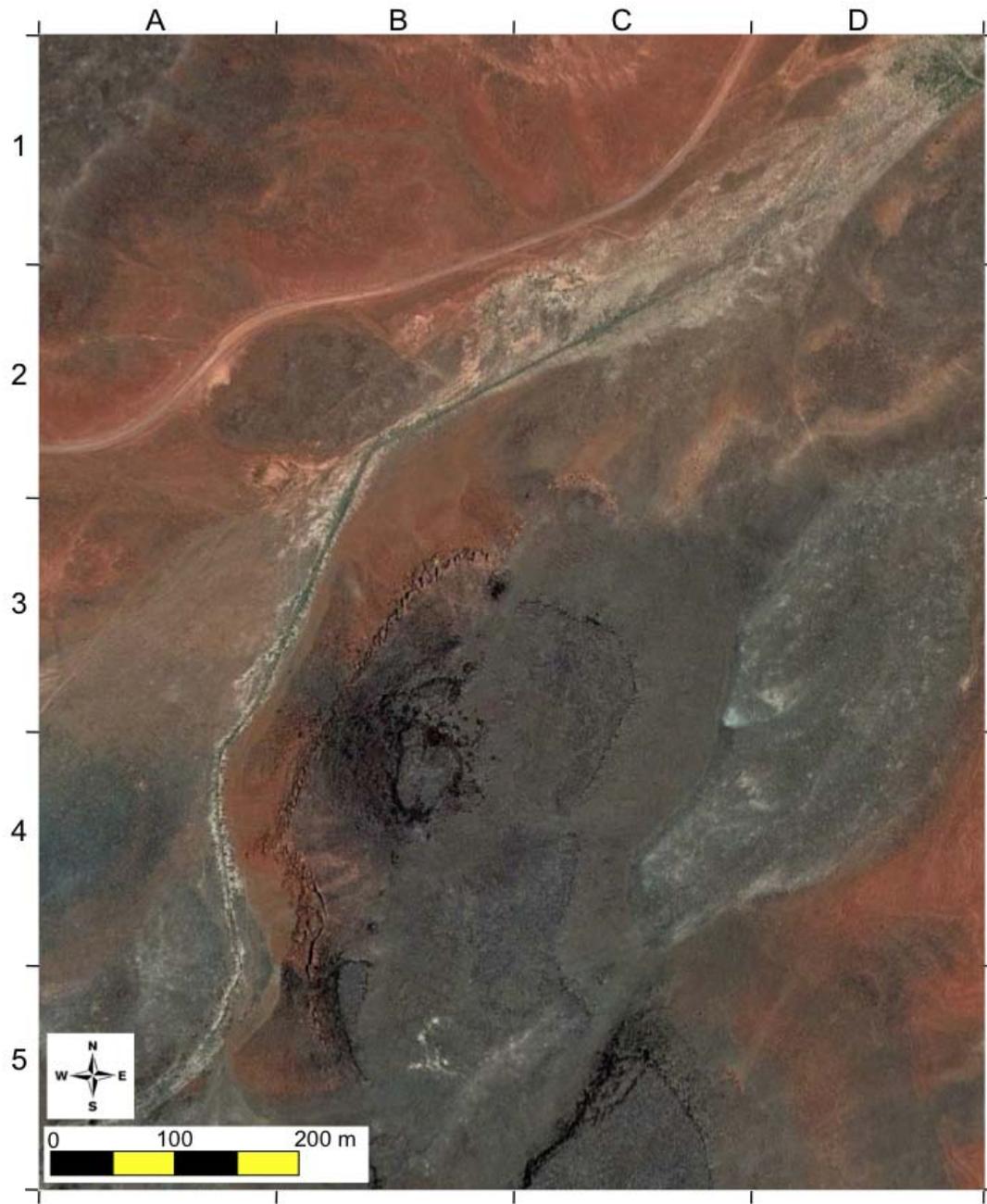


NASA's exploration plan for  
the 'Hot Dog Hill' site  
2011



Hot Dog Hill Base Image

# Hot Dog Hill: NASA's Field Science Objectives

(based on images from orbiting satellite)

## What is the geologic nature of Hot Dog Hill?

Dark rocky units      Dark smooth plains units  
Red rocky units      Red smooth plains unit  
High albedo (i.e., bright) patches  
Fluvial-looking erosion features

## What volcanic processes, if any, were involved in the creation of Hot Dog Hill?

Vent of some type?  
What style(s) of volcanism?  
Mineralogy (e.g., phenocrysts)?  
Distal end of flow lobe, separated from rest of flow by extensive erosion?

## What rock types and geologic processes are involved in the red-colored units?

Composition and deposition environment?  
Different weathering styles?

## Is there evidence of any local tectonics?

Uplifting?  
Faulting?

