td>
<td>Euhedral</td>
<td>Showing quenched acicular crystal.</td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>Trace</td>
<td>Trace</td>
<td>&lt;0.4</td>
<td>Euhedral</td>
<td>Showing quenched acicular crystal.</td>
</tr>
<tr>
<td>Glass</td>
<td>0</td>
<td>70-85</td>
<td>N/A</td>
<td></td>
<td>Fully altered to dusty brown clay.</td>
</tr>
</tbody>
</table>

SECONDARY MINERALOGY

<table>
<thead>
<tr>
<th>PRIMARY MINERALOGY</th>
<th>PERCENT PRESENT</th>
<th>PERCENT ORIGINAL (mm)</th>
<th>COMPOSITION</th>
<th>MORPHOLOGY</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clays</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glass</td>
<td></td>
<td></td>
<td>N/A</td>
<td></td>
<td>Colorless to very faintly green.</td>
</tr>
<tr>
<td>Plagioclase</td>
<td>15-30</td>
<td>55-65</td>
<td>N/A</td>
<td></td>
<td>Mostly elongate euhedral crystals.</td>
</tr>
<tr>
<td>Pyroxene</td>
<td>8-10</td>
<td>8-10</td>
<td>N/A</td>
<td></td>
<td>Mostly elongate euhedral crystals.</td>
</tr>
</tbody>
</table>

SECONDARY MINERALOGY

<table>
<thead>
<tr>
<th>PRIMARY MINERALOGY</th>
<th>PERCENT PRESENT</th>
<th>PERCENT ORIGINAL (mm)</th>
<th>COMPOSITION</th>
<th>MORPHOLOGY</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clays</td>
<td>10-15</td>
<td>Glass/matrix</td>
<td>N/A</td>
<td></td>
<td>Brown, amorphous, pervasive replacing glass in part of thin section; also intimately mixed with chlorite in breccia matrix.</td>
</tr>
<tr>
<td>Chlorite</td>
<td>30-50</td>
<td>Breccia</td>
<td>N/A</td>
<td></td>
<td>Matrix, mixed with clays, filling between moderately altered glassy clasts.</td>
</tr>
<tr>
<td>Carbonate</td>
<td>3-5</td>
<td>Veins</td>
<td>N/A</td>
<td></td>
<td>Lines veins up to 0.02 mm thick.</td>
</tr>
</tbody>
</table>

VESELS/CAVITIES

<table>
<thead>
<tr>
<th>PRIMARY MINERALOGY</th>
<th>PERCENT PRESENT</th>
<th>PERCENT ORIGINAL (mm)</th>
<th>COMPOSITION</th>
<th>MORPHOLOGY</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clays</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glass</td>
<td></td>
<td></td>
<td>N/A</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

COMMENTS: Phenocrysts and microphenocrysts define crude flow lamination and the later fracturing (parallel to the lamination) is developed throughout the rock. Phenocryst plagioclase is rarely fragmented and shows corroded form. Clinopyroxene, orthopyroxene and plagioclase often form glomerophyric texture.
ROCK NAME: Two-pyroxene-plagioclase phyric basalt

GRAIN SIZE: Moderately phyric

### PRIMARY MINERALOGY

<table>
<thead>
<tr>
<th>Phenocrysts</th>
<th>Percent Present</th>
<th>Percent Original (mm)</th>
<th>Composition</th>
<th>Morphology</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plagioclase</td>
<td>10-12</td>
<td>11-13</td>
<td>0.5-2</td>
<td>Equant, altered</td>
<td>Glass and spinel inclusions, moth-eaten texture, zoning.</td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>9-11</td>
<td>10-12</td>
<td>0.5-1.2</td>
<td>Elongate, euhedral</td>
<td>Glass and spinel inclusions, complex and abundant twinning.</td>
</tr>
<tr>
<td>Spinel</td>
<td>Trace</td>
<td>Trace</td>
<td>&lt;0.01</td>
<td>Euhedral</td>
<td>Primarily as inclusions.</td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>9-11</td>
<td>9-11</td>
<td>0.8-1.2</td>
<td>Elongate, euhedral</td>
<td>Glass and sparse spinel inclusions.</td>
</tr>
</tbody>
</table>

### GROUNDMASS

<table>
<thead>
<tr>
<th>Groundmass</th>
<th>Percent Present</th>
<th>Percent Original (mm)</th>
<th>Composition</th>
<th>Morphology</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glass</td>
<td>&lt;3</td>
<td>45-55</td>
<td>N/A</td>
<td>N/A</td>
<td>Devitrified, locally fresh in glomerocrysts.</td>
</tr>
<tr>
<td>Plagioclase</td>
<td>2-3</td>
<td>2-3</td>
<td>0.1-0.2</td>
<td>Equant, lath-tabulars</td>
<td>Low birefringence, variable extinction.</td>
</tr>
<tr>
<td>Pyroxene</td>
<td>3-5</td>
<td>3-5</td>
<td>0.1-0.2</td>
<td>Equant, subhedral</td>
<td>Low birefringence, variable extinction.</td>
</tr>
<tr>
<td>Microlites</td>
<td>2-3</td>
<td>3-5</td>
<td>0.01-0.62</td>
<td>Needles</td>
<td>Low birefringence, variable extinction.</td>
</tr>
</tbody>
</table>

### SECONDARY REPLACING/MINERALOGY

<table>
<thead>
<tr>
<th>Secondary Mineralogy</th>
<th>Percent Filling</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clays</td>
<td>50-60 Glass-matrix crystals</td>
<td>Brown amorphous clay, pervasively altering the glassy matrix.</td>
</tr>
<tr>
<td>Chlorite</td>
<td>&lt;5 Glass in glomerocrysts</td>
<td>Weakly birefringent, locally fibrous; yellow to yellow-green.</td>
</tr>
<tr>
<td>Hematite</td>
<td>Trace Pyroxene</td>
<td>Amorphous, intimately mixed with chlorite, present only in the middle of pyroxene glomerocrysts.</td>
</tr>
</tbody>
</table>

### VESICLES/CAVITIES

<table>
<thead>
<tr>
<th>Vesicles</th>
<th>Percent Location (mm)</th>
<th>Filling</th>
<th>Shape</th>
</tr>
</thead>
<tbody>
<tr>
<td>7-10</td>
<td>Throughout 0.1-3</td>
<td>No</td>
<td>Irregular</td>
</tr>
</tbody>
</table>

COMMENTS: Glass within glomerocrysts is slightly fresh, altering to minor chlorite but not brown clays. Glomerocrysts of one and two pyroxenes with and without plagioclase. Matrix phases are obscured by the intensive clay alteration of the glassy groundmass making a confident determination difficult.
### Sample Information
- **Sample ID:** 125-786B-12R-02
- **Location:** Izu-Bonin outer-arc high
- **Observer:** JH
- **Grain Size:** 0.1-1 mm
- **Texture:** Moderately phyric

### Rock Name
- **Name:** Pyroxene-plagioclase phyric basalt

### Primary Mineralogy

<table>
<thead>
<tr>
<th>Phenocrysts</th>
<th>Percent Present</th>
<th>Original Size (mm)</th>
<th>Composition</th>
<th>Morphology</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plagioclase</td>
<td>9-11</td>
<td>10-12</td>
<td>0.1-0.8</td>
<td>Elongate, subhedral</td>
<td>Oscillatory zoning, moth-eaten texture with altered glass inclusions, spinel inclusions.</td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>7-9</td>
<td>8-10</td>
<td>0.15-1</td>
<td>Euhedral-subhedral</td>
<td>Complex twinning, spinel and altered glass inclusions.</td>
</tr>
<tr>
<td>Spinel</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>&lt;0.01</td>
<td>Equant</td>
<td>In glassy matrix and as inclusions.</td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>4-7</td>
<td>3-7</td>
<td>0.1-1</td>
<td>Equant, euhedral</td>
<td>Glass inclusions, two growth phases (relict core).</td>
</tr>
</tbody>
</table>

### Groundmass
- **Glass:** <3 60-65 N/A
- **Microlites:** 1-3 3-5 <0.01
- **Clinopyroxene:** 3-5 3-5 0.05-0.1
- **Plagioclase:** 1-2 1-2 <0.01

### Secondary Mineralogy
- **Clays:** 60-70 Glass/matrix
- **Chlorite:** <1 Clinopyroxene

### Vesicles/ Cavities
- **Vesicles:** 10-12 Throughout 0.1-3.5 No Oval, round

### Comments
- Glomerocrysts of orthopyroxene + or - clinopyroxene + or - plagioclase are common up to 4 mm in diameter. Individual grains are commonly rounded possibly indicating recrystallization or disequilibrium.
### PRIMARY MINERALOGY

<table>
<thead>
<tr>
<th>PHENOCRYST</th>
<th>PERCENT</th>
<th>PERCENT</th>
<th>SIZE</th>
<th>COMPOSITION</th>
<th>MORPHOLOGY</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plagioclase</td>
<td>5</td>
<td>5</td>
<td>1-4</td>
<td></td>
<td>Euhedral-subhedral-anhedral</td>
<td></td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>4</td>
<td>4</td>
<td>0.1-2</td>
<td>Augite</td>
<td>Subhedral-subhedral</td>
<td>2V=40-60 degrees.</td>
</tr>
<tr>
<td>Opaque</td>
<td>Trace</td>
<td>Trace</td>
<td>0.1-0.2</td>
<td>Magnetite?</td>
<td>Subhedral-subhedral-anhedral</td>
<td>Inclusions in pyroxenes.</td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>7</td>
<td>7</td>
<td>0.1-2</td>
<td>Bronzite</td>
<td>Subhedral-subhedral</td>
<td>2V=80-85 degrees, (100) exsolution lamellae are rare, augite rim is common, compositional zoning is common.</td>
</tr>
</tbody>
</table>

### GROUNDMASS

<table>
<thead>
<tr>
<th>PHENOCRYST</th>
<th>PERCENT</th>
<th>PERCENT</th>
<th>SIZE</th>
<th>COMPOSITION</th>
<th>MORPHOLOGY</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glass</td>
<td>35-40</td>
<td>70-80</td>
<td>N/A</td>
<td></td>
<td></td>
<td>Brown glass.</td>
</tr>
<tr>
<td>Opaque</td>
<td>Trace</td>
<td>Trace</td>
<td>-0.05</td>
<td></td>
<td>Subhedral</td>
<td>Magnetite?</td>
</tr>
</tbody>
</table>

### SECONDARY MINERALOGY

<table>
<thead>
<tr>
<th>Clays</th>
<th>PERCENT</th>
<th>FILLING</th>
<th>SHAPE</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glass</td>
<td>35-40</td>
<td></td>
<td></td>
<td>Replacing glass.</td>
</tr>
</tbody>
</table>

### VESICLES/CAVITIES

<table>
<thead>
<tr>
<th>VESICLES/CAVITIES</th>
<th>SIZE</th>
<th>PERCENT</th>
<th>LOCATION</th>
<th>FILLING</th>
<th>SHAPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vesicles</td>
<td>5</td>
<td>Random</td>
<td>0.2-2</td>
<td>None</td>
<td>Round</td>
</tr>
</tbody>
</table>

### COMMENTS

Orthopyroxene has (100) exsolution lamellae (rarely). In the groundmass glass, very fine needle-like crystals are observed. They may be pyroxene, but detail is not clear because the thin section is too thick (clinoenstatite?).

---

### PRIMARY MINERALOGY

<table>
<thead>
<tr>
<th>PHENOCRYST</th>
<th>PERCENT</th>
<th>PERCENT</th>
<th>SIZE</th>
<th>COMPOSITION</th>
<th>MORPHOLOGY</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plagioclase</td>
<td>50-60</td>
<td>55-65</td>
<td>0.3-1.5</td>
<td></td>
<td>Euhedral</td>
<td>Relict cores, oscillatory zoning, glass and spinel inclusions, pyroxene inclusions.</td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>2-5</td>
<td>8-15</td>
<td>0.2-1.2</td>
<td>Subhedral</td>
<td>Uralitized, spinel inclusions.</td>
<td></td>
</tr>
<tr>
<td>Spinel</td>
<td>5-7</td>
<td>5-7</td>
<td>0.1-0.4</td>
<td>Subhedral-euhedral</td>
<td>Uralitized.</td>
<td></td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>2-5</td>
<td>5-10</td>
<td>0.2-1.2</td>
<td>Subhedral</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### GROUNDMASS

| N/A | N/A | N/A | N/A |

### SECONDARY MINERALOGY

<table>
<thead>
<tr>
<th>Clays</th>
<th>PERCENT</th>
<th>FILLING</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plagioclase</td>
<td>15-20</td>
<td></td>
<td>Brown-gray clay, pervasive, replacing 50-95% of some plagioclase.</td>
</tr>
</tbody>
</table>

### VESICLES/CAVITIES

<table>
<thead>
<tr>
<th>VESICLES/CAVITIES</th>
<th>SIZE</th>
<th>PERCENT</th>
<th>LOCATION</th>
<th>FILLING</th>
<th>SHAPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>VESICLES</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**SITE 786**

125-786B-16R-01 (Piece 20, 137-144 cm)  
**Observer:** JOH  
**Where Sampled:** Izu-Bonin outer-arc high

**Rock Name:** Plagioclase-phyric andesite  
**Grain Size:** 0.2-1 mm  
**Texture:** Glomerophyric, moderately phryic

**Primary Mineralogy**

<table>
<thead>
<tr>
<th>Phenocrysts</th>
<th>Percent Present</th>
<th>Size (mm)</th>
<th>Composition</th>
<th>Morphology</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plagioclase</td>
<td>10-12</td>
<td>0.2-1</td>
<td></td>
<td>Euhedral-subhedral</td>
<td>Pale brown glass inclusions, spinel inclusions.</td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>8-10</td>
<td>0.2-0.8</td>
<td></td>
<td>Euhedral-subhedral</td>
<td>Glass and rare clinopyroxene inclusions.</td>
</tr>
<tr>
<td>Spinel</td>
<td>Trace</td>
<td>0.01-0.1</td>
<td></td>
<td>Subhedral</td>
<td>Usually associated with glomerocrysts.</td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>1-3</td>
<td>0.2-0.8</td>
<td></td>
<td>Subhedral</td>
<td>Glass and rare orthopyroxene inclusions.</td>
</tr>
</tbody>
</table>

**Groundmass**

| Glass       | 35-45           | N/A       |             | N/A        | Light brown glass (with microlites). |
| Microlites  | 35-45           | <0.01-0.015 |             | Needles/laths | Probably half plagioclase and half pyroxene. |

**Secondary Mineralogy**

<table>
<thead>
<tr>
<th>Vesicles/</th>
<th>Percent Present</th>
<th>Size (mm)</th>
<th>Filling</th>
<th>Shape</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clays</td>
<td>3-6</td>
<td>Glass</td>
<td></td>
<td>Brown amorphous clays following perlitic pattern.</td>
<td></td>
</tr>
</tbody>
</table>

**Vesicles/Cavities**

<table>
<thead>
<tr>
<th>Vesicles</th>
<th>Percent Location</th>
<th>Size (mm)</th>
<th>Filling</th>
<th>Shape</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clays</td>
<td>Throughout 0.1-2</td>
<td></td>
<td></td>
<td>Round-oval</td>
<td>Glomerocrysts of plagioclase + or - pyroxene up to 3 mm diameter. This rock is very fresh although the matrix is microcrystalline without patches of crystal-free glass. Same as rock in 786B-16R-02 (32-36 cm).</td>
</tr>
</tbody>
</table>

125-786B-16R-02 (Piece 6, 32-36 cm)  
**Observer:** JOH  
**Where Sampled:** Izu-Bonin outer-arc high

**Rock Name:** Brecciated andesite  
**Grain Size:** 0.2-1 mm  
**Texture:** Brecciated glomerophyric

**Primary Mineralogy**

<table>
<thead>
<tr>
<th>Phenocrysts</th>
<th>Percent Present</th>
<th>Size (mm)</th>
<th>Composition</th>
<th>Morphology</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plagioclase</td>
<td>8-11</td>
<td>0.2-1</td>
<td></td>
<td>Euhedral-subhedral</td>
<td>Spinel and pale brown glass inclusions.</td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>6-9</td>
<td>0.2-0.8</td>
<td></td>
<td>Euhedral-subhedral</td>
<td>Glass and rare clinopyroxene inclusions.</td>
</tr>
<tr>
<td>Spinel</td>
<td>Trace</td>
<td>0.01-0.1</td>
<td></td>
<td>Subhedral</td>
<td>Usually associated with plagioclase and pyroxene.</td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>1-3</td>
<td>0.2-0.8</td>
<td></td>
<td>Subhedral</td>
<td>Glass and rare orthopyroxene inclusions.</td>
</tr>
</tbody>
</table>

**Groundmass**

| Glass       | 25-35           | N/A       |             | N/A        | Light brown glass (interstitial to microlite mesh). |
| Microlites  | 25-35           | <0.01-0.015 |             | Needles/laths | Probably half plagioclase and pyroxene. |

**Secondary Mineralogy**

| Zeolites    | 8-10            | Vesicles, vesicles |         |         | Brown-grey, amorphous clay filling perlitic fractures and obscuring patches of glass/matrix. |
| Chlorite    | 5-10            | Glass, veins       |         |         | Pale green-yellow, slightly pleochroic, low birefringence, 0.01-0.02 wide as veins. |

**Vesicles/Cavities**

<table>
<thead>
<tr>
<th>Vesicles</th>
<th>Percent Location</th>
<th>Size (mm)</th>
<th>Filling</th>
<th>Shape</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clays</td>
<td>Throughout 0.1-1.5</td>
<td></td>
<td>Zeolite</td>
<td>Round-irregular</td>
<td>Glomerocrysts of plagioclase + or - pyroxene up to 2 mm in diameter.</td>
</tr>
</tbody>
</table>

**Comments:** Same as 786B-16R-01 (137-146 cm), but brecciated and more altered especially along breccia zones. Glomerocrysts of plagioclase + or - pyroxene up to 2 mm in diameter.
SITE 786

125-786B-19R-01 (Piece 14.91-94 cm)  OBSERVER: JOH  WHERE SAMPLED: Izu-Bonin outer-arc high

ROCK NAME: Andesite flow
GRAIN SIZE: Fine-grained
TEXTURE: Porphyritic

<table>
<thead>
<tr>
<th>PRIMARY MINERALOGY</th>
<th>PERCENT PRESENT</th>
<th>SIZE (mm)</th>
<th>COMPOSITION</th>
<th>MORPHOLOGY</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHENOCRYSTS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plagioclase</td>
<td>12-15</td>
<td>12-15</td>
<td>N/A</td>
<td>Euhedral</td>
<td>Spinel and glass inclusions.</td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>10-12</td>
<td>10-12</td>
<td>0.1-1.4</td>
<td>Euhedral</td>
<td>Spinel and glass inclusions, sparse twinning, pale green and slightly pleochroic.</td>
</tr>
<tr>
<td>Spinel</td>
<td>Trace</td>
<td>Trace</td>
<td>&lt;0.1</td>
<td>Euhedral-subhedral</td>
<td>Glass inclusions.</td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>3-5</td>
<td>3-5</td>
<td>0.1-1.4</td>
<td>Euhedral-subhedral</td>
<td></td>
</tr>
</tbody>
</table>

| GROUNDMASS         |                |           |             |            |          |
| Glass              | 12-17          | 20-30     | N/A         |            | Pale to medium yellow-brown, 15-30% altered. |
| Matrix             | 40-50          | 45-50     | <0.01       |            | Plagioclase and pyroxene needles (in glassy matrix). |
| Spinel             | 1              | 1         | <0.01       | Euhedral   |