**"Hot Dog Hill" - Color Shaded Relief**



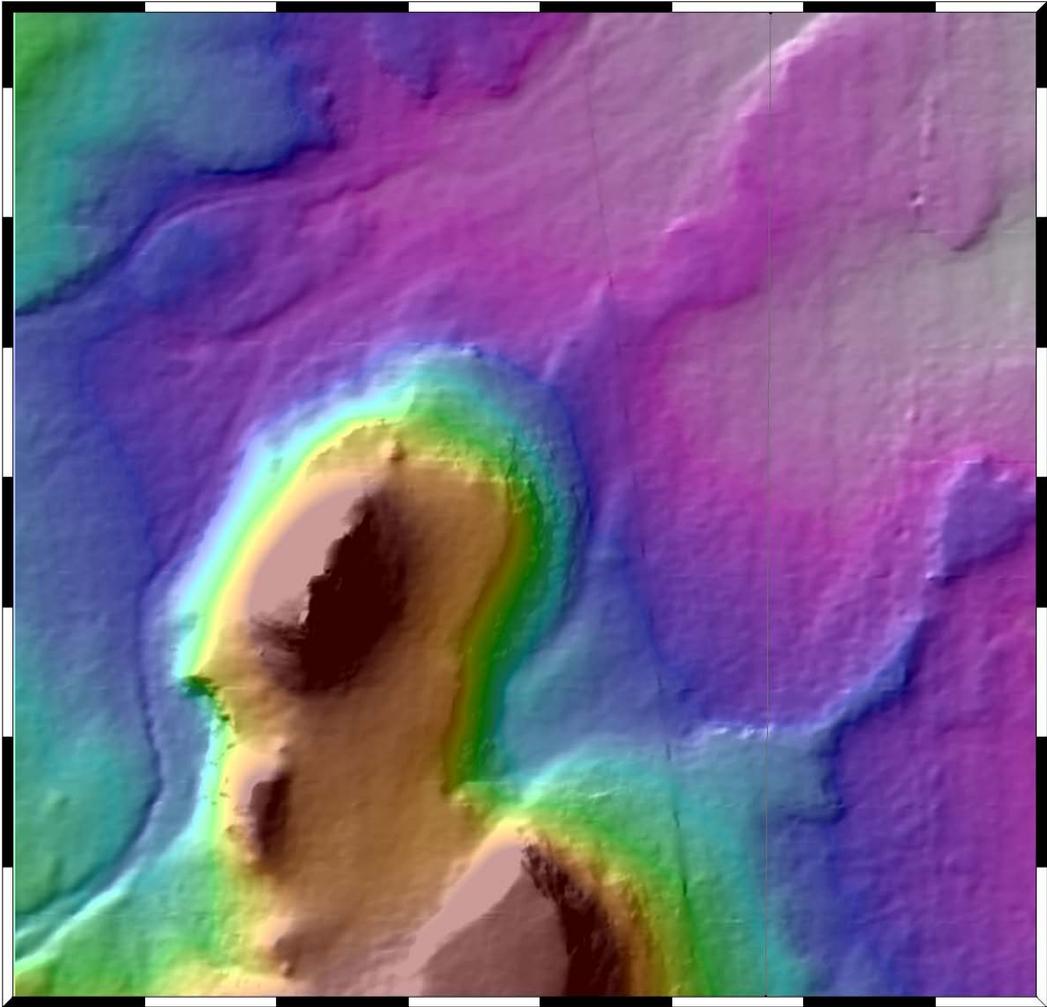
High : 1653.45



Low : 1587.17

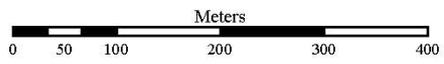
**Elevation (meters)**

111°30'0"W

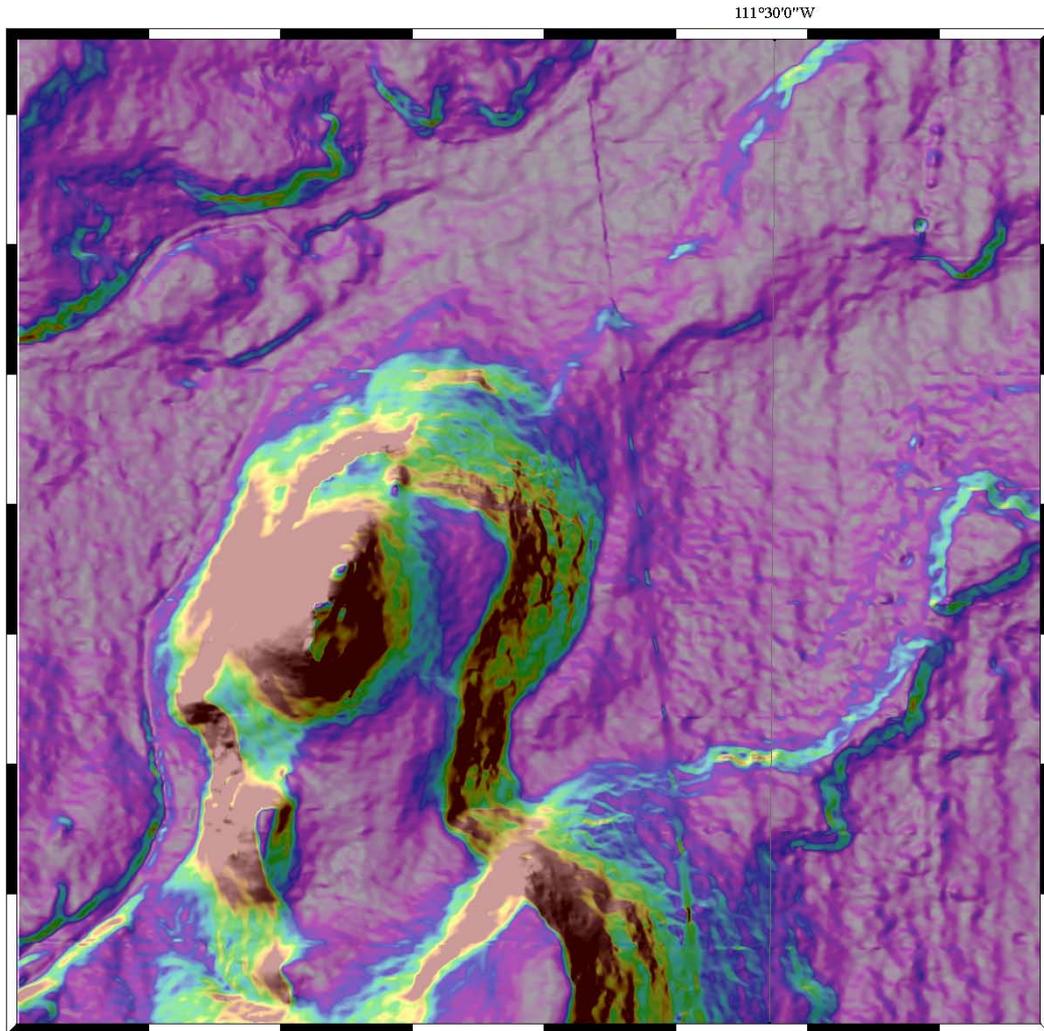
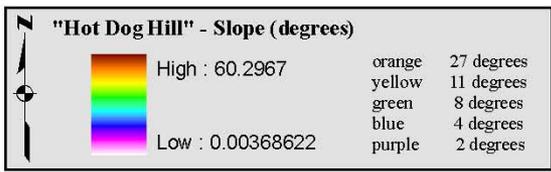


111°30'0"W

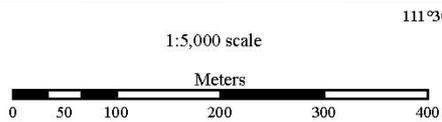
1:5,000 scale



**Hot Dog Hill  
Digital Elevation  
Map (DEM)**



# Hot Dog Hill Slope Map



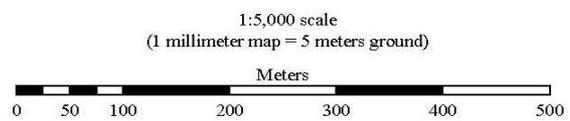
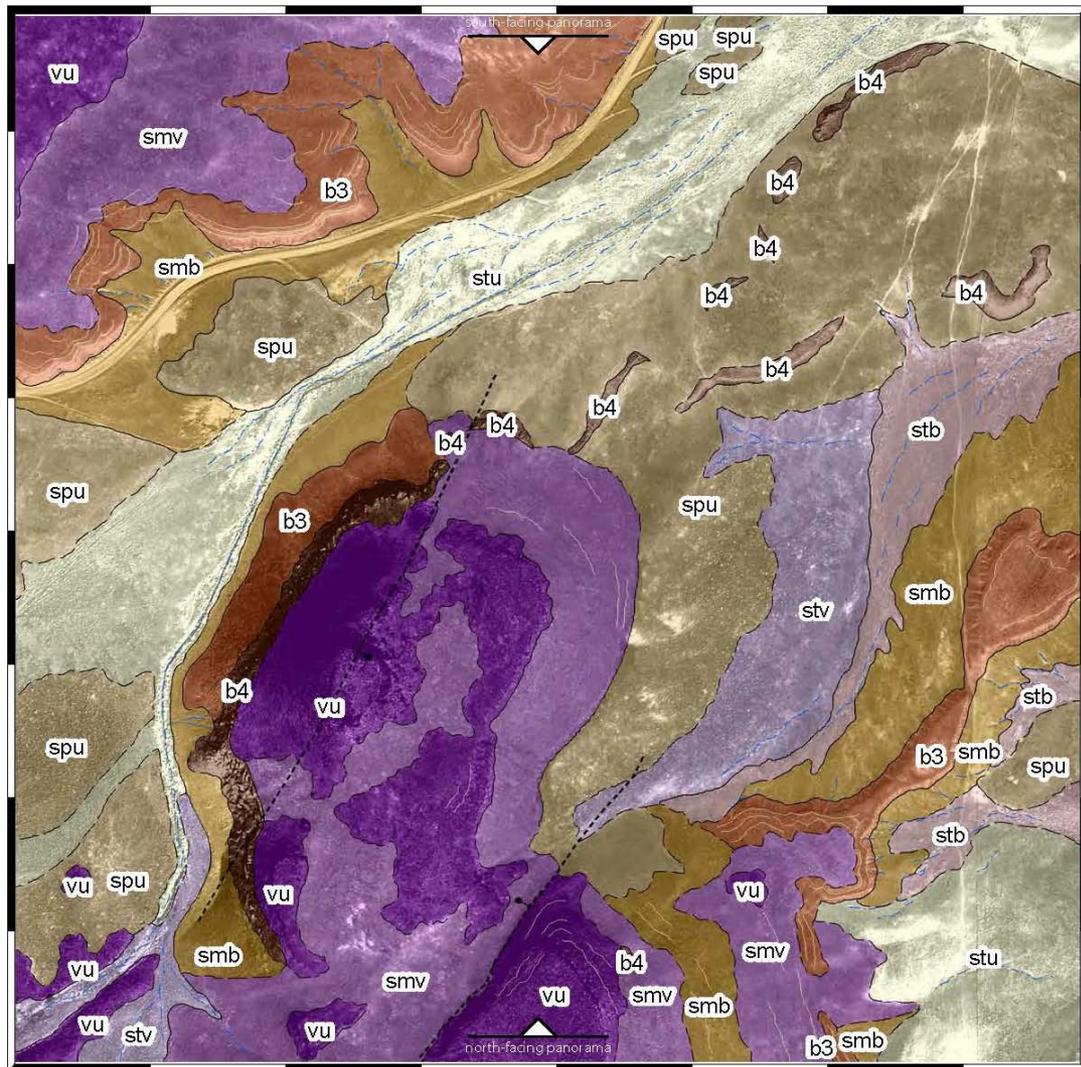
# Geologic unit map based on satellite imagery



## Map Legend

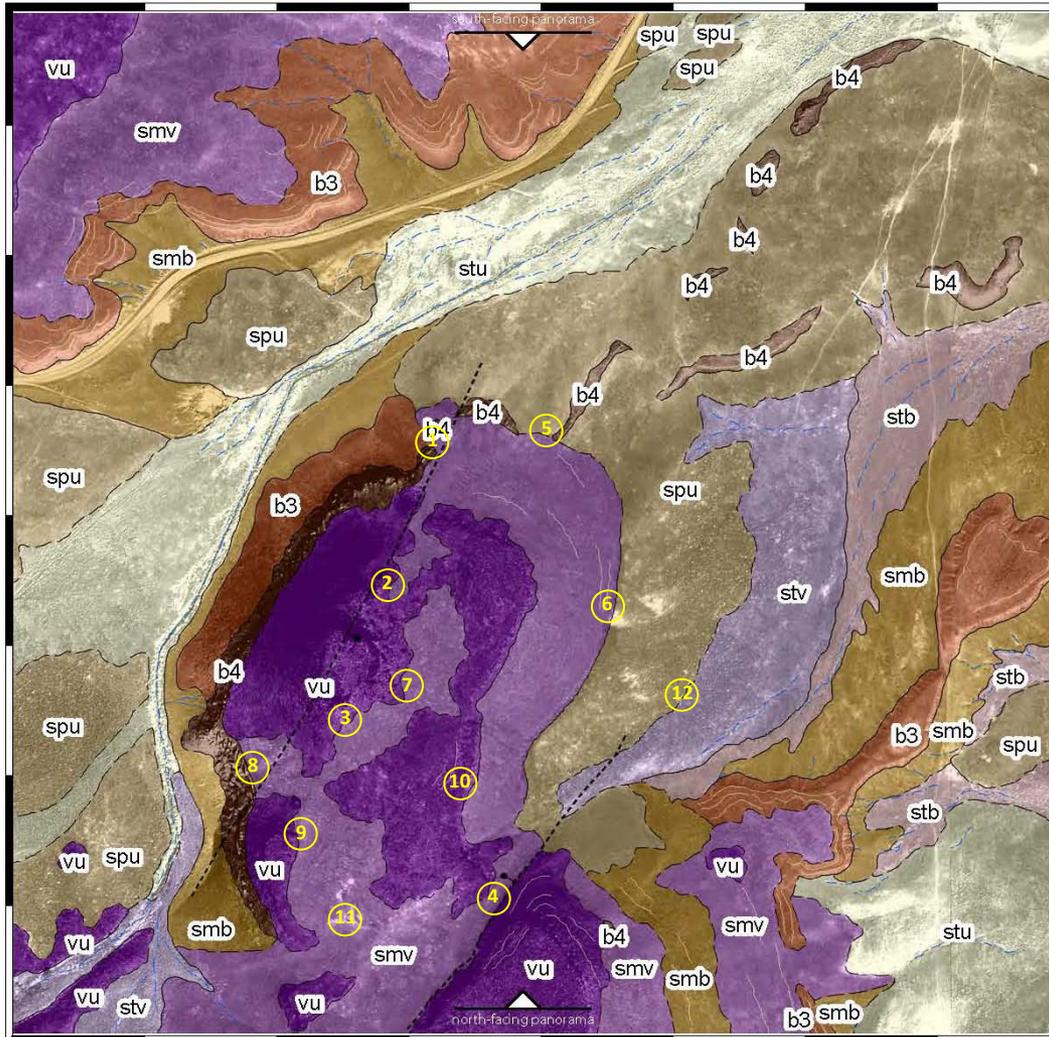
-  stu – surficial transported material, undifferentiated (alluvium associated with erosion of all units; linear to braided patterns and striations)
-  stv – surficial transported material, volcanic (alluvium associated with erosion of volcanic rock and mantle units)
-  stb – surficial transported material, basement (alluvium associated with erosion of basement rock and mantle units)
-  spu – surficial plains material, undifferentiated (colluvium and/or alluvium associated with erosion of basement and volcanic rocks due to sheet wash)
-  smv – surficial mantled volcanic material (colluvium associated with erosion of higher-standing volcanic rocks)
-  smb – surficial mantled basement material (colluvium associated with erosion of higher-standing basement rocks)
-  b4 – red toned platy (cliff forming, competent rock; younger of two basement units)
-  b3 – red toned layered (layered-implied horizontality suggests origin as water lain sediment; older of two basement units)
-  vu – volcanic material, undifferentiated (eroded lava flow of basaltic composition)

 Proposed fault – ‘stick and ball’ icon represents the down, or dropped, side of the fault

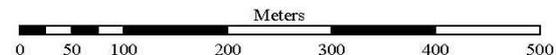


Photogeologic Map of the Hot Dog Hill Site, DRATS 2011

By  
J. A. Skinner, Jr. and C. M. Fortezzo  
2011



1:5,000 scale  
(1 millimeter map = 5 meters ground)



Photogeologic Map of the Hot Dog Hill Site, DRATS 2011

By  
J. A. Skinner, Jr. and C. M. Fortezzo  
2011

## Priority 1 (High)

- Area 1: b3/b4 genetic association, fault(?)
- Area 2: vu geologic nature, fault(?)
- Area 3: vu geologic nature, fault(?)
- Area 4: vu geologic nature, promontory association with stations 2 & 3 promontory, fault(?)

## Priority 2 (Medium)

- Area 5: smv geologic nature (lobe margin?)
- Area 6: smv geologic nature (layering?), high albedo area on spu
- Area 7: vu geologic nature
- Area 8: b4 geologic nature
- Area 9: vu geologic nature, promontory association with area 2, 3 & 4 promontories, fault(?)
- Area 10: vu geologic nature (layering?), vu/smv association