<table>
<thead>
<tr>
<th>SECONDARY MINERALOGY</th>
<th>PERCENT REPLACING/ FILLING</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clays</td>
<td>10-25 Glass/matrix</td>
<td>Brown and grey amorphous clay altered in a patchy pattern, some patches 10-20% altered, some 30-40%.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>VELOCITIES/CAVITIES</th>
<th>SIZE</th>
<th>FILLING</th>
<th>SHAPE</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vesicles</td>
<td>3-7</td>
<td>Throughout 0.9-2.4</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>VESICLES/CAVITIES</th>
<th>SIZE</th>
<th>FILLING</th>
<th>SHAPE</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vesicles</td>
<td>3-5</td>
<td>Throughout 0.1-1.1</td>
<td>No</td>
<td>Irregular</td>
</tr>
</tbody>
</table>

125-786B-21R-01 (Piece 3.26-29 cm)  OBSERVER: JOH  WHERE SAMPLED: Izu-Bonin outer-arc high

ROCK NAME: Andesite
GRAIN SIZE: 0.2-1.2 mm
TEXTURE: Porphyritic

<table>
<thead>
<tr>
<th>PRIMARY MINERALOGY</th>
<th>PERCENT PRESENT</th>
<th>SIZE (mm)</th>
<th>COMPOSITION</th>
<th>MORPHOLOGY</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHENOCRYSTS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plagioclase</td>
<td>12-15</td>
<td>14-17</td>
<td>0.2-1.2</td>
<td>Subhedral</td>
<td>Spinel inclusions, altered, moth-eaten, oscillatory zoning.</td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>5-7</td>
<td>6-9</td>
<td>0.2-0.8</td>
<td>Euhedral-subhedral</td>
<td>Pale-yellow-green in plane light, altered, rare twinning.</td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>1-2</td>
<td>2-4</td>
<td>0.2-0.6</td>
<td>Subhedral</td>
<td>Altered.</td>
</tr>
</tbody>
</table>

| GROUNDMASS         |                |           |             |            |          |
| Glass              | 0              | 55-65     | N/A         | Laths      |          |
| Plagioclase        | 15-20          | 20-25     | <0.2        | Euhedral-subhedral | Equant, mostly in matrix, same as inclusions. |
| Magnetite           | 1              | 1         | <0.01       | Euhedral-subhedral |          |

<table>
<thead>
<tr>
<th>SECONDARY MINERALOGY</th>
<th>PERCENT REPLACING/ FILLING</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clays</td>
<td>50-65 Pyroxene, glass</td>
<td>Dark brown; patchy; pervasive; variable.</td>
</tr>
<tr>
<td>Chlorite</td>
<td>5-15</td>
<td>Slight pale yellow-green pleochroism.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>VELOCITIES/CAVITIES</th>
<th>SIZE</th>
<th>FILLING</th>
<th>SHAPE</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vesicles</td>
<td>3-5</td>
<td>Throughout 0.1-1.1</td>
<td>No</td>
<td>Irregular</td>
</tr>
</tbody>
</table>

COMMENTS: Alteration boundary between <60% clay alteration to >75%. Plagioclase is typically moth-eaten and appears to be marking glomerocrysts of radiating plagioclase + or - pyroxene.
SITE 786

125-786B-21R-01 (Piece 7, 59-63 cm)  OBSERVER: JON  WHERE SAMPLIED: Izu-Bonin outer-arc high

ROCK NAME: Volcanic breccia
GRAIN SIZE: Glassy
TEXTURE: Brecciated

<table>
<thead>
<tr>
<th>PRIMARY MINERALOGY</th>
<th>PERCENT PRESENT</th>
<th>PERCENT SIZE</th>
<th>COMPOSITION</th>
<th>MORPHOLOGY</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHENOCRYSTSS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>8-10</td>
<td>10-12</td>
<td>&lt;0.2</td>
<td>Anhedral</td>
<td>Fragmented. Do not have quench texture.</td>
</tr>
<tr>
<td>Spinel</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>&lt;0.1</td>
<td>Subhedral</td>
<td>Dark blood-red to black.</td>
</tr>
<tr>
<td>GROUNDMASS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glass</td>
<td>20-40</td>
<td>80-90</td>
<td>N/A</td>
<td>N/A</td>
<td>Glassy fragments 0.5-2 mm in diameter in a clay matrix; fresh glass is yellow.</td>
</tr>
<tr>
<td>SECONDARY MINERALOGY</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clays</td>
<td>55-70</td>
<td>Glass</td>
<td></td>
<td></td>
<td>Yellow-brown to dark brown, amorphous, pervasive, 10-20% of glass fragments, 100% of breccia matrix.</td>
</tr>
<tr>
<td>Chlorite</td>
<td>1-2</td>
<td>Glass</td>
<td></td>
<td></td>
<td>Along fractures in glassy pieces in breccia.</td>
</tr>
</tbody>
</table>

COMMENTS: One end of thin section is glass broken up in a clay matrix, the other is altered sediment with pyroxene fragments. The connecting portion is missing. The sediment is a hematite-stained clay matrix with 10% pyroxene lithic fragments. Paint layering is apparent.

125-786B-21R-01 (Piece 10, 105-107 cm)  OBSERVER: SAN  WHERE SAMPLIED: Izu-Bonin outer-arc high

ROCK NAME: Andesitic tuff
GRAIN SIZE: 0.3-2 mm
TEXTURE: Tuffaceous

<table>
<thead>
<tr>
<th>PRIMARY MINERALOGY</th>
<th>PERCENT PRESENT</th>
<th>PERCENT SIZE</th>
<th>COMPOSITION</th>
<th>MORPHOLOGY</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHENOCRYSTSS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plagioclase</td>
<td>3-7</td>
<td>4-8</td>
<td>0.4-2</td>
<td>Subhedral-euhedral</td>
<td>Twinning is common.</td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>1-2</td>
<td>1-2</td>
<td>0.3-1</td>
<td>Subhedral-euhedral</td>
<td>Pale green to colorless.</td>
</tr>
<tr>
<td>Spinel</td>
<td>1</td>
<td>1</td>
<td>&lt;0.2</td>
<td>Euhedral</td>
<td>Black.</td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>2-3</td>
<td>2-3</td>
<td>0.3-1</td>
<td>Subhedral-euhedral</td>
<td>Pale green to colorless.</td>
</tr>
<tr>
<td>GROUNDMASS</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>SECONDARY MINERALOGY</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clays</td>
<td>82-88</td>
<td>Matrix</td>
<td></td>
<td>Brown, amorphous, pervasive.</td>
<td></td>
</tr>
<tr>
<td>Chlorite</td>
<td>5</td>
<td>Matrix</td>
<td></td>
<td>Pale green to colorless and intermixed with clays.</td>
<td></td>
</tr>
</tbody>
</table>

COMMENTS: Glomerocrysts of plagioclase + pyroxene up to 2 mm in diameter in a tuff.
**Site 786**

---

**125-786B-21R-01 (Piece 120,129-132 cm)**  
**Observer:** Jon  
**Where Sampled:** Izu-Bonin outer-arc high

**Rock Name:** Dacite  
**Grain Size:** 0.1-1.2  
**Texture:** Sparsely phytic

<table>
<thead>
<tr>
<th>Primary Mineralogy</th>
<th>Percent Present</th>
<th>Percent Original (mm)</th>
<th>Composition</th>
<th>Morphology</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phenocrysts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plagioclase</td>
<td>5-7</td>
<td>6-8</td>
<td>0.3-1.2</td>
<td>Euhedral</td>
<td>Fractured, sparse glass inclusions.</td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>1-2</td>
<td>&lt;2</td>
<td>0.15-0.18</td>
<td>Anhedral</td>
<td>Pale green to gray, sparse spinel inclusions.</td>
</tr>
<tr>
<td>Spinel</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>0.1-0.2</td>
<td>Anhedral</td>
<td></td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>N/A</td>
<td>Anhedral</td>
<td></td>
</tr>
<tr>
<td>Groundmass</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glass</td>
<td>65-70</td>
<td>65-75</td>
<td>N/A</td>
<td></td>
<td>Yellow-gold, locally devitrified, perlitic fracture.</td>
</tr>
<tr>
<td>Microlites</td>
<td>18-20</td>
<td>18-20</td>
<td>&lt;0.02</td>
<td>Needles</td>
<td>Locally aligned.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Secondary Mineralogy</th>
<th>Percent Filling</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clays</td>
<td>&lt;1.0</td>
<td>Glass/veins</td>
</tr>
<tr>
<td>Carbonate?</td>
<td></td>
<td>Brown to gray, amorphous.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Vesicles/Cavities</th>
<th>Percent Location (mm)</th>
<th>Filling</th>
<th>Shape</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vesicles</td>
<td>3-6</td>
<td>No</td>
<td>Irregular-round</td>
</tr>
</tbody>
</table>

---

**125-786B-21R-02 (Piece 6,72-76 cm)**  
**Observer:** Jon  
**Where Sampled:** Izu-Bonin outer-arc high

**Rock Name:** Two-pyroxene basalt  
**Grain Size:** 0.1-1 mm  
**Texture:** Moderately phytic

<table>
<thead>
<tr>
<th>Primary Mineralogy</th>
<th>Percent Present</th>
<th>Percent Original (mm)</th>
<th>Composition</th>
<th>Morphology</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phenocrysts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>5-8</td>
<td>20-25</td>
<td>0.1-0.8</td>
<td>Subhedral-anhedral</td>
<td>Some are completely replaced by carbonate / hematite, others have spinel inclusions.</td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>2-5</td>
<td>3-5</td>
<td>0.2-0.5</td>
<td>Euhedral-subhedral</td>
<td>Spinel inclusions.</td>
</tr>
<tr>
<td>Groundmass</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glass</td>
<td>0</td>
<td>50-60</td>
<td>N/A</td>
<td></td>
<td>100% pervasively altered to clays.</td>
</tr>
<tr>
<td>Plagioclase</td>
<td>18-25</td>
<td>25-30</td>
<td>&lt;0.15</td>
<td>Laths</td>
<td>Black individual blebs and euhedral crystals.</td>
</tr>
<tr>
<td>Magnetite</td>
<td>1-2</td>
<td>1-2</td>
<td>&lt;0.05</td>
<td>Irregular</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Secondary Mineralogy</th>
<th>Percent Filling</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clays</td>
<td>35-45</td>
<td>Glass</td>
</tr>
<tr>
<td>Carbonate</td>
<td>18-32</td>
<td>Clinopyroxene, vesicles and veins</td>
</tr>
<tr>
<td>Chlorite</td>
<td>10-12</td>
<td>Glass, clinopyroxene</td>
</tr>
<tr>
<td>Hematite</td>
<td>7-10</td>
<td>Clinopyroxene</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Vesicles/Cavities</th>
<th>Percent Location (mm)</th>
<th>Filling</th>
<th>Shape</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vesicles</td>
<td>1-3</td>
<td>Carbonate</td>
<td>Round-irregular</td>
</tr>
</tbody>
</table>

**Comments:** Glomerocrysts of pyroxene are common, (both fresh and altered). Fe/carbonate alteration similar to 786B-32R-01, 121-122 cm, 786B-31R-02, 86-87 cm.

---
ROCK NAME: Plagioclase-phyric dacite

GRAIN SIZE: Fine-grained

TEXTURE: Sparsely phyric

<table>
<thead>
<tr>
<th>PRIMARY MINERALLY</th>
<th>PERCENT PRESENT</th>
<th>PERCENT ORIGINAL (mm)</th>
<th>COMPOSITION</th>
<th>MORPHOLOGY</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHENOCYSTS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plagioclase</td>
<td>7-8</td>
<td>7-9</td>
<td>0.2-1.2</td>
<td>N/A</td>
<td>Altered glass inclusions.</td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>1-2</td>
<td>1-2</td>
<td>&lt;0.8</td>
<td>Euhedral-anhedral</td>
<td>Pale green, rarely twinned.</td>
</tr>
<tr>
<td>Spinel</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>&lt;0.5</td>
<td>Euhedral</td>
<td>Pale gray to light brown.</td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>Trace</td>
<td>Trace</td>
<td>0.5</td>
<td>N/A</td>
<td>Deep blood red.</td>
</tr>
<tr>
<td>GROUNDMASS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glass</td>
<td>&lt;10</td>
<td>65-70</td>
<td>N/A</td>
<td>N/A</td>
<td>Yellow, locally devitrified, largely altered to clays.</td>
</tr>
<tr>
<td>Microlites</td>
<td>12-15</td>
<td>15-20</td>
<td>&lt;0.01</td>
<td>Equant, needles</td>
<td>May be pyroxene, locally aligned.</td>
</tr>
</tbody>
</table>

SECONDARY MINERALOGY

<table>
<thead>
<tr>
<th>SECONDARY MINERALOGY</th>
<th>PERCENT</th>
<th>REPLACING</th>
<th>FILLING</th>
<th>SHAPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clays</td>
<td></td>
<td>Glass, plagioclase, microlites</td>
<td>Dark brown, amorphous, pervasive, especially concentrated along fracture in glass.</td>
<td></td>
</tr>
</tbody>
</table>

VESSICLES/CAVITIES

<table>
<thead>
<tr>
<th>VESSIONS/CAVITIES</th>
<th>PERCENT</th>
<th>LOCATION (mm)</th>
<th>FILLING</th>
<th>SHAPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vesicles</td>
<td>&lt;1</td>
<td></td>
<td>None</td>
<td>Rounded-Irregular</td>
</tr>
</tbody>
</table>

COMMENTS: Sparse glomerocrysts of plagioclase and pyroxene up to 1 mm diameter. Some appear physically disaggregated. Clay alteration obscures much of the original texture in the groundmass.

ROCK NAME: Sparsely phyric dacite

GRAIN SIZE: 0.2-0.8 mm

TEXTURE: Glomerophyric

<table>
<thead>
<tr>
<th>PRIMARY MINERALLY</th>
<th>PERCENT PRESENT</th>
<th>PERCENT ORIGINAL (mm)</th>
<th>COMPOSITION</th>
<th>MORPHOLOGY</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHENOCYSTS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plagioclase</td>
<td>4-6</td>
<td>5-7</td>
<td>0.2-0.8</td>
<td>Euhedral-subhedral</td>
<td>Pale-green, rarely twinned.</td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>&lt;2</td>
<td>1-2</td>
<td>0.1-0.8</td>
<td>Subhedral-euhedral</td>
<td>Pale green to yellow pleochroism.</td>
</tr>
<tr>
<td>Spinel</td>
<td>Trace</td>
<td>Trace</td>
<td>&lt;0.3</td>
<td>Irregular-rounded</td>
<td>N/A</td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>&lt;1</td>
<td>1</td>
<td>0.1-0.6</td>
<td>N/A</td>
<td>Tiny in groundmass, may be secondary.</td>
</tr>
<tr>
<td>GROUNDMASS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glass</td>
<td>&lt;5</td>
<td>55-60</td>
<td>N/A</td>
<td>N/A</td>
<td>Devitrified, altered.</td>
</tr>
<tr>
<td>Microlites</td>
<td>32-35</td>
<td>35-38</td>
<td>&lt;0.15</td>
<td>Needles</td>
<td>Probably plagioclase, locally aligned.</td>
</tr>
<tr>
<td>Spinel/magnetite</td>
<td>1</td>
<td>1</td>
<td>&lt;0.01</td>
<td>Equant-irregular</td>
<td>Tiny in groundmass, may be secondary.</td>
</tr>
</tbody>
</table>

SECONDARY MINERALOGY

<table>
<thead>
<tr>
<th>SECONDARY MINERALOGY</th>
<th>PERCENT</th>
<th>REPLACING</th>
<th>FILLING</th>
<th>SHAPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clays</td>
<td>48-55</td>
<td>Glass, matrix</td>
<td>Brown to dark gray, amorphous, pervasive, variable.</td>
<td></td>
</tr>
<tr>
<td>Hematite</td>
<td>7-10</td>
<td>Glass/matrix</td>
<td>Intimately mixed with clay.</td>
<td></td>
</tr>
</tbody>
</table>

VESSICLES/CAVITIES

<table>
<thead>
<tr>
<th>VESSIONS/CAVITIES</th>
<th>PERCENT</th>
<th>LOCATION (mm)</th>
<th>FILLING</th>
<th>SHAPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vesicles</td>
<td>7-10</td>
<td>Throughout 0.1-2.5</td>
<td>None</td>
<td>Irregular</td>
</tr>
</tbody>
</table>

COMMENTS: Glomerocrysts of plagioclase + or - pyroxene.
### 125-786B-26R-01 (Piece 8.67-68 cm)

**Observer:** SAB  
**Where Sampled:** Izu-Bonin outer-arc high

**Rock Name:** Pumice  
**Grain Size:** 0.5-2 mm  
**Texture:** Glassy, vesicular

#### Primary Mineralogy
- **Phenocrysts**
  - Plagioclase: 2 pieces, 0.5-2 mm
  - Clinopyroxene: 1 piece, 0.5-1 mm

- **Groundmass**
  - Glass: <5 pieces, 97 pieces, N/A

#### Secondary Mineralogy
- **Clays:** >93 pieces, Glass

#### Vesicles/Cavities
- **Vesicles:** 15-20 pieces, Random, <12 mm

#### Composition

<table>
<thead>
<tr>
<th>Component</th>
<th>Percent Present</th>
<th>Percent Original (mm)</th>
<th>Composition</th>
<th>Morphology</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phenocrysts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plagioclase</td>
<td>2</td>
<td>2</td>
<td></td>
<td>Euhedral-subhedral</td>
<td>Twinning is present.</td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>1</td>
<td>1</td>
<td></td>
<td>Subhedral</td>
<td></td>
</tr>
<tr>
<td>Groundmass</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glass</td>
<td>&lt;5</td>
<td>97</td>
<td>N/A</td>
<td></td>
<td>Devitrified.</td>
</tr>
</tbody>
</table>

| Phenocrysts        |                 |                       |             |                     |                       |
| Plagioclase        | 2-3             | 2-3                   | 0.2-1.2     | Euhedral-subhedral  | Altered, Moch-esten texture. |
| Orthopyroxene      | 2-3             | 2-3                   | N/A         | Euhedral-subhedral  | Pale gray-green.       |
| Spinel             | 1-2             | 1-2                   | 0.2-0.8     | Euhedral-subhedral  | Very pale green, spinel and fluid inclusions(?) |

#### Vesicles/Cavities
- **Vesicles:** 10-12 pieces, Throughout, 0.1-2 mm

### 125-786B-27R-01 (Piece 12.91-93 cm)

**Observer:** JOH  
**Where Sampled:** Izu-Bonin outer-arc high

**Rock Name:** Dacite  
**Grain Size:**  
**Texture:** Sparsely phryic, brecciated

#### Primary Mineralogy
- **Phenocrysts**
  - Plagioclase: 2-3 pieces, 0.2-1.2 mm
  - Clinopyroxene: 1-2 pieces, 0.2-0.8 mm
  - Orthopyroxene: 2-3 pieces, N/A

- **Microcrysts**
  - Orthopyroxene: Trace, Trace <0.2

- **Groundmass**
  - Glass: <10 pieces, 70-77 pieces, N/A
  - Microcrysts: 15-18 pieces, 18-22 pieces, <0.02