## Priority 3 (Low)

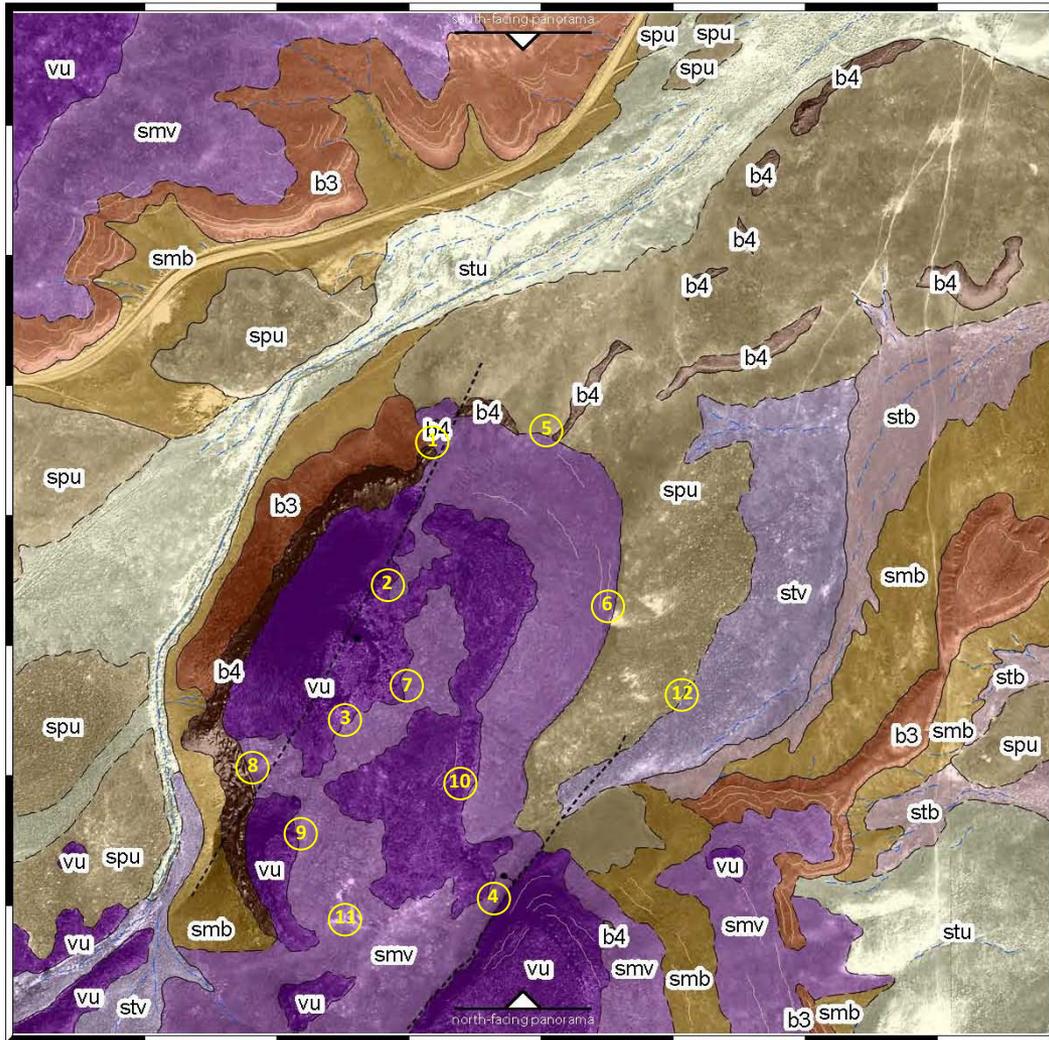
- Area 11: high albedo area on smv
- Area 12: spu/stv association

## Notes

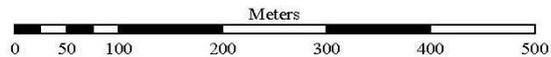
These areas of interest may or may not represent actual science stations on a planned traverse.

Yellow circles represent 30 m diameter work areas.

# NASA's Areas of Interest and Corresponding Stations



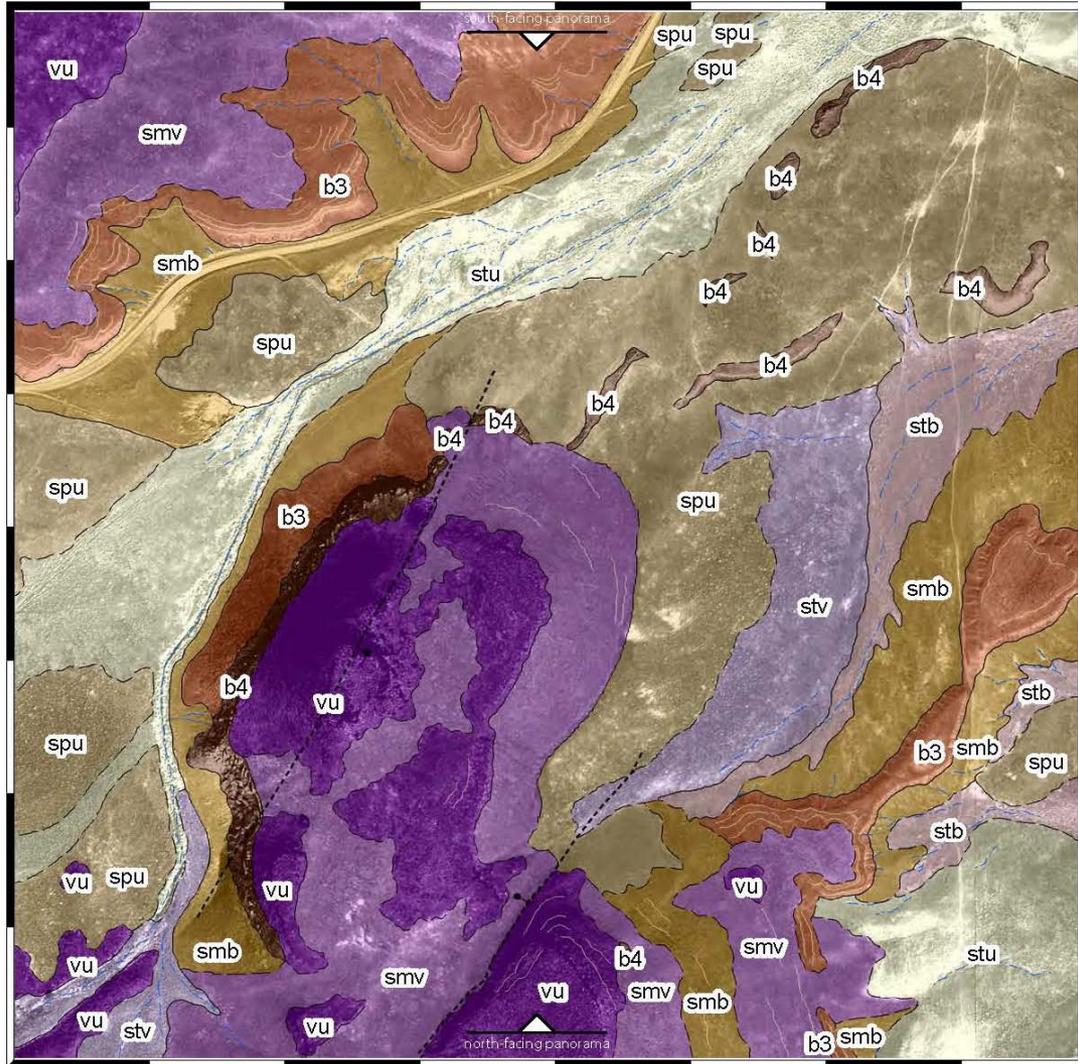
1:5,000 scale  
(1 millimeter map = 5 meters ground)



Photogeologic Map of the Hot Dog Hill Site, DRATS 2011

By  
J. A. Skinner, Jr. and C. M. Fortezzo  
2011

Area of Interest	Test Day 5 Stations	Test Day 7 Stations
1	H8B, (H2B in a similar location)	H1A, (H6A in a similar location)
2	H9B	H3A
3	H5B, H6B	H5A
4	H1B	H7A
5		
6	H14B	
7	H7B, H10B	H4A
8		
9	H3B	
10	H11B, H12B, H13B	
11		
12		



1:5,000 scale  
(1 millimeter map = 5 meters ground)

Meters

0 50 100 200 300 400 500

Photogeologic Map of the Hot Dog Hill Site, DRATS 2011  
By  
J. A. Skinner, Jr. and C. M. Fortezzo  
2011

**Test Day #5, Crew B**  
Condition 7: 2 SEVs with 2 crew members in each

### Morning 2.5 hr block of time

Anchoring mode  
Crew must 'anchor' SEV to asteroid before going EVA  
Both crew in each SEV go EVA using 'Super-SAFERs'  
25 meter radius of exploration around SEV  
Lots of 'operational overhead' only allows for two stations

### Afternoon 2.5 hr block of time

Free-flying mode  
1 crew goes EVA on an 'astronaut positioning system' that is attached to the front of the SEV  
Once outside, the EV crew stays outside for the duration of the 2.5 hours  
Work area defined by limits of APS

**Test Day #7, Crew A**

Condition 6: 1 SEV with 3 crew members (only 2 go EVA), fourth crew member in DSH

### Morning 2.5 hr block of time

Free-flying mode  
1 crew goes EVA on an 'astronaut positioning system' that is attached to the front of the SEV (work area defined by limits of APS)  
1 crew goes EVA on a 'Super-SAFER' with a 25 meter radius of exploration around SEV  
Once outside, the EV crews stay outside for the duration of the 2.5 hours  
1 crew remains in SEV to 'fly' it and the APS

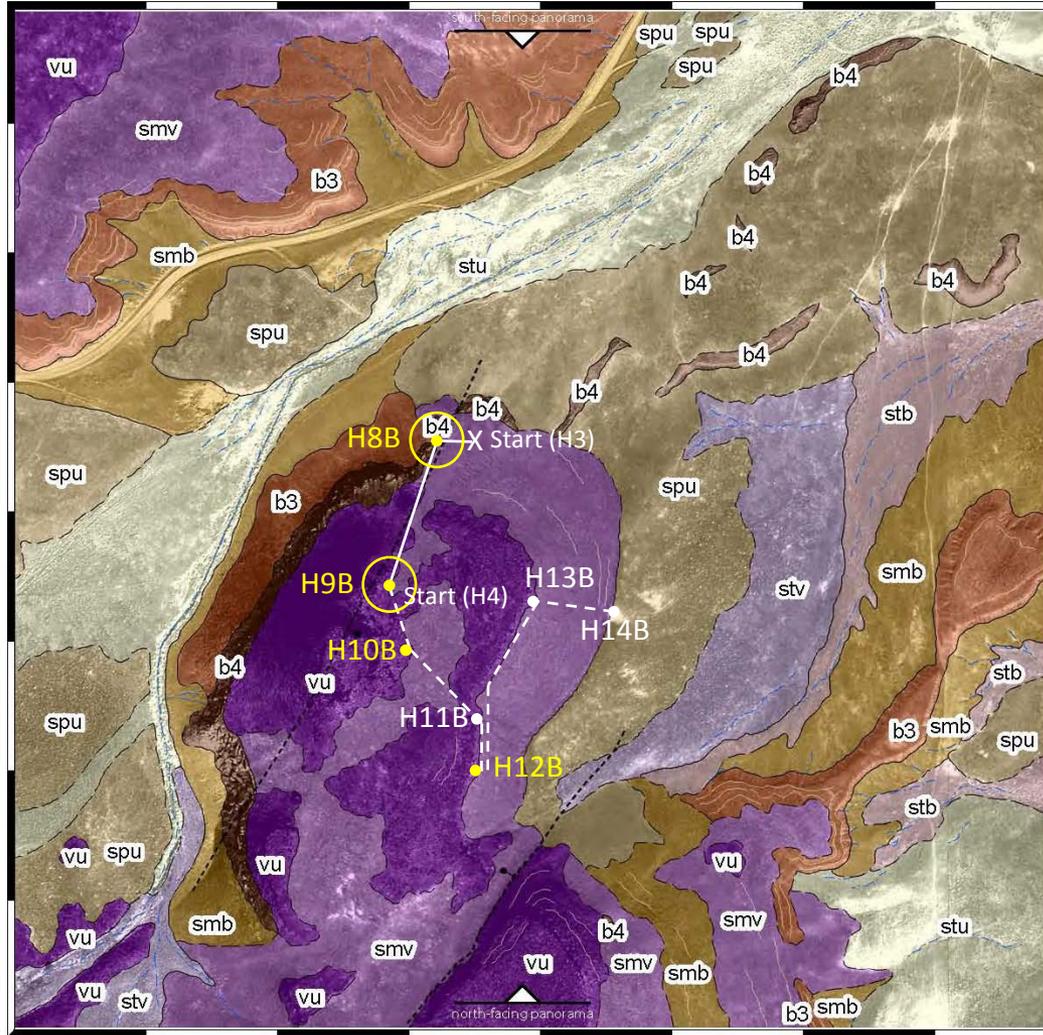
### Afternoon 2.5 hr block of time

Anchoring mode  
Crew must 'anchor' SEV to asteroid before going EVA  
2 crew go EVA on 'Super-SAFERs'; 1 remains inside SEV  
25 meter radius of exploration around SEV  
Lots of 'operational overhead' only allows for two stations

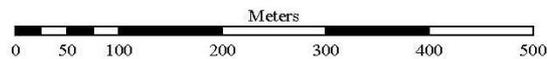
Test Day 5

## Test Day #5 Plan, Hot Dog Hill, Condition 7

Note: High priority sites in yellow



1:5,000 scale  
(1 millimeter map = 5 meters ground)



Photogeologic Map of the Hot Dog Hill Site, DRATS 2011

By  
J. A. Skinner, Jr. and C. M. Fortezzo  
2011

### Crew B1 (AM-anchoring mode, 2 crew EVA, SEV-A)

Start at H3

Traverse to station H8B (0.3 m/s) [5 min]

ANCHOR/IVA Prep [20 min]

Egress/Get Tools [15 min]

Station H8B science ops (circle = 25 m radius) [20 min]

Stow Tools & Samples/Ingress/DETACH ANCHOR [20 min]

Traverse to station H9B (0.6 m/s) [5 min]

ANCHOR/IVA Prep [20 min]

Egress/Get Tools [15 min]

Station H9B science ops [20 min]

Stow Tools & Samples/Ingress/DETACH ANCHOR [20 min]

Total Time 160 min

### Crew B1 (PM-free flying mode, 1 crew EVA, SEV-A)

Start at H4

Traverse to station H10B (0.3 m/s between stations) [5 min]

SEV IVA Prep [10 min]

Egress/Get Tools (one EV to APS) [10 min]

Station H10B science ops [30 min]

Traverse to station H11B [5 min]

Station H11B science ops [15 min]

Traverse to station H12B [5 min]

Station H12B science ops [20 min]

Traverse to station H13B [5 min]

Station H13B science ops [15 min]

Traverse to station H14B [5 min]

Station H14B science ops [15 min]