#### Secondary Mineralogy
- **Clays:** 15-65 pieces, Glass

#### Vesicles/Cavities
- **Vesicles:** 10-12 pieces, Throughout, 0.1-2 mm

#### Composition

<table>
<thead>
<tr>
<th>Component</th>
<th>Percent Present</th>
<th>Percent Original (mm)</th>
<th>Composition</th>
<th>Morphology</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phenocrysts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plagioclase</td>
<td>2-3</td>
<td>2-3</td>
<td>0.2-1.2</td>
<td>Euhedral-subhedral</td>
<td>Altered, Moch-esten texture.</td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>1-2</td>
<td>1-2</td>
<td>0.2-0.8</td>
<td>Euhedral-subhedral</td>
<td>Pale gray-green.</td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>2-3</td>
<td>2-3</td>
<td>N/A</td>
<td>Euhedral-subhedral</td>
<td>Very pale green, spinel and fluid inclusions(?)</td>
</tr>
<tr>
<td>Microcrysts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>Trace</td>
<td>Trace</td>
<td>&lt;0.2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Vesicles/Cavities
- **Vesicles:** 10-12 pieces, Throughout, 0.1-2 mm

**Comments:** Crystallization sequence is clearly plagioclase-pyroxene. Individual breccia fragments have an alignment of matrix microcrysts, probably indicating flow direction.
**SITE 786**

125-786B-27R-01 (Piece 13,101-104 cm)  
**ROCK NAME:** Dacite breccia  
**GRAIN SIZE:** 0.2-1 mm  
**TEXTURE:** Sparsely phyllic, brecciated

<table>
<thead>
<tr>
<th>PRIMARY MINERALOGY</th>
<th>PERCENT</th>
<th>PERCENT</th>
<th>SIZE</th>
<th>COMPOSITION</th>
<th>MORPHOLOGY</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHENOCRYSTS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plagioclase</td>
<td>2-3</td>
<td>2-3</td>
<td>0.2-1</td>
<td>Subhedral-euhedral</td>
<td>Twinning and zoning.</td>
<td></td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>1-2</td>
<td>1-2</td>
<td>0.2-5.8</td>
<td>Subhedral-subhedral</td>
<td>Pale green to colorless.</td>
<td></td>
</tr>
<tr>
<td>Spinel</td>
<td>1</td>
<td>1</td>
<td>&lt;0.2</td>
<td>Euhedral-anhedral</td>
<td>Black.</td>
<td></td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>2-3</td>
<td>2-3</td>
<td>0.2-0.8</td>
<td>Subhedral-subhedral</td>
<td>Pale green to colorless.</td>
<td></td>
</tr>
<tr>
<td>GROUNDMASS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glass</td>
<td>10</td>
<td>70-77</td>
<td>N/A</td>
<td>N/A</td>
<td>Laths, needles</td>
<td>Plagioclase and/or pyroxenes(?).</td>
</tr>
<tr>
<td>Microcrysts</td>
<td>15-18</td>
<td>20</td>
<td>&lt;0.02</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**SECONDARY MINERALOGY**

<table>
<thead>
<tr>
<th>PERCENT</th>
<th>REPLACING/ FILLING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clays</td>
<td>55-65 Glass</td>
</tr>
<tr>
<td>Chlorite</td>
<td>5 Matrix</td>
</tr>
<tr>
<td>Hematite</td>
<td>Trace</td>
</tr>
</tbody>
</table>

**VESICLES/CAVITIES**

<table>
<thead>
<tr>
<th>PERCENT</th>
<th>LOCATION</th>
<th>SIZE</th>
<th>FILLING</th>
<th>SHAPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vesicles</td>
<td>5-10</td>
<td>Random &lt;2</td>
<td>No</td>
<td>Round, oval</td>
</tr>
</tbody>
</table>

---

125-786B-27R-02 (Piece 7,57-59 cm)  
**ROCK NAME:** Two-pyroxene-plagioclase boninite  
**GRAIN SIZE:** 0.3-2 mm  
**TEXTURE:** Glomerophytic

<table>
<thead>
<tr>
<th>PRIMARY MINERALOGY</th>
<th>PERCENT</th>
<th>PERCENT</th>
<th>SIZE</th>
<th>COMPOSITION</th>
<th>MORPHOLOGY</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHENOCRYSTS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plagioclase</td>
<td>15-20</td>
<td>0.3-3</td>
<td></td>
<td>Subhedral-euhedral</td>
<td>Moth-eaten texture in larger crystals; spinel and fluid inclusions; some are corroded.</td>
<td></td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>7-10</td>
<td>9-12</td>
<td>0.2-2</td>
<td>Subhedral-euhedral</td>
<td>Brown-black.</td>
<td></td>
</tr>
<tr>
<td>Spinel</td>
<td>Trace</td>
<td>Trace</td>
<td>&lt;0.2</td>
<td>Equant</td>
<td>Subhedral-subhedral</td>
<td>Pale-green to colorless.</td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>2-5</td>
<td>3-6</td>
<td>0.2-1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GROUNDMASS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glass</td>
<td>10</td>
<td>35-45</td>
<td>N/A</td>
<td>N/A</td>
<td>Lath-prismatic</td>
<td>Microlites.</td>
</tr>
<tr>
<td>Plagioclase</td>
<td>10</td>
<td>30</td>
<td>&lt;0.1</td>
<td>Lath</td>
<td>Microlites.</td>
<td></td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>10</td>
<td>10-12</td>
<td>&lt;0.2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SECONDARY MINERALOGY</td>
<td>PERCENT</td>
<td>REPLACING/ FILLING</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clays</td>
<td>25</td>
<td>Glass Brown-gray, amorphous clay pervasive throughout slide.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**VESICLES/CAVITIES**

<table>
<thead>
<tr>
<th>PERCENT</th>
<th>LOCATION</th>
<th>SIZE</th>
<th>FILLING</th>
<th>SHAPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vesicles</td>
<td>N/A</td>
<td>Throughout</td>
<td>0.4-3</td>
<td>No</td>
</tr>
</tbody>
</table>

**COMMENTS:** Glomerocrysts of plagioclase + pyroxenes. Larger glomerocrysts appear to be more "moth-eaten" than separate crystals.
SITE 786

125-786B-10R-01 (Piece 20, 29-31 cm)  OBSERVER: JOH  WHERE SAMPL: Izu-Bonin outer-arc high

ROCK NAME: Two-pyroxene-plagioclase boninite
GRAIN SIZE: 0.3-3 mm
TEXTURE: Highly phyric

PRIMARY MINERALOGY  PERCENT  PERCENT SIZE  COMPOSITION  MORPHOLOGY  COMMENTS
PRENCRYSTES
Plagioclase 8-11 8-12 0.3-3 Euhedral-anehedral  Moth-eaten texture common, normal and reverse zoning, rare spinel inclusions. Some are pale green, complex twinning, rare spinel inclusions. Deep blood-red to black.
Clinopyroxene 20-23 20-25 0.3-1.7 Euhedral-anehedral
Spinel 1 1 <0.2
Orthopyroxene 3-5 3-5 0.4-1.4 Subhedral Pale green to colorless.

GROUNDMASS
Glass <5 25-35 N/A N/A
Pyroxene 8-10 10-12 <0.2 Subhedral
Plagioclase? 18-20 22-25 <0.2 Needles Microtites of white, low-birefringent mineral with inclined extinction.
Magnetite 1-2 1-2 <0.01 Euhedral

SECONDARY MINERALOGY  PERCENT ORIGINAL SIZE  FILLING SHAPE COMMENTS
Clays 20-23 20-25 0.3-1.7 No
Pyroxene 8-10 10-12 <0.2
Plagioclase? 18-20 22-25 <0.2
Magnetite 1-2 1-2 <0.01

VESICLES/CAVITIES  PERCENT LOCATION SIZE  FILLING SHAPE  COMMENTS
VESICLES 15-20 Throughout 0.5-4 Yes Irregular Some filled with carbonate, others lined with chlorite(?).

COMMENTS: Glomerocrysts of plagioclase, clinopyroxene, spinel up to 3 cm diameter. Crystals are smaller and may be tectonized.

125-786B-12R-02 (Piece 8, 86-87 cm)  OBSERVER: JOH  WHERE SAMPL: Izu-Bonin outer-arc high

ROCK NAME: Olivine-clinopyroxene-plagioclase boninite
GRAIN SIZE: 0.2-1.5 mm
TEXTURE: Glomerophytic

PRIMARY MINERALOGY  PERCENT  PERCENT SIZE  COMPOSITION  MORPHOLOGY  COMMENTS
PRENCRYSTES
Olivine 0 7-10 0.4-2 Subhedral Altered completely to carbonate + Fe-oxide.
Clinopyroxene 7-10 9-12 0.3-1 Euhedral-anehedral Glass and spinel inclusions, twinned, pale pink to yellow-green.
Spinel <1 <1 <0.2 Subhedral
Orthopyroxene <2 <2 1.4 Subhedral
Plagioclase 10-15 12-18 0.4-1.5 Euhedral-anehedral Moth-eaten, some oscillatory-zoned, relict core.

GROUNDMASS
Glass 10-15 10-50 N/A N/A 60% altered to clays.
Pyroxene 5-7 7-9 0.2 Euhedral
Pyroxene 8-10 18-20 0.2-0.3 Subhedral
Micas 5-10 5-10 0.2-0.3 Euhedral
Magnetite 1-2 1-2 <0.02 Euhedral

SECONDARY MINERALOGY  PERCENT ORIGINAL SIZE  FILLING SHAPE  COMMENTS
Clays 20-23 20-25 0.3-1.7 No
Chlorite 10-12 Orthopyroxene, vesicles, glass Brown amorphous clay, pervasive.
Carbonate 8-10 Olivine/c clinopyroxene Directly replacing orthopyroxene and forming patches in the glass and matrix. Also see carbonate comments.
Hematite 3-5

VESICLES/CAVITIES  PERCENT LOCATION SIZE  FILLING SHAPE  COMMENTS
VESICLES 15-20 Throughout 0.5-4 Yes Irregular Some filled with carbonate, others lined with chlorite.

COMMENTS: Glomerocrystals of plagioclase, clinopyroxene and orthopyroxene are common. Carbonate/hematite alteration is similar to 786B-21R-01, 72-76 cm and 786B-32R-01, 121-122 cm.
SITE 786

125-786B-32R-01 (Piece 17,121-122 cm) OBSERVER: JOH WHERE SAMPLED: Izu-Bonin outer-arc high

ROCK NAME: Olivine-two-pyroxene-plagioclase boninite

GRAIN SIZE: 0.2-1.2 mm

TEXTURE: Glomerophyric

<table>
<thead>
<tr>
<th>PRIMARY MINERALOGY</th>
<th>PERCENT PRESENT</th>
<th>PERCENT ORIGINAL</th>
<th>SIZE (mm)</th>
<th>COMPOSITION</th>
<th>MORPHOLOGY</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phenocrysts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Olivine</td>
<td>0</td>
<td>7</td>
<td>0.2-1.2</td>
<td></td>
<td>Subhedral</td>
<td>100% altered to carbonate and hematite.</td>
</tr>
<tr>
<td>Plagioclase</td>
<td>6-8</td>
<td>7-10</td>
<td>N/A</td>
<td></td>
<td>Anhedral-euhedral</td>
<td>Worn-out texture, glass and spinel inclusions.</td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>4-6</td>
<td>5-7</td>
<td>0.2-1.2</td>
<td></td>
<td>Subhedral</td>
<td>Pale green to yellow, slightly pleochroic, spinel inclusions.</td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>2-4</td>
<td>3-5</td>
<td>0.2-1</td>
<td></td>
<td>Subhedral-anhedral</td>
<td></td>
</tr>
<tr>
<td>Groundmass</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glass</td>
<td>&lt;7</td>
<td>35-45</td>
<td>N/A</td>
<td></td>
<td>N/A</td>
<td>Devitrified.</td>
</tr>
<tr>
<td>Microcrysts</td>
<td>25-30</td>
<td>35-40</td>
<td>&lt;0.05</td>
<td></td>
<td>Needles</td>
<td>Probably plagioclase, vague twinning.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Secondary Mineralogy</th>
<th>Percent Present</th>
<th>Percent Original</th>
<th>Size (mm)</th>
<th>Filling</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clays</td>
<td>20-30</td>
<td>Glass</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carbonate</td>
<td>7-10</td>
<td>Olivine, vesicles/cavities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chlorite</td>
<td>25-30</td>
<td>Orthopyroxene, clinopyroxene, glass</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hematite</td>
<td>&lt;3</td>
<td>Olivine</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Vesicles/Cavities</th>
<th>Percent Location</th>
<th>Size (mm)</th>
<th>Filling</th>
<th>Shape</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glass</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plagioclase</td>
<td>10-15</td>
<td>Throughout 0.2-6</td>
<td>Carbonate</td>
<td>Irregular</td>
<td></td>
</tr>
<tr>
<td>Magnetite</td>
<td>4-6</td>
<td>&lt;0.08</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Vesicles/Cavities</th>
<th>Percent Location</th>
<th>Size (mm)</th>
<th>Filling</th>
<th>Shape</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glass</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plagioclase</td>
<td>10-15</td>
<td>Throughout 0.2-6</td>
<td>Carbonate</td>
<td>Irregular</td>
<td></td>
</tr>
<tr>
<td>Magnetite</td>
<td>4-6</td>
<td>&lt;0.08</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Vesicles/Cavities</th>
<th>Percent Location</th>
<th>Size (mm)</th>
<th>Filling</th>
<th>Shape</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glass</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plagioclase</td>
<td>10-15</td>
<td>Throughout 0.2-6</td>
<td>Carbonate</td>
<td>Irregular</td>
<td></td>
</tr>
<tr>
<td>Magnetite</td>
<td>4-6</td>
<td>&lt;0.08</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Vesicles/Cavities</th>
<th>Percent Location</th>
<th>Size (mm)</th>
<th>Filling</th>
<th>Shape</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glass</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plagioclase</td>
<td>10-15</td>
<td>Throughout 0.2-6</td>
<td>Carbonate</td>
<td>Irregular</td>
<td></td>
</tr>
<tr>
<td>Magnetite</td>
<td>4-6</td>
<td>&lt;0.08</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Vesicles/Cavities</th>
<th>Percent Location</th>
<th>Size (mm)</th>
<th>Filling</th>
<th>Shape</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glass</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plagioclase</td>
<td>10-15</td>
<td>Throughout 0.2-6</td>
<td>Carbonate</td>
<td>Irregular</td>
<td></td>
</tr>
<tr>
<td>Magnetite</td>
<td>4-6</td>
<td>&lt;0.08</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Vesicles/Cavities</th>
<th>Percent Location</th>
<th>Size (mm)</th>
<th>Filling</th>
<th>Shape</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glass</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plagioclase</td>
<td>10-15</td>
<td>Throughout 0.2-6</td>
<td>Carbonate</td>
<td>Irregular</td>
<td></td>
</tr>
<tr>
<td>Magnetite</td>
<td>4-6</td>
<td>&lt;0.08</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Vesicles/Cavities</th>
<th>Percent Location</th>
<th>Size (mm)</th>
<th>Filling</th>
<th>Shape</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glass</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plagioclase</td>
<td>10-15</td>
<td>Throughout 0.2-6</td>
<td>Carbonate</td>
<td>Irregular</td>
<td></td>
</tr>
<tr>
<td>Magnetite</td>
<td>4-6</td>
<td>&lt;0.08</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

COMMENTS: Clay alteration of groundmass severely obscures the texture and matrix mineral associations.
**SITE 7B46**

**125-786B-33R-01 (Piece 19A, 101-103 cm)**

**ROCK NAME:** Plagioclase-phyric andesite  
**GRAIN SIZE:** Fine- to medium-grained  
**TEXTURE:** Sparsely-phyric glassy rind  
**WHERE SAMPLED:** Izu-Bonin outer-arc high

### PRIMARY MINERALOGY

<table>
<thead>
<tr>
<th>MINERAL</th>
<th>PHENOCRYSTS</th>
<th>GROUNDMASS</th>
<th>SECONDARY MINERALOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plagioclase</td>
<td>4-7</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>&lt;1</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Spinel</td>
<td>&lt;1</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Glass</td>
<td>&lt;10</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Microlites</td>
<td>&lt;5</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

### SECONDARY MINERALOGY

<table>
<thead>
<tr>
<th>MINERAL</th>
<th>PERCENT</th>
<th>FILLING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clays</td>
<td>65-75</td>
<td>Glass</td>
</tr>
<tr>
<td>Carbonate</td>
<td>5-7</td>
<td>Veins</td>
</tr>
<tr>
<td>Chlorite</td>
<td>&lt;5</td>
<td>Veins</td>
</tr>
<tr>
<td>Sulfide</td>
<td>&lt;1</td>
<td>Veins</td>
</tr>
</tbody>
</table>

### VESICLES/CAVITIES

<table>
<thead>
<tr>
<th>SIZE</th>
<th>FILLING</th>
<th>SHAPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vesicles</td>
<td>5-7</td>
<td>0.1-1.5</td>
</tr>
</tbody>
</table>

### COMMENTS

- Rock has glassy pillow rind which is less altered than the rest of the sample. This rock is cut by carbonate veins and has secondary sulfide precipitation.

**125-786B-34R-01 (Piece 16, 128-130 cm)**

**ROCK NAME:** Plagioclase-phyric andesite  
**GRAIN SIZE:** 0.2-1.8 mm  
**TEXTURE:** Sparsely phric, glassy  
**WHERE SAMPLED:** Izu-Bonin outer-arc high

### PRIMARY MINERALOGY

<table>
<thead>
<tr>
<th>MINERAL</th>
<th>PHENOCRYSTS</th>
<th>GROUNDMASS</th>
<th>SECONDARY MINERALOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plagioclase</td>
<td>12-15</td>
<td>12-16</td>
<td>0.2-1.8</td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>3-5</td>
<td>4-6</td>
<td>0.2-1.2</td>
</tr>
<tr>
<td>Spinel</td>
<td>1-2</td>
<td>1-2</td>
<td>0.02-0.3</td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>1-2</td>
<td>1-2</td>
<td>0.3-0.8</td>
</tr>
<tr>
<td>Glass</td>
<td>30-40</td>
<td>65-75</td>
<td>N/A</td>
</tr>
<tr>
<td>Microlites</td>
<td>1-2</td>
<td>10-12</td>
<td>&lt;0.05</td>
</tr>
</tbody>
</table>

### SECONDARY MINERALOGY

<table>
<thead>
<tr>
<th>MINERAL</th>
<th>PERCENT</th>
<th>FILLING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clays</td>
<td>55-65</td>
<td>Glass</td>
</tr>
<tr>
<td>Prehnite?</td>
<td>2-5</td>
<td>Vesicle lining</td>
</tr>
</tbody>
</table>

### VESICLES/CAVITIES

<table>
<thead>
<tr>
<th>SIZE</th>
<th>FILLING</th>
<th>SHAPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vesicles</td>
<td>5-7</td>
<td>Throughout 0.2-4</td>
</tr>
</tbody>
</table>

### COMMENTS

- Phenocrysts tend to cluster but are not always in contact (glomerocrysts). Evidence of fracturing and dissociation of pieces is common. Sample may be brecciated or have large lithic, plagioclase-bearing xenoliths. Two matrix textures are present. This may also be a flow texture with variable alteration and recrystallization.
SITE 786

ROCK NAME: Altered basalt
GRAIN SIZE: 0.3-4 mm
TEXTURE: Moderately phyric

PRIMARY MINERALOGY

PHENOCRYSTS
- Clinopyroxene: 9-10, 20-25, 0.3-1
- Spinel: 1-2
- Orthopyroxene: 0, 3-5, 1-4

GROUNDMASS
- Glass: <5, 45-55, N/A
- Plagioclase: 15-17, 17-22, <0.15
- Pyroxene: 10-15, 15-20, <0.15

SECONDARY MINERALOGY
- Clays: 15-20, Glass
- Carbonate: 12-17, Veins, vesicles, pyroxene
- Chlorite: 23-30, Glass, pyroxene
- Hematite: 5-7, Pyroxene?
- CAVITIES
- Vesicles: 15-20, 3-6, 0.3-1

MORPHOLOGY
- Euhedral-anhedral, equant to elongate
- Euhedral-subhedral
- Anhedral, long, tabular crystals
- N/A
- Needles
- N/A

COMMENTS
- Light to deep brown, devitrified
- Highly altered
- Hematite intergrown with carbonate pseudomorphing what appears to be pyroxene judging from crystal shape and fracture/cleavage pattern
- Hematite also forms poorly defined veins in the groundmass
- Mostly as veins and patches 0.3-0.5 mm wide
- Less abundant than in basalt matrix

COMMENTS: This rock is highly altered and much of the original textural and modal information is obscured.