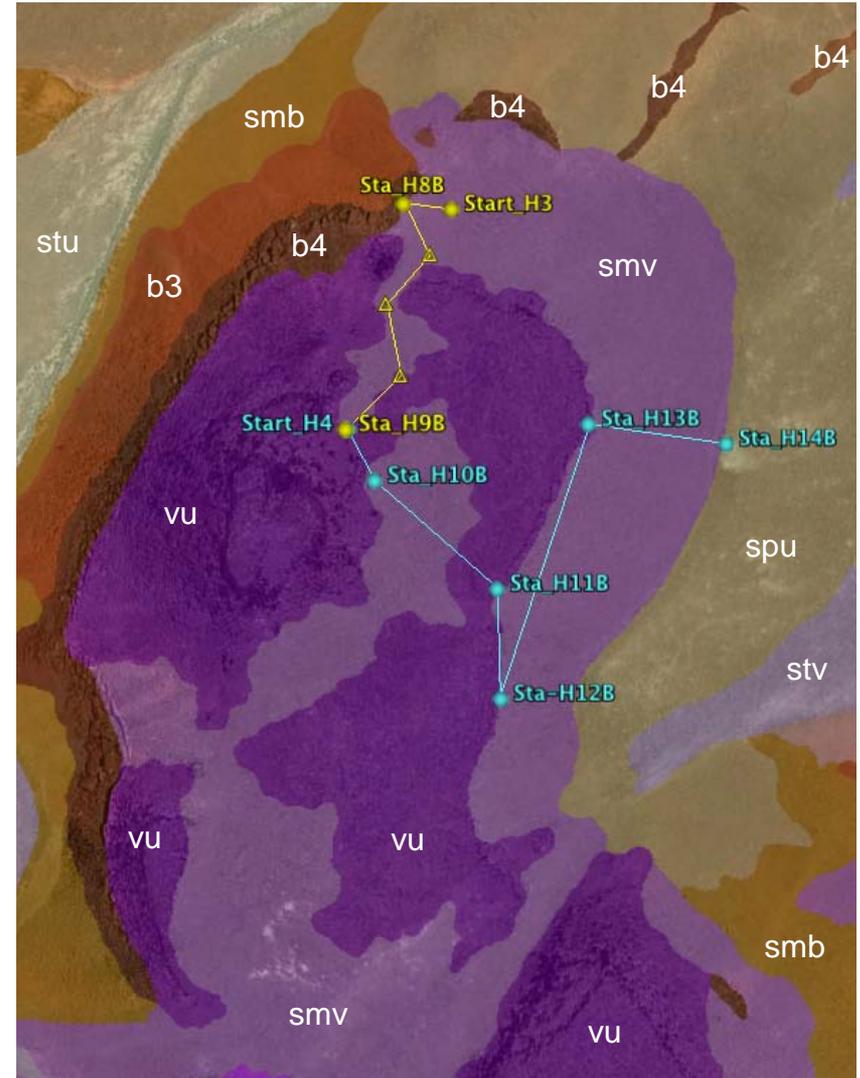
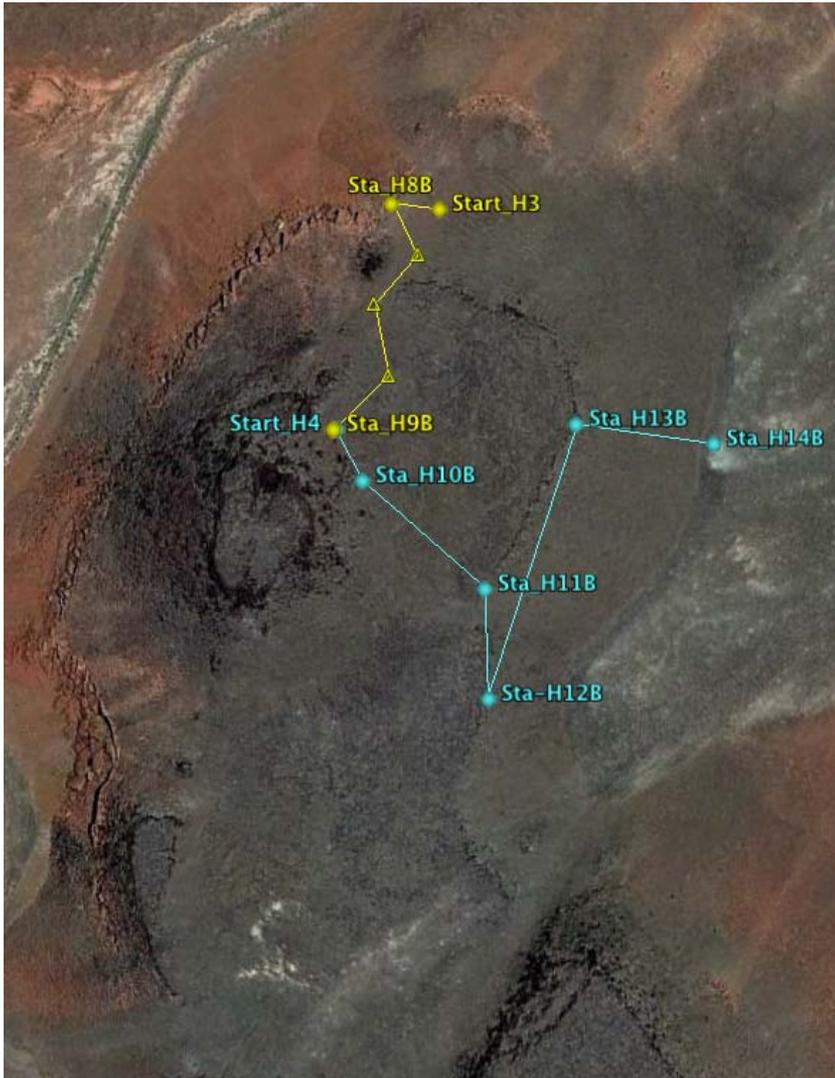
Stow Tools/Samples/Ingress [10 min]

Total time 150 min

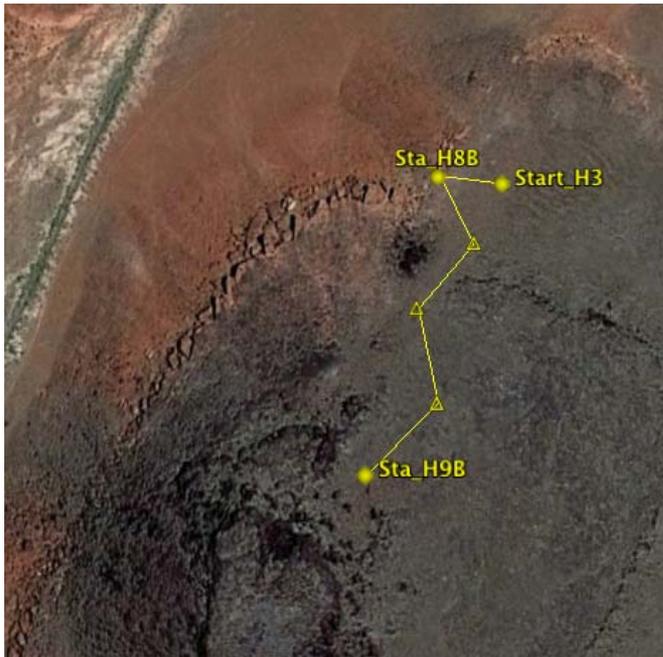
[Note: above stations are suggested stations, EV on APS should have flexibility to sample where needed anywhere along free flying path]

# Test Day 5, Condition 7, Crew B1 (SEV-A)

morning traverse = yellow  
afternoon traverse = blue



## Test Day 5, Condition 7 Crew B1 (SEV-A), Morning

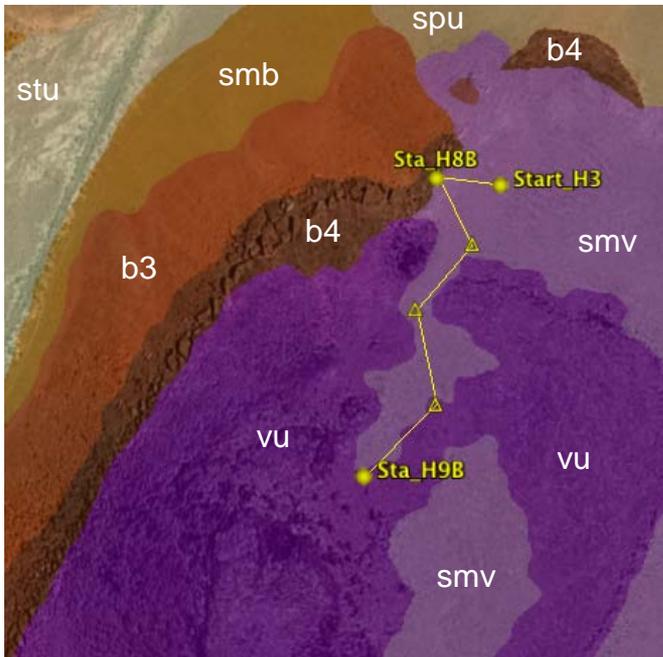


### Station H8B (~ 15-20 minutes)

**Primary objective** – describe the geologic setting/nature of the red-colored basement rocks (b3,b4); can you see two different basement units as depicted on the geologic map?; if so, is there a genetic association between the two; collect representative outcrop rock samples

**Primary objective** – describe any indication of local faulting

Describe the volcanic-derived material mantling the surface (smv) in the area; does it look like a thin flow, or alluvium/colluvium?; collect representative rock or soil samples