ROCK NAME: Dacite (inclusions in basalt)
GRAIN SIZE: Fine-grained to glassy
TEXTURE: Sparsely phyric

PRIMARY MINERALOGY

PHENOCRYSTS
- Plagioclase: 2-3, 3.5, 0.2-0.7
- Clinopyroxene: <1, <1, 0.1-0.4
- Spinel: 1-2, 1-2, <0.05

GROUNDMASS
- Plagioclase: 15-20, 17-22, <0.15
- Glass: 15-30, 70-80, 1-3

SECONDARY MINERALOGY
- Clays: 35-40, Glass
- Carbonate: 20-25, Veins, olivine, pyroxene
- Chlorite: 5-15, Pyroxenes, glass

MORPHOLOGY
- Euhedral to subhedral
- Euhedral
- Needles
- N/A

COMMENTS
- Highly altered, sparse spinel inclusions, glomerocrysts
- Altered to chlorite
- Equant
- Light yellow to brown, devitrified
- Less abundant than in basalt matrix

COMMENTS: Sample is two rock types in contact: a fresher glassy andesite basalt (described on a separate sheet) containing inclusions of dacite (described here).
**SITE 786**

**125-786B-34R-03 (Piece 12,108-109 cm) OBSERVER: JOH WHERE SAMPLED: Izu-Bonin outer-arc high**

ROCK NAME: Basalt (with dacite inclusions)

GRAIN SIZE: Fine-grained to glassy

TEXTURE: Moderately to sparsely phryic

<table>
<thead>
<tr>
<th>PRIMARY MINERALOGY</th>
<th>PERCENT PRESENT</th>
<th>PERCENT ORIGINAL</th>
<th>SIZE (mm)</th>
<th>COMPOSITION</th>
<th>MORPHOLOGY</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHENOCRYSTES</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Olivine?</td>
<td>0</td>
<td>1-2</td>
<td>0.5-1</td>
<td></td>
<td>Subhedral</td>
<td>Completely altered to carbonate and chlorite.</td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>1-3</td>
<td>2-3</td>
<td>0.3-3</td>
<td></td>
<td>Euhedral to subhedral</td>
<td>Usually tabular, rare spinel inclusions.</td>
</tr>
<tr>
<td>Spinel</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>&lt;0.1</td>
<td></td>
<td>Subhedral</td>
<td></td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>&lt;1</td>
<td>6-7</td>
<td>1-3</td>
<td></td>
<td>Euhedral to subhedral</td>
<td>Jacketed by clinopyroxene, also 5-6% completely chloritized.</td>
</tr>
<tr>
<td>GROUNDMASS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glass</td>
<td>15-20</td>
<td>75-85</td>
<td>1-3</td>
<td></td>
<td>N/A</td>
<td>Light yellow to brown, devitrified.</td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>8-10</td>
<td>10-12</td>
<td>&lt;0.1</td>
<td></td>
<td>Subhedral</td>
<td>Quench and microphenocrysts.</td>
</tr>
<tr>
<td>SECONDARY MINERALOGY</td>
<td>PERCENT FILLING</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clays</td>
<td>35-40</td>
<td>Glass</td>
<td></td>
<td></td>
<td></td>
<td>Brown, amorphous, pervasive.</td>
</tr>
<tr>
<td>Clays</td>
<td>&lt;2</td>
<td>Glass</td>
<td></td>
<td></td>
<td></td>
<td>Green, amorphous, patchy.</td>
</tr>
<tr>
<td>Carbonate</td>
<td>20-25</td>
<td>Veins, olivine, pyroxene</td>
<td>0.1-1.5</td>
<td></td>
<td>Mostly as veins and patches, 0.3-0.5 mm wide.</td>
<td></td>
</tr>
<tr>
<td>Chlorite</td>
<td>5-15</td>
<td>Pyroxenes, glass</td>
<td></td>
<td></td>
<td></td>
<td>Higher percentage in basalt than in dacite inclusions.</td>
</tr>
</tbody>
</table>

**VESELLES/CAVITIES**

<table>
<thead>
<tr>
<th>VESELLES/CAVITIES</th>
<th>PERCENT LOCATION</th>
<th>SIZE (mm)</th>
<th>FILLING</th>
<th>SHAPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vesicles</td>
<td>2-10</td>
<td>&lt;0.5</td>
<td>Carbonate</td>
<td>Irregular</td>
</tr>
</tbody>
</table>

COMMENTS: Sample consists of two rock types in contact: a fresher glassy basalt (described here) containing inclusions of dacite (described on a separate form).

**125-786B-35R-01 (Piece 9,73-76 cm) OBSERVER: HIR WHERE SAMPLED: Izu-Bonin outer-arc high**

ROCK NAME: Clinopyroxene-plagioclase dacite

GRAIN SIZE: 0.3-1.5 mm

TEXTURE: Porphyritic, hyalopilitic

<table>
<thead>
<tr>
<th>PRIMARY MINERALOGY</th>
<th>PERCENT PRESENT</th>
<th>PERCENT ORIGINAL</th>
<th>SIZE (mm)</th>
<th>COMPOSITION</th>
<th>MORPHOLOGY</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHENOCRYSTES</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plagioclase</td>
<td>5-10</td>
<td>5-10</td>
<td>0.5-1.5</td>
<td></td>
<td>Euhedral</td>
<td>Shows compositional zoning and twinning.</td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>2-3</td>
<td>2-3</td>
<td>0.3-1</td>
<td></td>
<td>Euhedral-subhedral</td>
<td>Frequently twinned.</td>
</tr>
<tr>
<td>GROUNDMASS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plagioclase</td>
<td>10-15</td>
<td>10-15</td>
<td>&gt;0.1</td>
<td></td>
<td>Euhedral</td>
<td>Typically quenched and slender prismatic crystals.</td>
</tr>
<tr>
<td>Glass</td>
<td>0</td>
<td>75-85</td>
<td>N/A</td>
<td></td>
<td>Euhedral-subhedral</td>
<td>Completely altered to brown clay.</td>
</tr>
<tr>
<td>Opaque</td>
<td>Trace</td>
<td>Trace</td>
<td>&gt;0.1</td>
<td></td>
<td></td>
<td>Scattered in groundmass.</td>
</tr>
<tr>
<td>SECONDARY MINERALOGY</td>
<td>PERCENT FILLING</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clays</td>
<td>75-85</td>
<td>Glass, vesicles</td>
<td></td>
<td></td>
<td></td>
<td>Pale green to pale brown in color.</td>
</tr>
<tr>
<td>VESELLES/CAVITIES</td>
<td>PERCENT LOCATION</td>
<td>SIZE (mm)</td>
<td>FILLING</td>
<td>SHAPE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vesicles</td>
<td>15</td>
<td>Random</td>
<td>0.1-5</td>
<td>Clay</td>
<td>Round to elongate</td>
<td></td>
</tr>
</tbody>
</table>

COMMENTS: Some plagioclase phenocrysts show corroded form.
**Site 786**

125-786B-35R-02 (Piece 16,122-126 cm)  
**Observer:** JOH  
**Where Sampled:** Izu-Bonin outer-arc high

**Rock Name:** Plagioclase-pyroxene phric dacite  
**Grain Size:** 0.2-2 mm  
**Texture:** Moderately phric

### Primary Mineralogy

<table>
<thead>
<tr>
<th>Phenoocrysts</th>
<th>Percent Present</th>
<th>Size (mm)</th>
<th>Composition</th>
<th>Morphology</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plagioclase</td>
<td>12-15</td>
<td>0.2-2</td>
<td></td>
<td>Subhedral-rounded</td>
<td>Most large crystals are moth-eaten with relic cores.</td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>7-9</td>
<td>0.2-1.3</td>
<td></td>
<td>Euhedral-subhedral</td>
<td>Pale green-yellow pleochroic, most have low (10-20 degrees) extinction angles, spinel inclusions.</td>
</tr>
<tr>
<td>Spinel</td>
<td>&lt;1</td>
<td>0.1-0.3</td>
<td></td>
<td>Round</td>
<td></td>
</tr>
</tbody>
</table>

### Groundmass

| Glass       | 10-20 | N/A |              | N/A         |          |
| Plagioclase | 25-35 | 50-60 |             | Needles, hollow | Very low birefringence, may not all be plagioclase. |
| Magnetite   | 1-2   | <0.01|             | Equant, irregular |          |

### Secondary Mineralogy

<table>
<thead>
<tr>
<th>Class</th>
<th>Percent Present</th>
<th>Original</th>
<th>Size (mm)</th>
<th>Composition</th>
<th>Morphology</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clays</td>
<td>30-40</td>
<td>Glass</td>
<td>0.2-0</td>
<td></td>
<td>Brown amorphous clay, pervasive.</td>
<td></td>
</tr>
<tr>
<td>Chlorite</td>
<td>15-15</td>
<td>Glass, clinopyroxene, veins</td>
<td>0.5-0.8</td>
<td>Green-yellow-brown birefringence pseudomorphing pyroxene and scattered intimately through glass.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Vesicles/ Cavities

<table>
<thead>
<tr>
<th>Size</th>
<th>Percent Location (mm)</th>
<th>Filling</th>
<th>Shape</th>
</tr>
</thead>
</table>

**Comments:** Some plagioclase crystals have large (0.2 mm) pyroxene inclusions. Glomerocrysts of plagioclase + or = clinopyroxene up to 3 mm diameter.

125-786B-37R-01 (Piece 6,44-47 cm)  
**Observer:** HIR  
**Where Sampled:** Izu-Bonin outer-arc high

**Rock Name:** Orthopyroxene-clinopyroxene-plagioclase dacite  
**Grain Size:** 0.5-1 mm  
**Texture:** Hyalo-ophitic, locally glomerophyric

### Primary Mineralogy

<table>
<thead>
<tr>
<th>Phenoocrysts</th>
<th>Percent Present</th>
<th>Size (mm)</th>
<th>Composition</th>
<th>Morphology</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Olivine</td>
<td>0</td>
<td>0.2-0.7</td>
<td></td>
<td>Euhedral</td>
<td>Completely altered to clay.</td>
</tr>
<tr>
<td>Plagioclase</td>
<td>10-15</td>
<td>0.5-1</td>
<td></td>
<td>Euhedral-anhedral</td>
<td>Compositional zoning and twinning are common.</td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>2-3</td>
<td>0.5-0.8</td>
<td></td>
<td>Subhedral-anhedral</td>
<td>Twining is common.</td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>&lt;1</td>
<td>0.5-1.5</td>
<td></td>
<td>Euhedral</td>
<td>Partly altered to clay.</td>
</tr>
</tbody>
</table>

### Groundmass

| Plagioclase  | 10-20 | 0.1-0.2 |             | Euhedral   | Slender quenched crystals are predominant. |
| Clinopyroxene| 1-2   | <0.1    |             | Anhedral   | Partly altered to clay, dusty. |
| Orthopyroxene| Trace | Trace  | <0.1        | Euhedral-subhedral | Showing relatively low birefringence. |
| Glass        | 60-75 | N/A     |             | N/A        | Completely altered to clay. |
|Opaque        | <1    | <1      |             | Euhedral-anhedral | Scattered throughout groundmass. |

### Secondary Mineralogy

<table>
<thead>
<tr>
<th>Class</th>
<th>Percent Present</th>
<th>Original</th>
<th>Size (mm)</th>
<th>Composition</th>
<th>Morphology</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clays</td>
<td>60-75</td>
<td>Olivine, orthopyroxene, vein, vesicles</td>
<td>Pale green to pale brown in color, low birefringence.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carbonate</td>
<td>&lt;2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Having characteristic high birefringence.</td>
</tr>
</tbody>
</table>

### Vesicles/ Cavities

<table>
<thead>
<tr>
<th>Size</th>
<th>Percent Location (mm)</th>
<th>Filling</th>
<th>Shape</th>
</tr>
</thead>
</table>

**Comments:** Calcite and clay veins (0.5-1 mm wide) run throughout the slide. Most of the plagioclase phenocrysts are dusty and show corroded form. Some plagioclase crystals occur as xenocrysts whose primary internal zonal structure was cut by their fragmented outlines.
### 125-786B-37R-01 (Piece 12, 95-98 cm)

**Observer:** HIR  
**Where Sampled:** Izu-Bonin outer-arc high

**Rock Name:** Orthopyroxene-clinopyroxene-plagioclase boninite  
**Grain Size:** 0.5-1.5 mm  
**Texture:** Hyalo-ophitic texture

<table>
<thead>
<tr>
<th><strong>Primary Mineralogy</strong></th>
<th><strong>Percent</strong></th>
<th><strong>Percent Size</strong></th>
<th><strong>Compositional</strong></th>
<th><strong>Morphology</strong></th>
<th><strong>Comments</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Phenocrysts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Olivine</td>
<td>0</td>
<td>1-2</td>
<td>0.3-0.6</td>
<td>Euhedral</td>
<td>Completely altered to clay.</td>
</tr>
<tr>
<td>Plagioclase</td>
<td>5-10</td>
<td>5-10</td>
<td>0.5-1.5</td>
<td>Euhedral-anhedral</td>
<td>Shows twinning and compositional banding.</td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>3-5</td>
<td>3-5</td>
<td>0.5-1</td>
<td>Subhedral-anhedral</td>
<td>Shows twinning, locally forms glomerocrystic texture.</td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>1-2</td>
<td>1-2</td>
<td>0.5-1</td>
<td>Euhedral, sometimes elongated</td>
<td>Partly altered to clay.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Groundmass</strong></th>
<th><strong>Percent</strong></th>
<th><strong>Percent Size</strong></th>
<th><strong>Compositional</strong></th>
<th><strong>Morphology</strong></th>
<th><strong>Comments</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Plagioclase</td>
<td>15-20</td>
<td>15-20</td>
<td>0.1-0.4</td>
<td>Euhedral</td>
<td>Slender prismatic plagioclase is predominant.</td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>1-2</td>
<td>1-2</td>
<td>0.05-0.2</td>
<td>Subhedral-anhedral</td>
<td>Scattered throughout groundmass.</td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>Trace</td>
<td>Trace</td>
<td>0.05-0.2</td>
<td>Euhedral</td>
<td>Relatively low birefringence.</td>
</tr>
<tr>
<td>Glass</td>
<td>0</td>
<td>70-80</td>
<td>N/A</td>
<td>N/A</td>
<td>Completely altered to brown clay.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Secondary Mineralogy</strong></th>
<th><strong>Replacing/Filling</strong></th>
<th><strong>Comments</strong></th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th><strong>Vesicles/Cavities</strong></th>
<th><strong>Percent</strong></th>
<th><strong>Percent Location</strong></th>
<th><strong>Filling</strong></th>
<th><strong>Shape</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Vesicles</td>
<td>5</td>
<td>Random</td>
<td>Clay</td>
<td>Round-ragged</td>
</tr>
</tbody>
</table>

**Comments:** Two types of plagioclase phenocryst are recognized. One is dusty and shows corroded form, and another is clean and euhedral in shape.

### 125-786B-37R-03 (Piece 8, 45-49 cm)

**Observer:** HIR  
**Where Sampled:** Izu-Bonin outer-arc high

**Rock Name:** Andesitic breccia  
**Grain Size:** 0.1-1.0 mm  
**Texture:** Hyalo-ophitic texture

<table>
<thead>
<tr>
<th><strong>Primary Mineralogy</strong></th>
<th><strong>Percent</strong></th>
<th><strong>Percent Size</strong></th>
<th><strong>Compositional</strong></th>
<th><strong>Morphology</strong></th>
<th><strong>Comments</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Phenocrysts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plagioclase</td>
<td>10-15</td>
<td>10-15</td>
<td>0.5-1.5</td>
<td>Euhedral</td>
<td></td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>Trace</td>
<td>Trace</td>
<td>0.5-1.5</td>
<td>Euhedral</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Groundmass</strong></th>
<th><strong>Percent</strong></th>
<th><strong>Percent Size</strong></th>
<th><strong>Compositional</strong></th>
<th><strong>Morphology</strong></th>
<th><strong>Comments</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Plagioclase</td>
<td>5-10</td>
<td>10-15</td>
<td>&lt;0.1</td>
<td>N/A</td>
<td>Partly altered to clay.</td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>1-2</td>
<td>1-2</td>
<td>&lt;0.15</td>
<td>Elongate, prismatic</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Secondary Mineralogy</strong></th>
<th><strong>Replacing/Filling</strong></th>
<th><strong>Comments</strong></th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th><strong>Vesicles/Cavities</strong></th>
<th><strong>Percent</strong></th>
<th><strong>Percent Location</strong></th>
<th><strong>Filling</strong></th>
<th><strong>Shape</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Vesicles</td>
<td>5</td>
<td>Random</td>
<td>Clay</td>
<td>Round-ragged</td>
</tr>
</tbody>
</table>

**Comments:** This rock is highly altered andesitic breccia. Pale greenish clay present throughout the rock.
**SITE 786**

125-786B-38R-01 (Piece 3, 9-11 cm)  
**OBSERVER:** SAB  
**WHERE SAMPLED:** Izu-Bonin outer-arc high

**ROCK NAME:** Plagioclase-phyric andesite

**GRAIN SIZE:** 0.3-2 mm

**TEXTURE:** Hyalo-ophitic, locally glomerophytic

<table>
<thead>
<tr>
<th>PRIMARY MINERALOGY</th>
<th>PERCENT PRESENT</th>
<th>ORIGINAL (mm)</th>
<th>COMPOSITION</th>
<th>MORPHOLOGY</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHENOGRATHS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plagioclase</td>
<td>10-15</td>
<td>15-15</td>
<td>0.3-2</td>
<td>Subhedral-euhedral</td>
<td>Twinning is common, zoning is rare.</td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>1-2</td>
<td>2-3</td>
<td>0.2-1</td>
<td>Subhedral</td>
<td>Pale green to colorless in color.</td>
</tr>
<tr>
<td>GROUNDMASS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glass</td>
<td>&lt;10</td>
<td>15-20</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Plagioclase</td>
<td>30-40</td>
<td>50-60</td>
<td>&lt;0.2</td>
<td>Laths</td>
<td></td>
</tr>
<tr>
<td>Magnetite</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>&lt;0.05</td>
<td>Equant</td>
<td></td>
</tr>
<tr>
<td>SECONDARY MINERALOGY</td>
<td>PERCENT REPLACING/FILLING</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clays</td>
<td>30-40</td>
<td>Glass</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**VESELICES/CAVITIES**

<table>
<thead>
<tr>
<th>VESELICES/CAVITIES</th>
<th>PERCENT LOCATION</th>
<th>SIZE (mm)</th>
<th>FILLING</th>
<th>SHAPE</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vesicles</td>
<td>1-3</td>
<td>Throughout 0.1-3</td>
<td>None</td>
<td>Round-irregular</td>
<td>Pale green to pale brown in color, pervasive.</td>
</tr>
</tbody>
</table>

**COMMENTS:** Glomerocrystals up to 2 mm in diameter consisting dominantly of plagioclase.

125-786B-39R-02 (Piece 3, 33-34 cm)  
**OBSERVER:** HIR  
**WHERE SAMPLED:** Izu-Bonin outer-arc high

**ROCK NAME:** Andesitic breccia

**GRAIN SIZE:** 0.1-1.5 mm

**TEXTURE:** Fracturing texture

<table>
<thead>
<tr>
<th>PRIMARY MINERALOGY</th>
<th>PERCENT PRESENT</th>
<th>ORIGINAL (mm)</th>
<th>COMPOSITION</th>
<th>MORPHOLOGY</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHENOGRATHS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plagioclase</td>
<td>15-20</td>
<td>15-20</td>
<td>0.5-1.5</td>
<td>Euhedral</td>
<td>Glomerophytic; twinning is common.</td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>Trace</td>
<td>Trace</td>
<td>0.5-1</td>
<td>Euhedral</td>
<td></td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>Trace</td>
<td>Trace</td>
<td>0.5-1</td>
<td>Euhedral</td>
<td></td>
</tr>
<tr>
<td>GROUNDMASS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glass</td>
<td>5-10</td>
<td>15-25</td>
<td>&lt;0.2</td>
<td>Euhedral</td>
<td>Partly altered to clay.</td>
</tr>
<tr>
<td>Opaque</td>
<td>0</td>
<td>50-60</td>
<td>N/A</td>
<td>N/A</td>
<td>Completely altered to clay.</td>
</tr>
<tr>
<td>SECONDARY MINERALOGY</td>
<td>PERCENT REPLACING/FILLING</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clays</td>
<td>50-60</td>
<td>Glass, vesicles</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**VESELICES/CAVITIES**

<table>
<thead>
<tr>
<th>VESELICES/CAVITIES</th>
<th>PERCENT LOCATION</th>
<th>SIZE (mm)</th>
<th>FILLING</th>
<th>SHAPE</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vesicles</td>
<td>1-2</td>
<td>Random</td>
<td>&lt;1</td>
<td>Clay</td>
<td>Bound to elongate</td>
</tr>
</tbody>
</table>

**COMMENTS:** This rock is highly fragmented.
### Site 786

**125-786B-39R-03 (Piece 43, 26-27 cm)**  
**Observer:** HIR  
**Where Sampled:** Izu-Bonin outer-arc high

**Rock Name:** Brecciated andesite  
**Grain Size:** 0.1-0.5 mm  
**Texture:** Porphyritic

#### Primary Mineralogy

<table>
<thead>
<tr>
<th>Component</th>
<th>Percent Present</th>
<th>Size Original (mm)</th>
<th>Composition</th>
<th>Morphology</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phenocrysts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plagioclase</td>
<td>2-5</td>
<td>0.5-1</td>
<td>Euhedral</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>1-3</td>
<td>0.3-0.7</td>
<td>Euhedral</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Groundmass</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plagioclase</td>
<td>7-10</td>
<td>&lt;0.1</td>
<td>Euhedral, prismatic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>5-10</td>
<td>&lt;0.1</td>
<td>Euhedral, prismatic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glass</td>
<td>0</td>
<td>70-80 N/A</td>
<td>N/A</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Secondary Mineralogy

<table>
<thead>
<tr>
<th>Component</th>
<th>Percent Filling</th>
<th>Filling</th>
<th>Shape</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clays</td>
<td>70-80</td>
<td>Glass, plagioclase</td>
<td></td>
<td>Pale-green to pale-brown clay is predominant.</td>
</tr>
<tr>
<td>Limonite</td>
<td>1-2</td>
<td>Crack</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Vesicles/ Cavities

<table>
<thead>
<tr>
<th>Component</th>
<th>Percent Location (mm)</th>
<th>Filling</th>
<th>Shape</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vesicles</td>
<td>3-5</td>
<td>Random</td>
<td>Clay</td>
<td></td>
</tr>
</tbody>
</table>

**Comments:** Limonitic material is locally predominant, especially along the brecciated fragments.

---

**125-786B-40R-01 (Piece 6, 40-41 cm)**  
**Observer:** HIR  
**Where Sampled:** Izu-Bonin outer-arc high

**Rock Name:** Andesitic tuff-breccia  
**Grain Size:** 0.1-1 mm  
**Texture:** Porphyritic (in andesitic fragments)

#### Primary Mineralogy

<table>
<thead>
<tr>
<th>Component</th>
<th>Percent Present</th>
<th>Size Original (mm)</th>
<th>Composition</th>
<th>Morphology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phenocrysts</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plagioclase</td>
<td>1-2</td>
<td>0.5-1.5</td>
<td>Euhedral</td>
<td>In andesitic fragments.</td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>Trace</td>
<td>0.5-1</td>
<td>Euhedral</td>
<td>In andesitic fragments.</td>
</tr>
<tr>
<td>Groundmass</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plagioclase</td>
<td>3-5</td>
<td>&lt;0.1</td>
<td>Euhedral, acicular</td>
<td></td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>Trace</td>
<td>&lt;0.1</td>
<td>Euhedral, prismatic</td>
<td></td>
</tr>
</tbody>
</table>

#### Secondary Mineralogy

<table>
<thead>
<tr>
<th>Component</th>
<th>Percent Filling</th>
<th>Filling</th>
<th>Shape</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clays</td>
<td>90-95</td>
<td>Glass</td>
<td></td>
<td>Pale greenish clay is predominant in andesitic fragments.</td>
</tr>
</tbody>
</table>

#### Vesicles/Cavities

<table>
<thead>
<tr>
<th>Component</th>
<th>Percent Location (mm)</th>
<th>Filling</th>
<th>Shape</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vesicles</td>
<td>30-40</td>
<td>Random</td>
<td>Clay</td>
<td></td>
</tr>
</tbody>
</table>

**Comments:** Phenocrysts of plagioclase and clinopyroxene in andesitic fragments are highly altered to clay.

---

1067
### Site 786

125-786B-40R-02 (Piece 18,54-56 cm) **OBSERVER:** HIR  **WHERE SAMPLED:** Izu-Bonin outer-arc high

**ROCK NAME:** Orthopyroxene-olivine basalt

**GRAIN SIZE:** 0.1-1.5 mm

**TEXTURE:** Hyalo-ophitic

<table>
<thead>
<tr>
<th>PRIMARY MINERALOGY</th>
<th>PHENOCRYSTS</th>
<th>GROUNDMASS</th>
<th>SECONDARY MINERALOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Olivine</td>
<td>Plagioclase</td>
<td>Clays</td>
</tr>
<tr>
<td></td>
<td>Orthopyroxene</td>
<td>Clinopyroxene</td>
<td>Carbonate</td>
</tr>
<tr>
<td><strong>PERCENT</strong></td>
<td>0</td>
<td>10-15</td>
<td>56-60</td>
</tr>
<tr>
<td><strong>PERCENT</strong></td>
<td>1-2</td>
<td>0-15</td>
<td>&lt;1</td>
</tr>
<tr>
<td><strong>SIZE (mm)</strong></td>
<td>15-20</td>
<td>&lt;0.2</td>
<td>0-5</td>
</tr>
<tr>
<td><strong>COMPOSITION</strong></td>
<td>0.5-3</td>
<td>Euhedral</td>
<td>65-75</td>
</tr>
<tr>
<td><strong>MORPHOLOGY</strong></td>
<td>Euhedral</td>
<td>Subhedral, prismatic</td>
<td>Glass, olivine</td>
</tr>
<tr>
<td><strong>COMMENTS</strong></td>
<td>Completely altered to clay.</td>
<td>Partly altered to clay; showing compositional zoning.</td>
<td>Brown, dusty clay replaces glass.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>VESICLES/CAVITIES</th>
<th>SIZE</th>
<th>FILLING</th>
<th>SHAPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vesicles</td>
<td>3-5</td>
<td>Glass, olivine</td>
<td>Round</td>
</tr>
<tr>
<td>Carbonate</td>
<td>1-3</td>
<td>vesicles</td>
<td></td>
</tr>
<tr>
<td><strong>PERCENT</strong></td>
<td>4-5</td>
<td>5-15</td>
<td></td>
</tr>
<tr>
<td><strong>LOCATION (mm)</strong></td>
<td>0.3-3</td>
<td>0.15-1</td>
<td></td>
</tr>
<tr>
<td><strong>COMMENTS</strong></td>
<td>Euhedral-subhedral</td>
<td>Euhedral-subhedral</td>
<td>Commonly twinned; glass and spinel inclusions.</td>
</tr>
</tbody>
</table>

### Site 786

125-786B-42R-01 (Piece 5,41-42 cm) **OBSERVER:** SAB  **WHERE SAMPLED:** Izu-Bonin outer-arc high

**ROCK NAME:** Pyroxene-plagioclase phyric andesite

**GRAIN SIZE:** 0.3-4 mm

**TEXTURE:** Moderately phyric

<table>
<thead>
<tr>
<th>PRIMARY MINERALOGY</th>
<th>PHENOCRYSTS</th>
<th>GROUNDMASS</th>
<th>SECONDARY MINERALOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Plagioclase</td>
<td>Orthopyroxene</td>
<td>Clays</td>
</tr>
<tr>
<td></td>
<td>Clinopyroxene</td>
<td>Glass</td>
<td>Carbonate</td>
</tr>
<tr>
<td></td>
<td>Spinel</td>
<td>Glass</td>
<td>Hematite</td>
</tr>
<tr>
<td><strong>PERCENT</strong></td>
<td>4-10</td>
<td>2-5</td>
<td>65-75</td>
</tr>
<tr>
<td><strong>PERCENT</strong></td>
<td>10-15</td>
<td>3-5</td>
<td>&lt;1</td>
</tr>
<tr>
<td><strong>SIZE (mm)</strong></td>
<td>5-7</td>
<td>0.1-0.3</td>
<td>0.01-0.05</td>
</tr>
<tr>
<td><strong>COMPOSITION</strong></td>
<td>0.3-3</td>
<td>Euhedral-subhedral</td>
<td>Euhedral-subhedral</td>
</tr>
<tr>
<td><strong>MORPHOLOGY</strong></td>
<td>Euhedral-subhedral</td>
<td>Glass and spinel inclusions, rarely zoned.</td>
<td>Euhedral-subhedral</td>
</tr>
<tr>
<td><strong>COMMENTS</strong></td>
<td>Commonly twinned; glass and spinel inclusions.</td>
<td>Glass and spinel inclusions, rarely zoned.</td>
<td>Pale green-colorless.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>VESICLES/CAVITIES</th>
<th>SIZE</th>
<th>FILLING</th>
<th>SHAPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vesicles</td>
<td>3-5</td>
<td>Glass</td>
<td>Round</td>
</tr>
<tr>
<td>Carbonate</td>
<td>1-3</td>
<td>Pyroxene</td>
<td></td>
</tr>
<tr>
<td><strong>PERCENT</strong></td>
<td>5-10</td>
<td>4-7</td>
<td>&lt;1</td>
</tr>
<tr>
<td><strong>LOCATION (mm)</strong></td>
<td>75-80</td>
<td>&lt;0.3</td>
<td></td>
</tr>
<tr>
<td><strong>COMMENTS</strong></td>
<td>Quench crystals.</td>
<td>Rust-orange; associated with fine-grained glomerocrysts.</td>
<td></td>
</tr>
</tbody>
</table>

**COMMENTS:** Glomerocrysts of plagioclase and of pyroxenes are present, up to 2 mm in diameter.
**Rock Name:** Olivine-two-pyroxene andesite  
**Grain Size:** 0.5-2 mm  
**Texture:** Hyalo-ophitic

### Primary Mineralogy

<table>
<thead>
<tr>
<th>Phenocrysts</th>
<th>Percent Present</th>
<th>Original (mm)</th>
<th>Composition</th>
<th>Morphology</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Olivine</td>
<td>0</td>
<td>2-3</td>
<td>0.5-1</td>
<td>Euhedral</td>
<td>Altered to clay.</td>
</tr>
<tr>
<td>Plagioclase</td>
<td>10-15</td>
<td>10-15</td>
<td>0.5-2</td>
<td>Euhedral</td>
<td>Compositional zoning and twinning are common.</td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>5-10</td>
<td>5-10</td>
<td>0.5-2</td>
<td>Euhedral</td>
<td>Compositional zoning and twinning are common.</td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>2-4</td>
<td>3-5</td>
<td>0.5-1.5</td>
<td>Euhedral</td>
<td>Partly or fully altered to clay.</td>
</tr>
</tbody>
</table>

**Groundmass**

| Glass         | 0               | 55-70         | N/A         | N/A        | Altered to clay. |
| Plagioclase   | 5-10            | 5-10          | <0.1        | Euhedral   | Quench texture. |
| Clinopyroxene | 2-3             | 2-3           | <0.1        | Subhedral-anhedral, prismatic | |
| Opaque        | Trace           | Trace         | <0.1        | Euhedral-anhedral | Scattered throughout the groundmass. |

### Secondary Mineralogy

<table>
<thead>
<tr>
<th>Clay</th>
<th>55-75</th>
<th>Glass, olivine, orthopyroxene, vesicles</th>
<th>Brown in color.</th>
</tr>
</thead>
</table>

### Vesicles/Cavities

<table>
<thead>
<tr>
<th>Size</th>
<th>Percent Location (mm)</th>
<th>Filling</th>
<th>Shape</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vesicles</td>
<td>Trace</td>
<td>Trace</td>
<td>Round</td>
</tr>
</tbody>
</table>

Comments: Some orthopyroxene grains have fine (100) augite lamellae and are surrounded by reaction rim of clinopyroxene (augite). Some plagioclase phenocrysts show corroded form.

---

**Rock Name:** Pyroxene-plagioclase phyric andesite  
**Grain Size:** 0.5-2 mm  
**Texture:** Moderately phyric

### Primary Mineralogy

<table>
<thead>
<tr>
<th>Phenocrysts</th>
<th>Percent Present</th>
<th>Original (mm)</th>
<th>Composition</th>
<th>Morphology</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plagioclase</td>
<td>10-15</td>
<td>15-20</td>
<td>0.5-2</td>
<td>Euhedral-subhedral</td>
<td>Spinel and glass inclusions, commonly twinned, moth-eaten texture.</td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>7-10</td>
<td>8-12</td>
<td>0.3-2</td>
<td>Subhedral-euhedral</td>
<td>Inclusions of fluid, pale green to colorless.</td>
</tr>
<tr>
<td>Spinel</td>
<td>Trace</td>
<td>Trace</td>
<td>&lt;0.02</td>
<td>Equant</td>
<td>Dispersed, black.</td>
</tr>
</tbody>
</table>

**Groundmass**

| Glass         | 10-15           | 53-67         | N/A         | N/A        | Altered to clays. |
| Plagioclase   | 8-10            | 10-15         | <0.02       | Laths      | Microlites in groundmass. |

### Secondary Mineralogy

<table>
<thead>
<tr>
<th>Clay</th>
<th>Percent Filling</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glass</td>
<td>47-61</td>
<td>Red to red-brown clays, pervasive.</td>
</tr>
<tr>
<td>Carbonate</td>
<td>&lt;1 Vein</td>
<td>0.5 mm vein.</td>
</tr>
<tr>
<td>Zeolites</td>
<td>1 Vesicles</td>
<td>Lines vesicles.</td>
</tr>
<tr>
<td>Chlorite</td>
<td>2 Vesicles</td>
<td>Pale green to colorless; lines some vesicles.</td>
</tr>
</tbody>
</table>

### Vesicles/Cavities

<table>
<thead>
<tr>
<th>Size</th>
<th>Percent Location (mm)</th>
<th>Filling</th>
<th>Shape</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vesicles</td>
<td>N/A Random</td>
<td>Chlorite, zeolites</td>
<td>Round, irregular</td>
</tr>
</tbody>
</table>

125-786B-42R-03 (Piece 10D,126-127 cm)  
Observer: HIR  
Where Sampled: Izu-Bonin outer-arc high
125-7868-48R-02 (Piece 12,106-107 cm)  OBSERVER: HIR  WHERE SAMPLED: Izu-Bonin outer-arc high

ROCK NAME: Two-pyroxene andesite
GRAIN SIZE: <2 mm
TEXTURE: Porphyritic

<table>
<thead>
<tr>
<th>PRIMARY MINERALOGY</th>
<th>PERCENT</th>
<th>PERCENT</th>
<th>SIZE</th>
<th>COMPOSITION</th>
<th>MORPHOLOGY</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHENOCRYSTs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plagioclase</td>
<td>15-20</td>
<td>15-20</td>
<td>0.5-2</td>
<td>Euhedral</td>
<td>Compositional zoning and twinning are common.</td>
<td></td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>10-15</td>
<td>10-15</td>
<td>0.5-1.5</td>
<td>Euhedral</td>
<td>Compositional zoning and twinning are common.</td>
<td></td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>10-15</td>
<td>10-15</td>
<td>0.5-2</td>
<td>Euhedral</td>
<td>Compositional zoning is common.</td>
<td></td>
</tr>
<tr>
<td>GROUNDMASS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plagioclase</td>
<td>20-30</td>
<td>20-30</td>
<td>&lt;0.2</td>
<td>Euhedral-subhedral</td>
<td>Quenched H-shaped crystal.</td>
<td></td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>&lt;0.2</td>
<td>Euhedral-subhedral, acicular</td>
<td>Quench texture.</td>
<td></td>
</tr>
<tr>
<td>Glass</td>
<td>15-35</td>
<td>20-40</td>
<td>N/A</td>
<td>Euhedral, acicular</td>
<td>Quench texture.</td>
<td></td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>&lt;2</td>
<td>&lt;2</td>
<td>&lt;0.2</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SECONDARY MINERALOGY</th>
<th>PERCENT</th>
<th>REPLACING/</th>
<th>FILLING</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clays</td>
<td>5</td>
<td>Glass</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>VESICLES/CAVITIES</th>
<th>PERCENT</th>
<th>LOCATION (mm)</th>
<th>FILLING</th>
<th>SHAPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vesicles</td>
<td>10-15</td>
<td>Random &lt;2</td>
<td>None</td>
<td>Round</td>
</tr>
</tbody>
</table>

COMMENTS: Clinopyroxene, orthopyroxene and plagioclase sometimes form glomerophyric texture. Groundmass glass is well preserved.

125-7868-48R-02 (Piece 4B,52-53 cm)  OBSERVER: SAB  WHERE SAMPLED: Izu-Bonin outer-arc high

ROCK NAME: Andesite breccia
GRAIN SIZE: 0.2-2 mm
TEXTURE: Brecciated, locally glomerophyric?