### Station H9B (~ 15-20 minutes)

**Primary objective** - describe the volcanic nature of the large promontory (vu); can you see any evidence for a local eruptive process (e.g., bombs, stream-lined shapes)?; collect representative outcrop samples

**Primary objective** – describe any indication of local faulting

Describe the volcanic-derived material mantling the surface (smv) in the area; does it look like a thin flow, or alluvium/colluvium?; collect representative rock or soil samples

## Test Day 5, Condition 7 Crew B1 (SEV-A), Afternoon

### Station H10B (~ 30 minutes)

**Primary objective** - describe the volcanic nature of the large promontory (vu); can you see any evidence for a local eruptive process (e.g., bombs, stream-lined shapes)?; collect representative outcrop samples

Describe the volcanic-derived material mantling the surface (smv) in the area; does it look like a thin flow, or alluvium/colluvium?; collect representative rock or soil samples

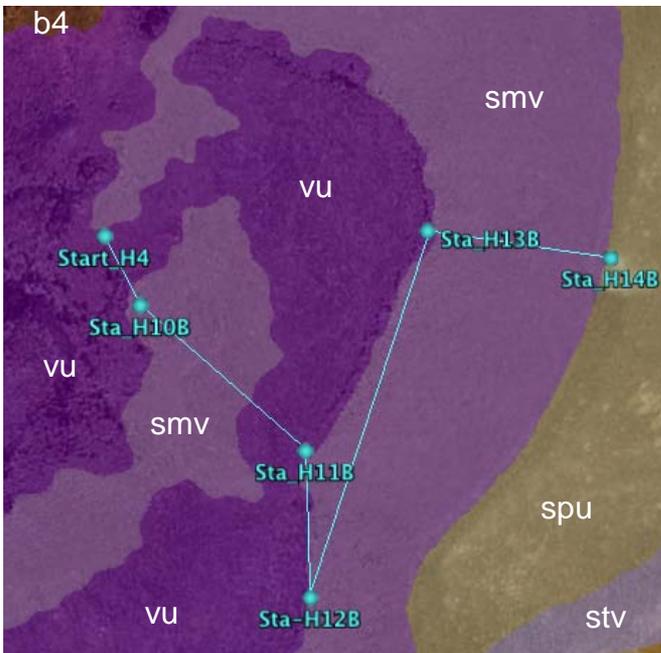
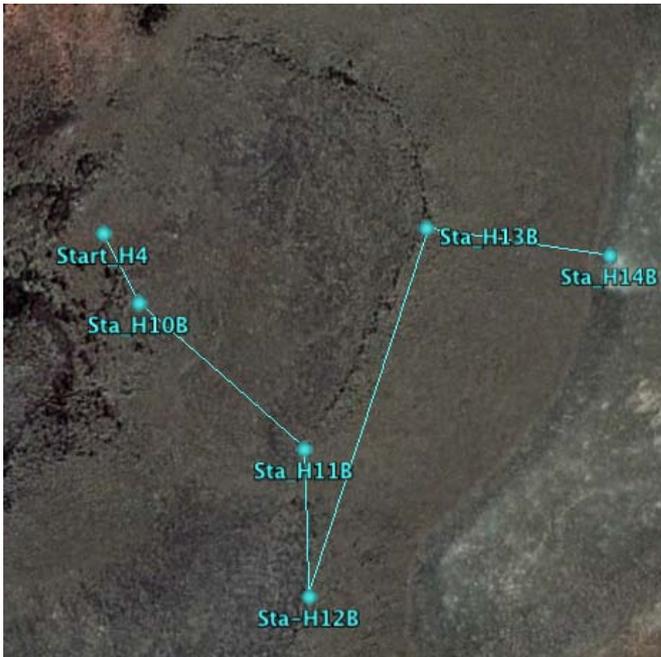
### Stations H11B, H12B, H13B (~ 15 minutes each)

**Primary objective** - describe the volcanic nature of the curving rock outcrop (vu); is this a flow margin?; can you see evidence of layering?; collect representative outcrop samples

Describe the volcanic-derived material mantling the surface (smv) in the area; does it look like a thin flow, or alluvium/colluvium?; collect representative rock or soil samples

### Station H14B (~ 15 minutes)

Describe the difference in surficial units (smv vs. spu); can you identify what causes the albedo difference as seen in orbital imagery?; collect representative soil samples



Note: High priority sites in yellow

## Crew B2 (AM-anchoring mode, 2 crew EVA, SEV-B)

Start at H1

Traverse to station H1B (0.3 m/s) [5 min]

ANCHOR/IVA Prep [20 min]

Egress/Get Tools [15 min]

Station H1B science ops (circle = 25 m radius) [20 min]

Stow Tools & Samples/Ingress/DETACH ANCHOR [20 min]

Traverse to station H2B (0.6 m/s) [5 min]

ANCHOR/IVA Prep [20 min]

Egress/Get Tools [15 min]

Station H2B science ops [20 min]

Stow Tools & Samples/Ingress/DETACH ANCHOR [20 min]

**Total Time 160 min**

## Crew B2 (PM-free flying mode, 1 crew EVA, SEV-B)

Start at H2

Traverse to station H3B (0.3 m/s between stations) [5 min]

SEV IVA Prep [10 min]

Egress/Get Tools (one EV to APS) [15 min]

Station H3B science ops [15 min]

Traverse to station H4B [5 min]

Station H4B science ops [15 min]

Traverse to station H5B [5 min]

Station H5B science ops [15 min]

Traverse to station H6B [5 min]

Station H6B science ops [15 min]

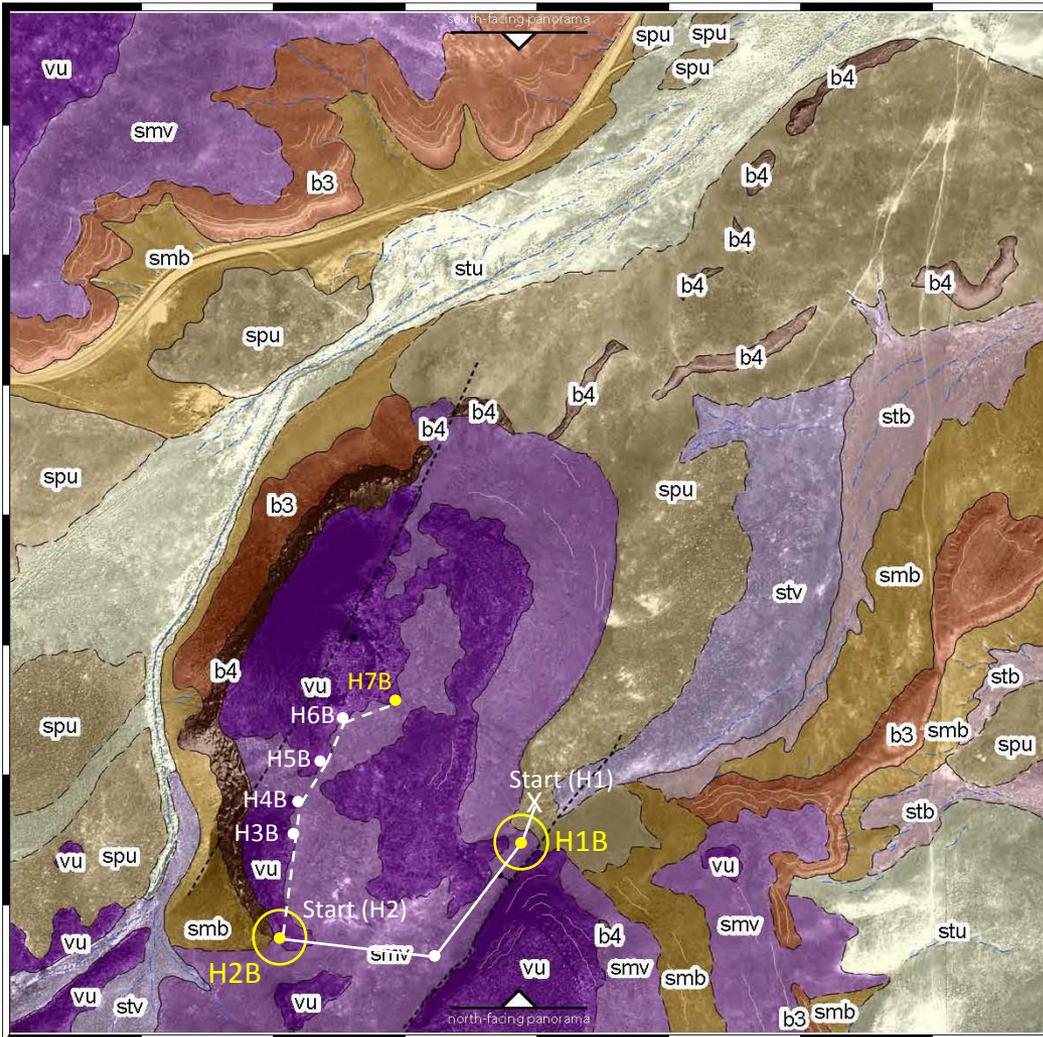
Traverse to station H7B [5 min]