<table>
<thead>
<tr>
<th>PRIMARY MINERALOGY</th>
<th>PERCENT</th>
<th>PERCENT</th>
<th>SIZE</th>
<th>COMPOSITION</th>
<th>MORPHOLOGY</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHENOCRYSTs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plagioclase</td>
<td>4-8</td>
<td>5-10</td>
<td>0.2-1.5</td>
<td>Euhedral-subhedral</td>
<td>Spinel and fluid inclusions, twinned, zoned.</td>
<td></td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>1-2</td>
<td>1-2</td>
<td>0.2-2</td>
<td>Euhedral-subhedral</td>
<td>Pale green to colorless.</td>
<td></td>
</tr>
<tr>
<td>Spinel</td>
<td>1</td>
<td>1</td>
<td>&lt;0.2</td>
<td>Euhedral-anhedral</td>
<td>Black.</td>
<td></td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>3-5</td>
<td>3-5</td>
<td>0.2-2</td>
<td>Euhedral-subhedral</td>
<td>Spinel and fluid(?) inclusions.</td>
<td></td>
</tr>
<tr>
<td>GROUNDMASS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glass</td>
<td>&lt;10</td>
<td>60-78</td>
<td>N/A</td>
<td>N/A</td>
<td>Lath</td>
<td>Microlites.</td>
</tr>
<tr>
<td>Plagioclase</td>
<td>15-20</td>
<td>18-22</td>
<td>&lt;0.02</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SECONDARY MINERALOGY</th>
<th>PERCENT</th>
<th>REPLACING/</th>
<th>FILLING</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clays</td>
<td>40-50</td>
<td>Glass</td>
<td>Pale brown to dark brown; pervasive but doesn't obscure original texture.</td>
<td></td>
</tr>
<tr>
<td>Chlorite</td>
<td>5-10</td>
<td>Matrix</td>
<td>Pale green; distributed among fragments and along boundaries.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>VESICLES/CAVITIES</th>
<th>PERCENT</th>
<th>LOCATION (mm)</th>
<th>FILLING</th>
<th>SHAPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vesicles</td>
<td>5-10</td>
<td>Random &lt;2</td>
<td></td>
<td>Round-oval</td>
</tr>
</tbody>
</table>

COMMENTS: Glomerocrysts of plagioclase and plagioclase plus pyroxene up to 2 mm in diameter. Rock is composed of breccia fragments of volcanic andesitic rocks. Degree of alteration varies between individual fragments.
125-786B-498-02 (Piece 4, 83-84 cm)  
**ROCK NAME:** Andesitic breccia  
**GRAIN SIZE:** 0.1-1 mm  
**TEXTURE:** Clastic texture

### PRIMARY MINERALOGY

<table>
<thead>
<tr>
<th>Phenocrysts</th>
<th>Percent</th>
<th>.ndim</th>
<th>Original (mm)</th>
<th>Composition</th>
<th>Morphology</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plagioclase</td>
<td>5-10</td>
<td>5-10</td>
<td>0.5-1</td>
<td></td>
<td>Euhedral-anhedral</td>
<td>Twinning and compositional zoning are common.</td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>2-3</td>
<td>2-3</td>
<td>0.5-1</td>
<td></td>
<td>Euhedral-anhedral</td>
<td>Twinning is common.</td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>3-5</td>
<td>3-5</td>
<td>0.5-2</td>
<td></td>
<td>Euhedral-anhedral</td>
<td>Clinopyroxene exsolution lamellae.</td>
</tr>
</tbody>
</table>

**Groundmass:**
- Plagioclase: 2-3 2-3 <0.1  Euhedral-anhedral, acicular

### SECONDARY MINERALOGY

<table>
<thead>
<tr>
<th>Clay</th>
<th>Percent</th>
<th>Filling</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>80-85</td>
<td>Glass</td>
<td>Brownish dusty clay is predominant.</td>
</tr>
</tbody>
</table>

### COMPOSITION

<table>
<thead>
<tr>
<th>Size</th>
<th>Present</th>
<th>Origin</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-10</td>
<td>10-15</td>
<td>10-15</td>
</tr>
<tr>
<td>2-3</td>
<td></td>
<td>5-10</td>
</tr>
<tr>
<td>3-5</td>
<td></td>
<td>5-10</td>
</tr>
</tbody>
</table>

**Morphology:**
- Euhedral-anhedral

**Comments:** This rock contains fragments of andesite and crystals in a fine-grained matrix. Matrix is highly altered to clay.

125-786B-498-04 (Piece 4, 32-37 cm)  
**ROCK NAME:** Orthopyroxene-clinopyroxene andesite  
**GRAIN SIZE:** 0.1-2 mm  
**TEXTURE:** Porphyritic texture

### PRIMARY MINERALOGY

<table>
<thead>
<tr>
<th>Phenocrysts</th>
<th>Percent</th>
<th>ndim</th>
<th>Original (mm)</th>
<th>Composition</th>
<th>Morphology</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plagioclase</td>
<td>10-15</td>
<td>10-15</td>
<td>0.5-2</td>
<td></td>
<td>Euhedral-subhedral</td>
<td>Shows compositional zoning.</td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>5-10</td>
<td>5-10</td>
<td>0.5-2</td>
<td></td>
<td>Euhedral</td>
<td>Partly altered to clay; has clinopyroxene exsolution lamellae.</td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>3-8</td>
<td>5-10</td>
<td>0.5-2</td>
<td></td>
<td>Euhedral</td>
<td></td>
</tr>
</tbody>
</table>

**Groundmass:**
- Plagioclase: 10-15 15-20 0.1-0.2  Euhedral
- Clinopyroxene: 5-10 5-10 0.1-0.2  Euhedral-subhedral
- Orthopyroxene: 5-10 5-10 0.1-0.4  Euhedral-subhedral
- Glass: 15-30 35-60 N/A  Euhedral-subhedral

### SECONDARY MINERALOGY

<table>
<thead>
<tr>
<th>Zeolites</th>
<th>Percent</th>
<th>Filling</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1</td>
<td>Glass, vesicles</td>
<td>Pale green to pale brown in color.</td>
<td></td>
</tr>
<tr>
<td>Carbonate</td>
<td>Trace</td>
<td>Orthopyroxene</td>
<td>High birefringence.</td>
</tr>
<tr>
<td>Zeolites</td>
<td>&lt;1</td>
<td>Vesicles</td>
<td>Radial, wavy extinction.</td>
</tr>
</tbody>
</table>

### COMPOSITION

<table>
<thead>
<tr>
<th>Size</th>
<th>Present</th>
<th>Origin</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15-30</td>
<td></td>
<td>35-60</td>
</tr>
</tbody>
</table>

**Comments:** Clinopyroxene occurs as exsolution lamellae of orthopyroxene and as reaction rim of orthopyroxene.
### 125-786B-51R-01 (Piece 8,51-55 cm)

**Observer:** HIR  
**Where Sampled:** Izu-Bonin outer-arc high

**Rock Name:** Two-pyroxene basalt  
**Grain Size:** 0.1-1.5 mm  
**Texture:** Porphyritic texture

<table>
<thead>
<tr>
<th>Primary Mineralogy</th>
<th>Percent</th>
<th>Percent</th>
<th>Size (mm)</th>
<th>Compos-</th>
<th>Morphology</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phenocrysts Plagioclase</td>
<td>15-20</td>
<td>15-20</td>
<td>0.5-1.5</td>
<td>Composi-</td>
<td>Euhedral-anhedral</td>
<td>Compositional zoning.</td>
</tr>
<tr>
<td>Phenocrysts Clinopyroxene</td>
<td>5-10</td>
<td>5-10</td>
<td>0.5-1.5</td>
<td>tion</td>
<td>Euhedral-anhedral</td>
<td>Partly altered to clay.</td>
</tr>
<tr>
<td>Phenocrysts Orthopyroxene</td>
<td>5-10</td>
<td>5-10</td>
<td>0.5-1.5</td>
<td></td>
<td>Euhedral</td>
<td></td>
</tr>
<tr>
<td>Groundmass Plagioclase</td>
<td>3-7</td>
<td>5-10</td>
<td>&lt;0.1</td>
<td></td>
<td>Euhedral</td>
<td>Partly altered to clay.</td>
</tr>
<tr>
<td>Groundmass Clinopyroxene</td>
<td>5-10</td>
<td>5-10</td>
<td>&lt;0.2</td>
<td></td>
<td>Euhedral, elongate, prismatic</td>
<td></td>
</tr>
<tr>
<td>Groundmass Orthopyroxene</td>
<td>5-10</td>
<td>5-10</td>
<td>&lt;0.2</td>
<td></td>
<td>Euhedral, elongate, prismatic</td>
<td></td>
</tr>
<tr>
<td>Glass</td>
<td>40-50</td>
<td>N/A</td>
<td></td>
<td></td>
<td>N/A</td>
<td>Altered to clay.</td>
</tr>
</tbody>
</table>

**Secondary Mineralogy**  
**Replacing/Filling**  
**Comments**

- **Clay:** 30-40 Glass  
  Brown dusty clay replacing glass.

**Vesicles/Cavities**

<table>
<thead>
<tr>
<th>Size</th>
<th>Percent</th>
<th>Location (mm)</th>
<th>Filling</th>
<th>Shape</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glass</td>
<td>Trace</td>
<td>Trace</td>
<td>N/A</td>
<td>Round</td>
</tr>
</tbody>
</table>

**Comments:** Plagioclase phenocrysts show corroded form. Clinopyroxene occurs as euhedral phenocryst, as exsolution lamellae of orthopyroxene, and as reaction rim of orthopyroxene.

### 125-786B-52R-01 (Piece 1,2-4 cm)

**Observer:** HIR  
**Where Sampled:** Izu-Bonin outer-arc high

**Rock Name:** Andesite breccia  
**Grain Size:** 0.1-1 mm  
**Texture:** Breccia with porphyritic andesite fragments

<table>
<thead>
<tr>
<th>Primary Mineralogy</th>
<th>Percent</th>
<th>Percent</th>
<th>Size (mm)</th>
<th>Compos-</th>
<th>Morphology</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phenocrysts Olivine</td>
<td>0</td>
<td>5-10</td>
<td>0.1-1</td>
<td>Composi-</td>
<td>Euhedral-subhedral</td>
<td>Completely altered to clay.</td>
</tr>
<tr>
<td>Phenocrysts Plagioclase</td>
<td>3-5</td>
<td>3-5</td>
<td>0.5-1.5</td>
<td>tion</td>
<td>Euhedral</td>
<td>Shows twinning and compositional zoning.</td>
</tr>
<tr>
<td>Phenocrysts Clinopyroxene</td>
<td>3-5</td>
<td>3-5</td>
<td>0.5-1</td>
<td></td>
<td>Subhedral</td>
<td></td>
</tr>
<tr>
<td>Phenocrysts Orthopyroxene</td>
<td>5-10</td>
<td>5-10</td>
<td>0.5-1</td>
<td></td>
<td>Euhedral</td>
<td></td>
</tr>
<tr>
<td>Groundmass Orthopyroxene</td>
<td>5-10</td>
<td>5-10</td>
<td>0.05-0.2</td>
<td></td>
<td>Euhedral, elongate, prismatic</td>
<td>Occurs as crystal.</td>
</tr>
<tr>
<td>Groundmass Clinopyroxene</td>
<td>3-5</td>
<td>3-5</td>
<td>0.05-0.2</td>
<td></td>
<td>Euhedral, elongate, prismatic</td>
<td></td>
</tr>
<tr>
<td>Glass</td>
<td>Trace</td>
<td>Trace</td>
<td>&lt;0.1</td>
<td></td>
<td>Euhedral, acicular</td>
<td></td>
</tr>
<tr>
<td>Opaque</td>
<td>Trace</td>
<td>Trace</td>
<td>&lt;0.05</td>
<td></td>
<td>N/A</td>
<td>Altered to clay.</td>
</tr>
</tbody>
</table>

**Secondary Mineralogy**  
**Replacing/Filling**  
**Comments**

- **Clay:** 40-60 Glass  
  Replacing groundmass glass and matrix of hyaloclastite; pale green to pale brown in color.

**Vesicles/Cavities**

<table>
<thead>
<tr>
<th>Size</th>
<th>Percent</th>
<th>Location (mm)</th>
<th>Filling</th>
<th>Shape</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clay</td>
<td>2-3</td>
<td>Random</td>
<td></td>
<td>Round</td>
</tr>
</tbody>
</table>

**Comments:** Hyaloclastite consists of highly altered glass fragments.
**SITE 786**

125-786B-57R-01 (Piece 1A, 8-11 cm)  
**OBSERVER:** JOE  
**WHERE SAMPLED:** Izu-Bonin outer-arc high

**ROCK NAME:** Altered andesite  
**GRAIN SIZE:** Fine-grained  
**TEXTURE:** Sparsely phric

<table>
<thead>
<tr>
<th>PRIMARY MINERALOGY</th>
<th>PERCENT</th>
<th>PERCENT SIZE</th>
<th>COMPOSITION</th>
<th>MORPHOLOGY</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHENOCRYSTES</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>1-3</td>
<td>10-20 &lt;0.7</td>
<td></td>
<td>Euhedral-anhedral</td>
<td>Some crystals are completely altered to clays making phase determination difficult.</td>
</tr>
<tr>
<td>GROUNDMASS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glass</td>
<td>0</td>
<td>65-70 N/A</td>
<td></td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Microlites</td>
<td>&lt;5</td>
<td>10-20 &lt;0.02</td>
<td></td>
<td>Needles</td>
<td>No optical properties discernible.</td>
</tr>
<tr>
<td>SECONDARY MINERALOGY</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clays</td>
<td>80-85</td>
<td>Glass/matrix, clinopyroxene</td>
<td>Brown amorphous clays.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chlorite</td>
<td>&lt;7</td>
<td>Glass, veins</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**COMMENTS:** Much of material polished away during thin-section preparation.

---

125-786B-57R-03 (Piece 1A, 65-67 cm)  
**OBSERVER:** HIR  
**WHERE SAMPLED:** Izu-Bonin outer-arc high

**ROCK NAME:** Two-pyroxene andesite  
**GRAIN SIZE:** 0.1-1 mm  
**TEXTURE:** Porphyritic

<table>
<thead>
<tr>
<th>PRIMARY MINERALOGY</th>
<th>PERCENT</th>
<th>PERCENT SIZE</th>
<th>COMPOSITION</th>
<th>MORPHOLOGY</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHENOCRYSTES</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plagioclase</td>
<td>0</td>
<td>10-15 0.5-1</td>
<td></td>
<td>Euhedral</td>
<td>Altered to clay.</td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>1-2</td>
<td>10-15 0.5-1</td>
<td></td>
<td>Euhedral-subhedral</td>
<td>Altered to clay.</td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>&lt;5</td>
<td>15-20 0.5-3</td>
<td></td>
<td>Euhedral</td>
<td>Altered to clay.</td>
</tr>
<tr>
<td>GROUNDMASS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plagioclase</td>
<td>2-3</td>
<td>10-15 &lt;0.2</td>
<td></td>
<td>Euhedral, elongate, prismatic</td>
<td>Altered to clay.</td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>0</td>
<td>1-10 &lt;0.2</td>
<td></td>
<td>Euhedral-subhedral</td>
<td>Altered to clay.</td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>Trace</td>
<td>1-10 &lt;0.2</td>
<td></td>
<td>Euhedral-subhedral, prismatic</td>
<td>Altered to clay.</td>
</tr>
<tr>
<td>Glass</td>
<td>0</td>
<td>40-50 N/A</td>
<td></td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>SECONDARY MINERALOGY</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clays</td>
<td>40-50</td>
<td>Glass, plagioclase, orthopyroxene</td>
<td>Mainly illite.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**COMMENTS:** This rock is highly altered andesite. Most of phenocrysts are replaced by illite-rich clay.
125-786B-57R-04 (Piece 4B, 64-66 cm)  
**OBSERVER:** HIR  
**WHERE SAMPLED:** Izu-Bonin outer-arc high

**ROCK NAME:** Andesite breccia

**GRAIN SIZE:**

**TEXTURE:** Porphyritic

<table>
<thead>
<tr>
<th>PRIMARY MINERALOGY</th>
<th>PERCENT</th>
<th>PERCENT SIZE</th>
<th>COMPOSITION</th>
<th>MORPHOLOGY</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHENOCRYST</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plagioclase</td>
<td>Trace</td>
<td>Trace 0.5-1</td>
<td></td>
<td>Euhedral</td>
<td>Highly altered to clay.</td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>Trace</td>
<td>Trace 0.5-1</td>
<td></td>
<td>Euhedral</td>
<td>Mostly torn off by polishing.</td>
</tr>
<tr>
<td>GROUNDMASS</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SECONDARY MINERALOGY</th>
<th>PERCENT</th>
<th>FILLING</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clays</td>
<td>&gt;95</td>
<td>Groundmass, glass, vesicles</td>
<td>Groundmass is highly altered to clay.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>VESELS/CAVITIES</th>
<th>PERCENT</th>
<th>LOCATION (mm)</th>
<th>FILLING</th>
<th>SHAPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vesicles</td>
<td>5-10</td>
<td>Random 0.5-1</td>
<td>Clay</td>
<td>Round</td>
</tr>
</tbody>
</table>

**COMMENTS:** This rock is highly altered andesite and is locally brecciated.

125-786B-57R-05 (Piece 1A, 49-50 cm)  
**OBSERVER:** HIR  
**WHERE SAMPLED:** Izu-Bonin outer-arc high

**ROCK NAME:** Orthopyroxene boninite

**GRAIN SIZE:** 0.2-2 mm

**TEXTURE:** Vesicular

<table>
<thead>
<tr>
<th>PRIMARY MINERALOGY</th>
<th>PERCENT</th>
<th>PERCENT SIZE</th>
<th>COMPOSITION</th>
<th>MORPHOLOGY</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHENOCRYST</td>
<td></td>
<td></td>
<td></td>
<td>Euhedral</td>
<td></td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>3-5</td>
<td>3-5</td>
<td>1-2</td>
<td>Euhedral</td>
<td></td>
</tr>
<tr>
<td>GROUNDMASS</td>
<td>10-15</td>
<td>10-15</td>
<td>0.05-0.2</td>
<td>Anhedral, acicular</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SECONDARY MINERALOGY</th>
<th>PERCENT</th>
<th>FILLING</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clays</td>
<td>80-90</td>
<td>Glass</td>
<td></td>
</tr>
<tr>
<td>Zeolites</td>
<td>1-2</td>
<td>Vesicles</td>
<td></td>
</tr>
<tr>
<td>Chlorite</td>
<td>Trace</td>
<td>Vesicles</td>
<td></td>
</tr>
<tr>
<td>Prehnite?</td>
<td>Trace</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>VESELS/CAVITIES</th>
<th>SIZE</th>
<th>PERCENT</th>
<th>LOCATION (mm)</th>
<th>FILLING</th>
<th>SHAPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vesicles</td>
<td>30-40</td>
<td>Random 1-4</td>
<td>Zeolite, clay, prehnite</td>
<td>Round</td>
<td></td>
</tr>
</tbody>
</table>

**COMMENTS:** Vesicles are abundant throughout the rock.
### 125-786B-57R-05 (Piece 1A, 50-51 cm)

**Observer:** JOH  
**Where Sampled:** Izu-Bonin outer-arc high

**Rock Name:** Two-pyroxene boninite  
**Grain Size:** Fine-grained to glassy  
**Texture:** Vesicular, sparsely phyric

#### Primary Mineralogy

<table>
<thead>
<tr>
<th>Phenocrysts</th>
<th>Percent</th>
<th>Present</th>
<th>Original (mm)</th>
<th>Composition</th>
<th>Morphology</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinopyroxene</td>
<td>&lt;2</td>
<td>2-5</td>
<td>&lt;0.5</td>
<td>Subhedral</td>
<td>Too altered to determine accurate original mode, spinel inclusions.</td>
<td></td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>&lt;2</td>
<td>2-5</td>
<td>&lt;1</td>
<td>Subhedral</td>
<td>Too altered to determine accurate original mode, spinel inclusions.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Groundmass</th>
<th>Percent</th>
<th>Present</th>
<th>Original (mm)</th>
<th>Composition</th>
<th>Morphology</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glass</td>
<td>0</td>
<td>85-90</td>
<td>N/A</td>
<td>N/A</td>
<td>Brown in PPL, probably alteration.</td>
<td></td>
</tr>
<tr>
<td>Microlites</td>
<td>&lt;5</td>
<td>10-15</td>
<td>&lt;0.07</td>
<td>Needles</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Secondary Mineralogy

<table>
<thead>
<tr>
<th>Mineralogy</th>
<th>Percent</th>
<th>Present</th>
<th>Original (mm)</th>
<th>Filling</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clays</td>
<td>75-85</td>
<td>Glass, vesicles</td>
<td></td>
<td>Zeolite, chlorite</td>
<td>Yellow-brown amorphous clay: ~5% pale green, pervasive.</td>
</tr>
<tr>
<td>Zeolites</td>
<td>5</td>
<td>Vesicles</td>
<td></td>
<td></td>
<td>3 types, radiating, parallel extinction; small crystals (&lt;0.01 mm) and mixed with chlorite.</td>
</tr>
<tr>
<td>Chlorite</td>
<td>&lt;10</td>
<td>Glass, vesicles</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Velesicles/ Cavities**

<table>
<thead>
<tr>
<th>Size</th>
<th>Percent</th>
<th>Location (mm)</th>
<th>Filling</th>
<th>Shape</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vesicles</td>
<td>25-35</td>
<td>0.2-1.2</td>
<td>Zeolite, chlorite</td>
<td>Round</td>
<td>Nice examples of zeolite filling.</td>
</tr>
</tbody>
</table>

**Comments:** This rock is quite altered; primary mineralogy and texture are obscured by alteration.

### 125-786B-57R-06 (Piece 1B, 48-49 cm)

**Observer:** HIR  
**Where Sampled:** Izu-Bonin outer-arc high

**Rock Name:** Orthopyroxene boninite  
**Grain Size:** Fine-grained to glassy  
**Texture:** Vesicular, porphyritic

#### Primary Mineralogy

<table>
<thead>
<tr>
<th>Phenocrysts</th>
<th>Percent</th>
<th>Present</th>
<th>Original (mm)</th>
<th>Composition</th>
<th>Morphology</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orthopyroxene</td>
<td>25-35</td>
<td>25-35</td>
<td>0.5-1.5</td>
<td>Euhedral</td>
<td>Shows clinopyroxene exsolution lamellae.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Groundmass</th>
<th>Percent</th>
<th>Present</th>
<th>Original (mm)</th>
<th>Composition</th>
<th>Morphology</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plagioclase</td>
<td>Trace</td>
<td>1-2</td>
<td>&lt;0.1</td>
<td>Acicular</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>Trace</td>
<td>1-2</td>
<td>&lt;0.1</td>
<td>Prismatic</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Secondary Mineralogy

<table>
<thead>
<tr>
<th>Mineralogy</th>
<th>Percent</th>
<th>Present</th>
<th>Filling</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clays</td>
<td>65-75</td>
<td>Glass, plagioclase</td>
<td>Pale-green to pale-brown dusty clay replaces groundmass glass and fills in vesicles.</td>
<td></td>
</tr>
</tbody>
</table>

**Velesicles/ Cavities**

<table>
<thead>
<tr>
<th>Size</th>
<th>Percent</th>
<th>Location (mm)</th>
<th>Filling</th>
<th>Shape</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vesicles</td>
<td>15-20</td>
<td>Random</td>
<td>Clay</td>
<td>Round</td>
<td></td>
</tr>
</tbody>
</table>

**Comments:** This rock is quite altered; primary mineralogy and texture are obscured by alteration.
### SITE 786

125-786B-57R-06 (Piece IE, 48-49 cm)  
**Observer:** JOH  
**Where Sampled:** Izu-Bonin outer-arc high  

**Rock Name:** Andesite  
**Grain Size:** Fine-grained to glassy  
**Texture:** Sparsely phyric  

#### PRIMARY MINERALOGY

<table>
<thead>
<tr>
<th>Phenocrysts</th>
<th>Percent Present</th>
<th>Percent Original (mm)</th>
<th>Composition</th>
<th>Morphology</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plagioclase</td>
<td>5-7</td>
<td>5-8</td>
<td>Subhedral-anhedral</td>
<td>Spinel inclusions.</td>
<td></td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>1-2</td>
<td>1-2</td>
<td>Subhedral-anhedral</td>
<td>Spinel inclusions.</td>
<td></td>
</tr>
</tbody>
</table>

**Groundmass**

| Glass     | 10-15         | 75-80                  | N/A         | Needles | Brown to green. |
| Plagioclase | <10          | 15-20                  | <0.05       | Neatly | Chloritid and clay alteration. |

**Secondary Mineralogy**

| Clays     | 50-55         | Glass, matrix          | Dark brown to yellow to green, amorphous, pervasive in glassy portions. |
| Zeolites  | 20-25         | Glass, matrix          | Green to brownish yellow, slightly pleochroic, intimately mixed with clays. |

**Vesicles/Cavities**

<table>
<thead>
<tr>
<th>Vesicles</th>
<th>Percent Location (mm)</th>
<th>Filling</th>
<th>Shape</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;10</td>
<td>0.2-1.5</td>
<td>Zeolite</td>
<td>Elongate</td>
<td>Slide is very thin and only a small portion (5 mm diameter) remains. This and the degree of alteration make the rock difficult to characterize.</td>
</tr>
</tbody>
</table>

125-786B-57R-07 (Piece 50, 114-115 cm)  
**Observer:** JOH  
**Where Sampled:** Izu-Bonin outer-arc high  

**Rock Name:** Boninite  
**Grain Size:** Fine-grained to glassy  
**Texture:** Sparsely phyric  

#### PRIMARY MINERALOGY

<table>
<thead>
<tr>
<th>Phenocrysts</th>
<th>Percent Present</th>
<th>Percent Original (mm)</th>
<th>Composition</th>
<th>Morphology</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinopyroxene</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>Subhedral</td>
<td>Very low extinction angle, spinel inclusions.</td>
<td></td>
</tr>
<tr>
<td>Spinel</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>Equant</td>
<td>Very dark red.</td>
<td></td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>&lt;1-1</td>
<td>1-2</td>
<td>Subhedral</td>
<td>Spinel inclusions. Mostly altered and altered material, plucked out.</td>
<td></td>
</tr>
</tbody>
</table>

**Groundmass**

| Glass     | 0             | 65-70                  | N/A         | Needles | Equant | Totally altered to brown clays. |
| Microlites       | <5           | 30-35                  | <0.05       | Needles | Equant | Low birefringence, bimodal size/shape, equant ones may be zeolite. |

**Secondary Mineralogy**

| Clays     | 85-90         | Glass, matrix          | Brown, amorphous, clay pervasive. |
| Zeolites  | 5-10          | Vesicle lining         | Lining vesicles. May also be the equant crystals above as microlites. They occur as crystals pointing into vesicles. |

**Vesicles/Cavities**

<table>
<thead>
<tr>
<th>Vesicles</th>
<th>Percent Location (mm)</th>
<th>Filling</th>
<th>Shape</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;10</td>
<td>0.2-1.5</td>
<td>Zeolite lining</td>
<td>Irregular</td>
<td>Some may be plucking during thin section preparation.</td>
</tr>
</tbody>
</table>

**Comments:** Relict glomerocrysts of orthopyroxene up to 2.0 mm. Totally altered rock is so severely altered that most of its original mineralogy is obscured.
125-786B-58R-01 (Piece 21,107-108 cm)  
**Observer:** SAB  
**Where Sampled:** Izu-Bonin outer-arc high

**Rock Name:** Andesite  
**Grain Size:** Fine-grained to glassy  
**Texture:** Sparsely phyric

### Primary Mineralogy

<table>
<thead>
<tr>
<th>Phenocryst</th>
<th>Present</th>
<th>Original (mm)</th>
<th>Composition</th>
<th>Morphology</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plagioclase</td>
<td>1-2</td>
<td>0.2-1</td>
<td>Subhedral</td>
<td>Twinning is rarely visible.</td>
<td></td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>2-4</td>
<td>0.3-2</td>
<td>Subhedral-euhedral</td>
<td>Mostly altered.</td>
<td></td>
</tr>
</tbody>
</table>

#### Groundmass

| Glass | 0 | 80 | N/A |

#### Secondary Mineralogy

<table>
<thead>
<tr>
<th>Phenocryst</th>
<th>Present</th>
<th>Original (mm)</th>
<th>Filling</th>
<th>Composition</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plagioclase</td>
<td>92</td>
<td>Glass, vesicles</td>
<td>2</td>
<td>Green-brown, amorphous clay pervasive and in vesicles.</td>
<td></td>
</tr>
</tbody>
</table>

### Vesicles/Cavities

<table>
<thead>
<tr>
<th>Size</th>
<th>Percent Location (mm)</th>
<th>Filling</th>
<th>Shape</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vesicles</td>
<td>15-20</td>
<td>Random 0.5-1</td>
<td>Clays</td>
<td>Round Some filled with clays + zeolites.</td>
</tr>
</tbody>
</table>

### Comments

Very poorly made thin section. It is extremely difficult to tell what type of rock it is. Rock appears almost totally altered so primary mineralogy is obscured.

125-786B-58R-01 (Piece 21,127-128 cm)  
**Observer:** TER  
**Where Sampled:** Izu-Bonin outer-arc high

**Rock Name:** Andesite  
**Grain Size:** Fine-grained to glassy  
**Texture:** Intermediate texture, sparsely phyric

### Primary Mineralogy

<table>
<thead>
<tr>
<th>Phenocryst</th>
<th>Present</th>
<th>Original (mm)</th>
<th>Composition</th>
<th>Morphology</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plagioclase</td>
<td>0</td>
<td>0.05-0.2</td>
<td>Subhedral-subhedral</td>
<td>Replaced by clays.</td>
<td></td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>1</td>
<td>0.05-0.1</td>
<td>Subhedral</td>
<td>2V=85 degrees, replaced by clays.</td>
<td></td>
</tr>
</tbody>
</table>

#### Groundmass

| Glass | 0 | 75-80 | N/A |
| Opaque | 1 | 0.01-0.05 | Subhedral |

#### Secondary Mineralogy

<table>
<thead>
<tr>
<th>Phenocryst</th>
<th>Present</th>
<th>Original (mm)</th>
<th>Filling</th>
<th>Composition</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clays</td>
<td>85-90</td>
<td>Glass, plagioclase</td>
<td>2</td>
<td>Pale-brown clay replacing minerals and glass.</td>
<td></td>
</tr>
</tbody>
</table>

### Vesicles/Cavities

<table>
<thead>
<tr>
<th>Size</th>
<th>Percent Location (mm)</th>
<th>Filling</th>
<th>Shape</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vesicles</td>
<td>30</td>
<td>Random 0.1-5</td>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>

### Comments

Relatively altered andesite.
### Site 786

125-786B-61R-04 (Piece IE, 32-34 cm)  
**Observer:** JOH  
**Where Sampled:** Izu-Bonin outer-arc high  

**Rock Name:** Andesite  
**Grain Size:** Fine-grained to glassy  
**Texture:** Sparsely phryic/glassy margin

<table>
<thead>
<tr>
<th>Primary Mineralogy</th>
<th>Percent Present</th>
<th>Size (mm)</th>
<th>Composition</th>
<th>Morphology</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phenocrysts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plagioclase</td>
<td>≈5</td>
<td>10-15</td>
<td>0.2-1.2</td>
<td>Subhedral</td>
<td>Sparse spinel inclusions.</td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>≈2</td>
<td>&lt;5</td>
<td>&lt;0.5</td>
<td>Euhedral-subhedral</td>
<td>Some are pale green.</td>
</tr>
<tr>
<td>Spinel</td>
<td>Trace</td>
<td>Trace</td>
<td>&lt;0.02</td>
<td>Subhedral</td>
<td></td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>1-3</td>
<td>1-3</td>
<td>&lt;1</td>
<td>Subhedral</td>
<td></td>
</tr>
<tr>
<td>Groundmass</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glass</td>
<td>&lt;10</td>
<td>55-60</td>
<td>N/A</td>
<td>N/A</td>
<td>Deep yellow to light brown, highly altered.</td>
</tr>
<tr>
<td>Microlites?</td>
<td>&lt;10</td>
<td>25-30</td>
<td>&lt;0.02</td>
<td>N/A</td>
<td>No discernible optical properties.</td>
</tr>
</tbody>
</table>

**Secondary Mineralogy**  
**Percent Replacing/Filling**  
**Comments**

| Clay                | 65-70           | Matrix | Brown to yellow-brown clays, pervasive. |
| Chlorite            | 5-10            | Glass/matrix | Slight yellow-green pleochroism, seems to be chlorite intimately mixed with brown clay. |

**Vesicles/Cavities**  
**Size**  
**Comments**

<table>
<thead>
<tr>
<th>Vesicles</th>
<th>Percent Filling</th>
<th>Size (mm)</th>
<th>Filling</th>
<th>Shape</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Calcite, chlorite</td>
<td>Round-elongate</td>
</tr>
</tbody>
</table>

**Comments:** Most of sample was ground away during thin-section preparation. The remaining portion appears to be the glassy margin attached to a piece of more crystal rock. The more crystalline rock is mostly missing. Therefore the above description is highly biased towards the glassy margins.

125-786B-61R-05 (Piece 10A, 81-84 cm)  
**Observer:** HIR  
**Where Sampled:** Izu-Bonin outer-arc high  

**Rock Name:** Rhyolite tuff  
**Grain Size:** Variable  
**Texture:** Clastic texture

<table>
<thead>
<tr>
<th>Primary Mineralogy</th>
<th>Percent Present</th>
<th>Size (mm)</th>
<th>Composition</th>
<th>Morphology</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phenocrysts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plagioclase</td>
<td>5-10</td>
<td>5-10</td>
<td>0.5-1</td>
<td>Euhedral</td>
<td>Mostly torn off by polishing.</td>
</tr>
<tr>
<td>Groundmass</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
</tr>
</tbody>
</table>

**Secondary Mineralogy**  
**Percent Replacing/Filling**  
**Comments**

| Clay                | 70-85           | Matrix | Dusty clay filling in matrix. |
| Carbonate           | <1              | Vesicles | Showing typical twinning and high birefringence. |
| Chlorite            | <1              | Matrix, vesicles | Pale, green-colored chlorite is scattered throughout the rock. |
| Plagioclase         | 10-20           | Matrix | Showing anhedral shape, <0.2 mm. |

**Vesicles/Cavities**  
**Size**  
**Comments**
125-786B-62R-03 (Piece IE, 40-42 cm)  OBSERVER: JOH  WHERE SAMPLED: Izu-Bonin outer-arc high

ROCK NAME: Orthopyroxene-phyric boninite
GRAIN SIZE: Fine-grained to glassy
TEXTURE: Porphyritic

<table>
<thead>
<tr>
<th>PRIMARY MINERALOGY</th>
<th>PERCENT</th>
<th>PERCENT ORIGINAL (mm)</th>
<th>COMPOSITION</th>
<th>MORPHOLOGY</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHENOCRYSTS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spinel</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td></td>
<td>Euhedral-subhedral</td>
<td>Most crystals plucked during preparation; those that remain have spinel inclusions. Some chlorite alteration.</td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>2</td>
<td>2-10</td>
<td>0.5-2.5</td>
<td>Euhedral-subhedral</td>
<td></td>
</tr>
<tr>
<td>GROUNDMASS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glass</td>
<td>&lt;5</td>
<td>55-60</td>
<td>N/A</td>
<td></td>
<td>Slightly altered to clay.</td>
</tr>
<tr>
<td>Plagioclase</td>
<td>&lt;10</td>
<td>30-35</td>
<td>&lt;0.25</td>
<td></td>
<td>Random orientation.</td>
</tr>
<tr>
<td>Pyroxene</td>
<td>&lt;5</td>
<td>10-15</td>
<td>&lt;0.2</td>
<td></td>
<td>Chloritic alteration.</td>
</tr>
<tr>
<td>SECONDARY MINERALOGY</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clays</td>
<td>65-70</td>
<td>Glass/groundmass</td>
<td></td>
<td></td>
<td>Brown to yellow-brown clay, pervasive.</td>
</tr>
<tr>
<td>Carbonate</td>
<td>2-4</td>
<td>Veins, vesicles</td>
<td></td>
<td></td>
<td>Patchwork up to 0.8 mm blocks.</td>
</tr>
<tr>
<td>Zeolites</td>
<td>&lt;2</td>
<td>Vesicle</td>
<td></td>
<td></td>
<td>Yellow and black in crossed polars with a radiating structure. Low-birefringence crystals mixed with carbonate.</td>
</tr>
<tr>
<td>Chlorite</td>
<td>5-10</td>
<td>Groundmass, pyroxene</td>
<td></td>
<td></td>
<td>Green to green-brown, slight pleochroism.</td>
</tr>
</tbody>
</table>

COMMENTS: Plucking of pyroxene and plagioclase crystals was quite severe during thin-section preparation. This may indicate high alteration.

125-786B-63R-02 (Piece 12, 72-74 cm)  OBSERVER: SAB  WHERE SAMPLED: Izu-Bonin outer-arc high

ROCK NAME: Rhyolite tuff
GRAIN SIZE: Variable
TEXTURE: Clastic texture

<table>
<thead>
<tr>
<th>PRIMARY MINERALOGY</th>
<th>PERCENT</th>
<th>PERCENT ORIGINAL (mm)</th>
<th>COMPOSITION</th>
<th>MORPHOLOGY</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHENOCRYSTS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plagioclase</td>
<td>5-10</td>
<td>5-10</td>
<td>0.5-1</td>
<td>Euhedral</td>
<td>Mostly plucked out by polishing.</td>
</tr>
<tr>
<td>GROUNDMASS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glass</td>
<td>0</td>
<td>70-85</td>
<td>N/A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plagioclase</td>
<td>10-20</td>
<td>10-20</td>
<td>&lt;0.2</td>
<td>Anhedral</td>
<td>Black, euhedral and as dusty grains distributed throughout matrix.</td>
</tr>
<tr>
<td>Opaque</td>
<td>1-2</td>
<td>1-2</td>
<td>&lt;0.2</td>
<td>Euhedral</td>
<td></td>
</tr>
<tr>
<td>SECONDARY MINERALOGY</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clays</td>
<td>70-85</td>
<td>Matrix</td>
<td>Dusty brown clay filling in matrix.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VESICLES/CAVITIES</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vesicles</td>
<td>1-2</td>
<td>Random</td>
<td>&lt;2</td>
<td>Round-elongate</td>
<td></td>
</tr>
</tbody>
</table>
**SITE 786**

**125-786B-65R-01 (Piece 2B, 16-17 cm) OBSERVER: JOH WHERE SAMPLED: Izu-Bonin outer-arc high**

**ROCK NAME:** Andesite  
**GRAIN SIZE:** Fine-grained to glassy  
**TEXTURE:** Aphyric

### PRIMARY MINERALOGY

<table>
<thead>
<tr>
<th>MINERALOGY</th>
<th>PERCENT</th>
<th>PERCENT</th>
<th>SIZE</th>
<th>COMPOSITION</th>
<th>MORPHOLOGY</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHENOCRYST</td>
<td>Trace</td>
<td>Trace</td>
<td>&lt;0.3</td>
<td></td>
<td>Euhedral</td>
<td></td>
</tr>
<tr>
<td>GROUNDMASS</td>
<td>Glass</td>
<td>&lt;5</td>
<td>35-45</td>
<td>N/A</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Plagioclase</td>
<td>20-30</td>
<td>40-50</td>
<td>&lt;0.2</td>
<td>Needdles</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pyroxene</td>
<td>10-15</td>
<td>15-20</td>
<td>&lt;0.1</td>
<td>Anhedral</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Spinel</td>
<td>2-4</td>
<td>2-4</td>
<td>&lt;0.04</td>
<td>Euhedral-anhedral</td>
<td></td>
</tr>
</tbody>
</table>

### SECONDARY MINERALOGY

<table>
<thead>
<tr>
<th>MINERALOGY</th>
<th>PERCENT</th>
<th>FILLING</th>
<th>SHAPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clays</td>
<td>55-60</td>
<td>Glass matrix</td>
<td></td>
</tr>
<tr>
<td>Carbonate</td>
<td>1-2</td>
<td>Vesicles, phenocrysts</td>
<td></td>
</tr>
<tr>
<td>Chlorite</td>
<td>5-10</td>
<td>Matrix</td>
<td></td>
</tr>
</tbody>
</table>

### VESICLES/CAVITIES

<table>
<thead>
<tr>
<th>SIZE</th>
<th>PERCENT</th>
<th>LOCATION</th>
<th>FILLING</th>
<th>SHAPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vesicles</td>
<td>&lt;2</td>
<td>Throughout</td>
<td>0.2-4</td>
<td>Round</td>
</tr>
</tbody>
</table>

**125-786B-66R-01 (Piece 12, 87-88 cm) OBSERVER: JOH WHERE SAMPLED: Izu-Bonin outer-arc high**

**ROCK NAME:** Andesite  
**GRAIN SIZE:** Fine-grained to glassy  
**TEXTURE:** Aphyric

### PRIMARY MINERALOGY

<table>
<thead>
<tr>
<th>MINERALOGY</th>
<th>PERCENT</th>
<th>PERCENT</th>
<th>SIZE</th>
<th>COMPOSITION</th>
<th>MORPHOLOGY</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHENOCRYST</td>
<td>&lt;10</td>
<td>10-20</td>
<td>&lt;0.2</td>
<td></td>
<td>Anhedral</td>
<td></td>
</tr>
<tr>
<td>GROUNDMASS</td>
<td>Matrix</td>
<td>0</td>
<td>70-80</td>
<td>N/A</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Plagioclase</td>
<td>&lt;10</td>
<td>10-20</td>
<td>&lt;0.3</td>
<td>Laths</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Spinel</td>
<td>1-2</td>
<td>1-2</td>
<td>&lt;0.02</td>
<td>Subhedral, equant</td>
<td></td>
</tr>
</tbody>
</table>

### SECONDARY MINERALOGY

<table>
<thead>
<tr>
<th>MINERALOGY</th>
<th>PERCENT</th>
<th>FILLING</th>
<th>SHAPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbonate</td>
<td>1-2</td>
<td>Vesicles, cavities</td>
<td></td>
</tr>
<tr>
<td>Plagioclase</td>
<td>10-20</td>
<td>?</td>
<td></td>
</tr>
<tr>
<td>Clays</td>
<td>70-80</td>
<td>Groundmass</td>
<td></td>
</tr>
</tbody>
</table>

### VESICLES/CAVITIES

<table>
<thead>
<tr>
<th>SIZE</th>
<th>PERCENT</th>
<th>LOCATION</th>
<th>FILLING</th>
<th>SHAPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vesicles</td>
<td>5-7</td>
<td>Throughout</td>
<td>0.2-4</td>
<td>Elongate to round</td>
</tr>
</tbody>
</table>

**COMMENTS:** No igneous textures or mineralogy preserved. May be brecciated, glassy volcanic then altered to clays.

1080
## Site 786

**125-788B-67R-01 (Piece 2, 8-10 cm)**  
**Observer:** JOH  
**Where Sampled:** Izu-Bonin outer-arc high

**Rock Name:** Clinopyroxene-plagioclase-orthopyroxene andesite  
**Grain Size:** Fine-grained to glassy  
**Texture:** Moderately glomerophyric

### Primary Mineralogy

<table>
<thead>
<tr>
<th>Phenocrysts</th>
<th>Percent</th>
<th>Percent</th>
<th>Size (mm)</th>
<th>Composition</th>
<th>Morphology</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plagioclase</td>
<td>&lt;4</td>
<td>8-12</td>
<td>0.5-2.5</td>
<td>Euhedral-subhedral</td>
<td>Spinels; inclusion, Moth-eaten, altered to clays.</td>
<td></td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>&lt;3</td>
<td>5-7</td>
<td>0.3-0.8</td>
<td>Subhedral</td>
<td>Crystal, pale green.</td>
<td></td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>0</td>
<td>8-12</td>
<td>N/A</td>
<td>Subhedral, lath-shaped to equant</td>
<td>Crystals altered to Fe-oxide + carbonate + chlorite.</td>
<td></td>
</tr>
</tbody>
</table>

### Groundmass

| Glass       | <5      | 50-60   | N/A       | N/A | Nearly completely altered to clays. |
| Plagioclase | <8      | 10-15   | <0.15     | Needle | Completely altered to clays and chlorite. |
| Clinopyroxene| <8     | 10-15   | <0.3      | Tabular |

### Secondary Mineralogy

| Clays       | 45-50   | Glass, plagioclase | Brown, amphibole clay. |
| Carbonate   | 5-7     | Orthopyroxene, olivine | Pseudomorph pyroxene, also in fractures and cleavages. |
| Chlorite    | 17-22   | Glass, olivine, orthopyroxene | Part of the Fe-oxide + carbonate + chlorite alteration assemblage. |
| Hematite    | 3-5     | Orthopyroxene |

### Vesicles/Cavities

<table>
<thead>
<tr>
<th>Vesicles</th>
<th>Percent</th>
<th>Location (mm)</th>
<th>Filling</th>
<th>Shape</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-15</td>
<td>Rock</td>
<td>0.2-6</td>
<td>No</td>
<td>Irregular</td>
<td>Some may be due to plucking during thin-section preparation.</td>
</tr>
</tbody>
</table>

**Comments:** Glomerocrysts of plagioclase + clinopyroxene up to 3 mm across.

---

**125-786B-67R-01 (Piece 9, 62-63 cm)**  
**Observer:** TER  
**Where Sampled:** Izu-Bonin outer-arc high

**Rock Name:** Plagioclase-clinopyroxene-orthopyroxene phyric basalt  
**Grain Size:** Fine-grained to glassy (0-3 mm)  
**Texture:** Glomerophyric, hyalophytic texture

### Primary Mineralogy

<table>
<thead>
<tr>
<th>Phenocrysts</th>
<th>Percent</th>
<th>Percent</th>
<th>Size (mm)</th>
<th>Composition</th>
<th>Morphology</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Olivine</td>
<td>0</td>
<td>Trace</td>
<td>Trace</td>
<td>Subhedral</td>
<td>Olivine replaced by carbonate.</td>
<td></td>
</tr>
<tr>
<td>Plagioclase</td>
<td>1</td>
<td>1</td>
<td>0.1-0.5</td>
<td>Subhedral-euhedral</td>
<td>Plagioclase is very sparse in this rock.</td>
<td></td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>3</td>
<td>3</td>
<td>0.1-1</td>
<td>Subhedral-euhedral</td>
<td>Orthopyroxene has reaction rim.</td>
<td></td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>4</td>
<td>5</td>
<td>0.1-3</td>
<td>Subhedral-euhedral</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Groundmass

| Glass       | 10      | 30      | 0.05-0.1  | Ruhedral    | Showing lath shape. |
| Plagioclase | 5       | 10      | 0.02-0.05 | Subhedral-euhedral | Showing short prismatic shape. |
| Opaque      | 3       | 3       | 0.01-0.02 | Subhedral-euhedral | Equant in shape. |
| Glass       | 10      | 40-45   | N/A       | N/A         | Party devitrified to clays. |

### Secondary Mineralogy

| Clays       | 60-65   | Glass, orthopyroxene, olivine | |
| Carbonate   | 3       | Orthopyroxene, olivine | |

### Vesicles/Cavities

<table>
<thead>
<tr>
<th>Vesicles</th>
<th>Percent</th>
<th>Location (mm)</th>
<th>Filling</th>
<th>Shape</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Comments:** Orthopyroxenes are sometimes surrounded by clinopyroxene rim. Plagioclase-poor, two-pyroxene basalt.
125-786B-68R-01 (Piece 1A, 7-9 cm)  OBSERVER: JOH  WHERE SAMPLED: Izu-Bonin outer-arc high

ROCK NAME: Meta-andesite  GRAIN SIZE: Fine-grained to glassy  TEXTURE: Moderately to highly phryic

**PRIMARY MINERALOGY**

<table>
<thead>
<tr>
<th>PHENOCRYST</th>
<th>PERCENT Present</th>
<th>PERCENT Original</th>
<th>SIZE (mm)</th>
<th>COMPOSITION</th>
<th>MORPHOLOGY</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plagioclase</td>
<td>&lt;2</td>
<td>2-5</td>
<td>0.8-2</td>
<td></td>
<td>Subhedral</td>
<td>Highly altered, only &quot;shells&quot; remain.</td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>&lt;3</td>
<td>4-6</td>
<td>0.4-1</td>
<td></td>
<td>Subhedral-subhedral</td>
<td>Spinel inclusions.</td>
</tr>
<tr>
<td>Spinel</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>&lt;0.15</td>
<td></td>
<td>Subhedral-subhedral</td>
<td>Black (equant) to red.</td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>0</td>
<td>15-20</td>
<td>0.3-1.2</td>
<td></td>
<td>Subhedral-subhedral</td>
<td>100% altered to clay and chlorite, shape of crystals and direction of chlorite extinction used as mineral identification.</td>
</tr>
</tbody>
</table>

**GROUNDMASS**

Groundmass <10  70-80  N/A  N/A  Glass and possible microphenocrysts of plagioclase. Alteration has obscured the textural distinction.

**SECONDARY MINERALOGY**

<table>
<thead>
<tr>
<th>MINERALOGY</th>
<th>PERCENT REPLACING/ FILLING</th>
<th>LOCATION (mm)</th>
<th>SHAPE</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clays</td>
<td>65-75 Glass, phenocrysts</td>
<td></td>
<td></td>
<td>Brown, amorphous pervasive.</td>
</tr>
<tr>
<td>Chlorite</td>
<td>10-15 Pyroxene, glass</td>
<td></td>
<td></td>
<td>Appears to have formed pseudomorphing orthopyroxene and later become overprinted by brown clays.</td>
</tr>
<tr>
<td>Magnetite</td>
<td>1-3 Veins</td>
<td></td>
<td></td>
<td>Black to deep blood-red, massive, forming veins up to 0.5 mm wide and crossing minerals.</td>
</tr>
</tbody>
</table>

**VESICLES/CAVITIES**

<table>
<thead>
<tr>
<th>VESICLES/CAVITIES</th>
<th>PERCENT LOCATION (mm)</th>
<th>FILLING</th>
<th>SHAPE</th>
<th>COMMENTS</th>
</tr>
</thead>
</table>

**COMMENTS:** Rock is highly altered to brown clays and minor chlorite which obscure the primary textural and crystallographic characteristics.

125-786B-68R-05 (Piece 18, 65-67 cm)  OBSERVER: JOH  WHERE SAMPLED: Izu-Bonin outer-arc high

ROCK NAME: Meta-andesite  GRAIN SIZE: Fine-grained to glassy  TEXTURE: Moderately phryic

**PRIMARY MINERALOGY**

<table>
<thead>
<tr>
<th>PHENOCRYST</th>
<th>PERCENT Present</th>
<th>PERCENT Original</th>
<th>SIZE (mm)</th>
<th>COMPOSITION</th>
<th>MORPHOLOGY</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plagioclase</td>
<td>1-2</td>
<td>&lt;3</td>
<td>&lt;0.2</td>
<td></td>
<td>Tabular</td>
<td>Fresh microphenocrysts, twinned.</td>
</tr>
<tr>
<td>Pyroxene</td>
<td>&lt;2</td>
<td>10-20</td>
<td>&lt;1.5</td>
<td></td>
<td>Subhedral-subhedral</td>
<td>Highly altered to clays + chlorite, no original mineral fragments or optical character left. Morphologically these appear to be pyroxenes.</td>
</tr>
<tr>
<td>Spinel</td>
<td>1-2</td>
<td>1-2</td>
<td>&lt;0.05</td>
<td></td>
<td>Equant</td>
<td>Low birefringence,</td>
</tr>
</tbody>
</table>

**GROUNDMASS**

Groundmass 0  65-85  N/A  N/A  May have been glass or microcrystalline completely obscured by alteration.

**SECONDARY MINERALOGY**

<table>
<thead>
<tr>
<th>MINERALOGY</th>
<th>PERCENT REPLACING/ FILLING</th>
<th>LOCATION (mm)</th>
<th>SHAPE</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clays</td>
<td>Glass, matrix</td>
<td></td>
<td></td>
<td>Orange-yellow to yellow-green pleochroism.</td>
</tr>
<tr>
<td>Carbonate</td>
<td>1-5 Veins</td>
<td></td>
<td></td>
<td>Intimately associated with albite or a low birefringence zeolite, and chlorite up to 0.15 mm equant subhedral-subhedral pieces.</td>
</tr>
<tr>
<td>Chlorite</td>
<td>10-20 Pyroxene, glass</td>
<td></td>
<td></td>
<td>Low birefringence, colorless, anhedral crystals approximately 0.05 mm across which interlock and may be albite, quartz or a zeolite.</td>
</tr>
<tr>
<td>Magnetite</td>
<td>1-2 Veins</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unknown?</td>
<td>20-25 Matrix</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**VESICLES/CAVITIES**

<table>
<thead>
<tr>
<th>VESICLES/CAVITIES</th>
<th>PERCENT LOCATION (mm)</th>
<th>FILLING</th>
<th>SHAPE</th>
<th>COMMENTS</th>
</tr>
</thead>
</table>

**COMMENTS:** Highly altered rock. Nearly all original mineralogy and texture have been obscured by alteration.
**SITE 786**

**125-786B-70R-01 (68-72 cm)**

**ROCK NAME:** Meta-andesite  
**GRAIN SIZE:** Fine-grained to glassy  
**TEXTURE:** Sparsely phyric

<table>
<thead>
<tr>
<th>PRIMARY MINERALOGY</th>
<th>PERCENT PRESENT</th>
<th>ORIGINAL (mm)</th>
<th>COMPOSITION</th>
<th>MORPHOLOGY</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHENOCRYSTS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pyroxene</td>
<td>Trace</td>
<td>20-25</td>
<td></td>
<td>Subhedral</td>
<td>Crystals 100% replaced by clays and some carbonate. Tiny traces of relict mineral suggest orthopyroxene as does general morphology.</td>
</tr>
<tr>
<td>Spinel</td>
<td>1-2</td>
<td>1-2</td>
<td>&lt;0.01</td>
<td>Equant</td>
<td>See pyroxene comments.</td>
</tr>
</tbody>
</table>

| GROUNDMASS         |                |               |             |            |          |
| Glass              | 0              | 55-60         | N/A         | N/A        |          |
| Microlites         | <10            | 20-25         | <0.05       | Needles    | Probably plagioclase; alteration obscures optical character. |

**SECONDARY MINERALOGY**

| Clays              | 75-80          | Glass, matrix |              |            | Brown to light brown, amorphous, pervasive locally patchy. Locally intimately mixed with clays, fills vesicles and may completely replace minerals. |
| Carbonate          | 5-10           | Glass, vesicles |              |            | Slight yellow-green pleochroism. |
| Chlorite           | 0              | Trace         | Vesicle/glass|            | Maybe mixed with chlorite, slight radiating fabric. |

**VESSICLES/CAVITIES**

| Vesicles          | 0              | 0             |              |            |          |

**COMMENTS:** This rock is highly altered and the original mineralogy and textural characteristics are obscured. No piece # given.

---

**125-786B-71R-04 (Piece 69,73-74 cm)**

**ROCK NAME:** Clinopyroxene-phyric basalt  
**GRAIN SIZE:** Fine-grained to glassy  
**TEXTURE:** Sparsely phyric

<table>
<thead>
<tr>
<th>PRIMARY MINERALOGY</th>
<th>PERCENT PRESENT</th>
<th>ORIGINAL (mm)</th>
<th>COMPOSITION</th>
<th>MORPHOLOGY</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHENOCRYSTS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plagioclase</td>
<td>7-9</td>
<td>10-14</td>
<td>0.3-1.5</td>
<td>Subhedral</td>
<td>Rare spinel inclusions, moth-eaten, oscillatory zoning.</td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>&lt;4</td>
<td>5-7</td>
<td>0.15-0.9</td>
<td>Subhedral-anhedral</td>
<td>Pale green to yellow, slightly pleochroic, spinel inclusions.</td>
</tr>
<tr>
<td>Spinel</td>
<td></td>
<td>Trace</td>
<td>&lt;0.02</td>
<td>Equant</td>
<td>As inclusions.</td>
</tr>
</tbody>
</table>

| GROUNDMASS         |                |               |             |            |          |
| Glass              | 0              | 65-70         | N/A         | N/A        |          |
| Plagioclase        | <10            | 10-15         | <0.15       | Laths      |          |
| Microlites         | <10            | 10-15         | <0.02       | Needles    |          |

**SECONDARY MINERALOGY**

| Clays              | 55-60          | Glass         |              |            | Brown amorphous clay, locally pervasive and patchy in appearance. |
| Chlorite           | <10            | Matrix        |              |            | Strings and irregular pieces of black opaque material locally concentrated and in veins. |
| Magnetite          | 1-3            | Veins, matrix |              |            |        |

**COMMENTS:** Glomerocrysts of plagioclase and of clinopyroxene, but not both. Some gaps in thin section appear to be caused by plucking during thin-section preparation.
SITE 786

125-786R-72R-01 (Piece 10R, 91-92 cm) OBSERVER: JCN WHERE SAMPLED: Izu-Bonin outer-arc high

ROCK NAME: Plagioclase-pyroxene phyric basalt

GRAIN SIZE: Fine-grained

TEXTURE: Glomerophyric

<table>
<thead>
<tr>
<th>PRIMARY MINERALOGY</th>
<th>PERCENT PRESENT</th>
<th>PERCENT ORIGINAL</th>
<th>SIZE (mm)</th>
<th>COMPOSITION</th>
<th>MORPHOLOGY</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phenocrysts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plagioclase</td>
<td>10-12</td>
<td>12-15</td>
<td>0.3-1</td>
<td></td>
<td>Subhedral</td>
<td>Moth-eaten, altered, apin inclusions oscillatory zoning.</td>
</tr>
<tr>
<td>Clinopyroxene</td>
<td>&lt;5</td>
<td>5-10</td>
<td>0.2-2</td>
<td></td>
<td>Euhedral-subhedral</td>
<td>Pale yellow to green, spinel and glass inclusions.</td>
</tr>
<tr>
<td>Spinel</td>
<td>1-3</td>
<td>1-3</td>
<td>&lt;0.1</td>
<td></td>
<td>Subhedral</td>
<td>Irregular shape, dark blood red, some may be secondary.</td>
</tr>
<tr>
<td>Orthopyroxene</td>
<td>0</td>
<td>2-3</td>
<td>&lt;2</td>
<td></td>
<td>Subhedral</td>
<td>100% altered to clays, mineral identification is based on crystal morphology.</td>
</tr>
</tbody>
</table>

| Groundmass         | 0               | 65-70            | N/A      |             | N/A        | Glass + microlites, distinction obscured by alteration. |
| Plagioclase        | <5              | 7-10             | <0.2     |             | Subhedral, tabular |          |

<table>
<thead>
<tr>
<th>SECONDARY MINERALOGY</th>
<th>PERCENT</th>
<th>REPLACING/FILLING</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clays</td>
<td>65-70</td>
<td>Glass, plagioclase, orthopyroxene</td>
<td>Brown amorphous, clustering in patches 0.1-0.7 mm long.</td>
</tr>
<tr>
<td>Chlorite</td>
<td>&lt;10</td>
<td>Glass</td>
<td>Slight yellow-green pleochroism.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>VESICLES/CAVITIES</th>
<th>SIZE</th>
<th>PERCENT</th>
<th>LOCATION (mm)</th>
<th>FILLING</th>
<th>SHAPE</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vesicles</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

COMMENTS: Glomerocrysts of plagioclase + clinopyroxene up to 6 mm across.