Station H7B science ops [30 min]

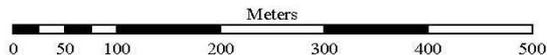
Stow Tools/Samples/Ingress [10 min]

**Total time 150 min**

[Note: above stations are suggested stations, EV on APS should have flexibility to sample where needed anywhere along free flying path]



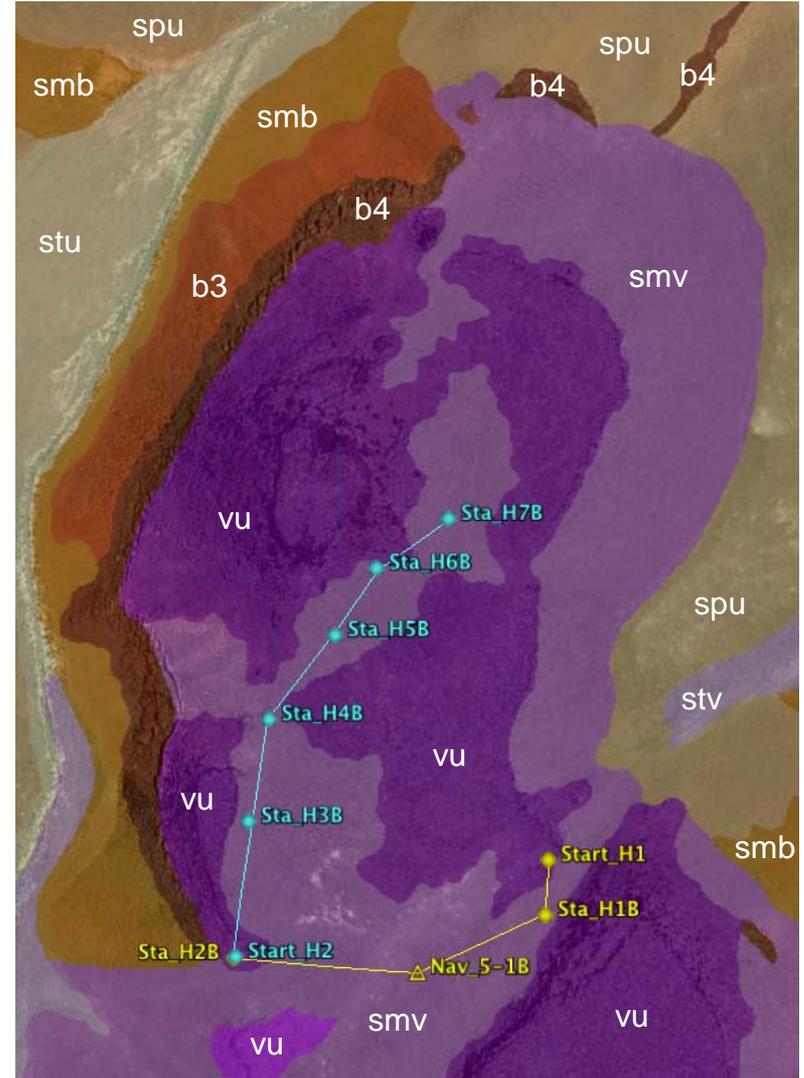
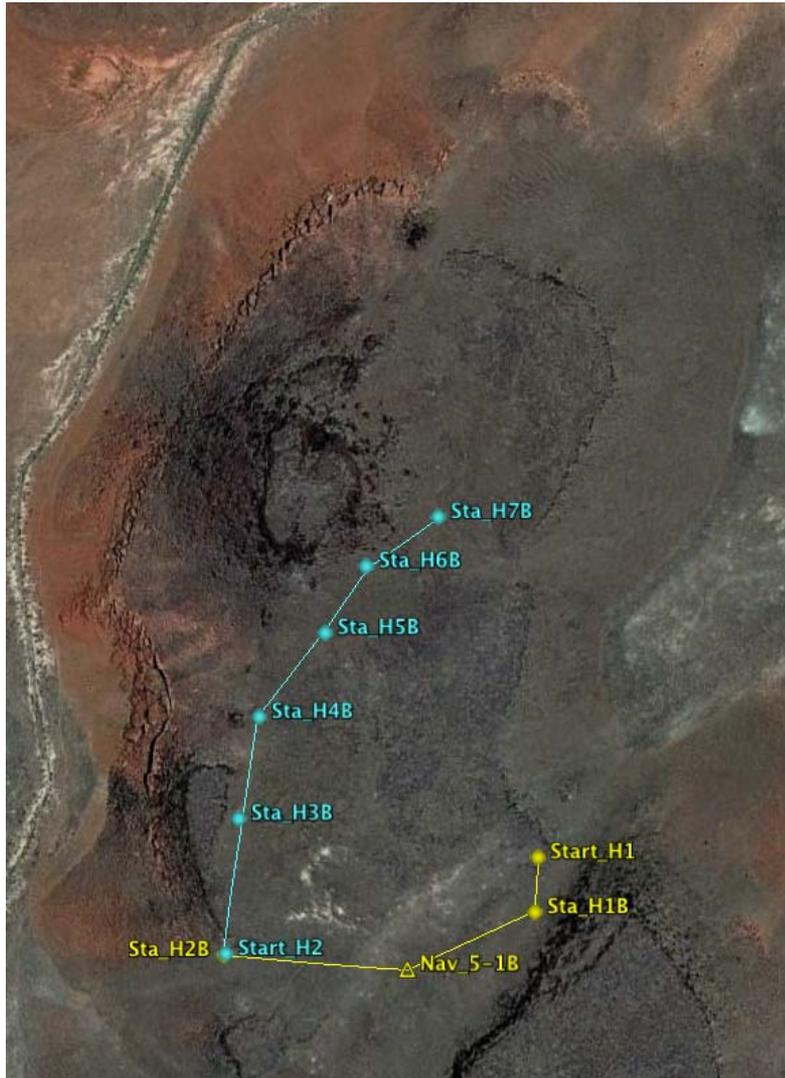
1:5,000 scale  
(1 millimeter map = 5 meters ground)



Photogeologic Map of the Hot Dog Hill Site, DRATS 2011  
By  
J. A. Skinner, Jr. and C. M. Fortezzo  
2011

# Test Day 5, Condition 7, Crew B2 (SEV-B)

morning traverse = yellow  
afternoon traverse = blue



## Test Day 5, Condition 7 Crew B2 (SEV-B), Morning

### Station H1B (~ 15-20 minutes)

**Primary objective** - describe the volcanic nature of the local, large promontory (vu); collect representative outcrop samples

Describe the volcanic-derived material mantling the surface (smv) in the area; does it look like a thin flow, or alluvium/colluvium?; collect representative rock or soil samples

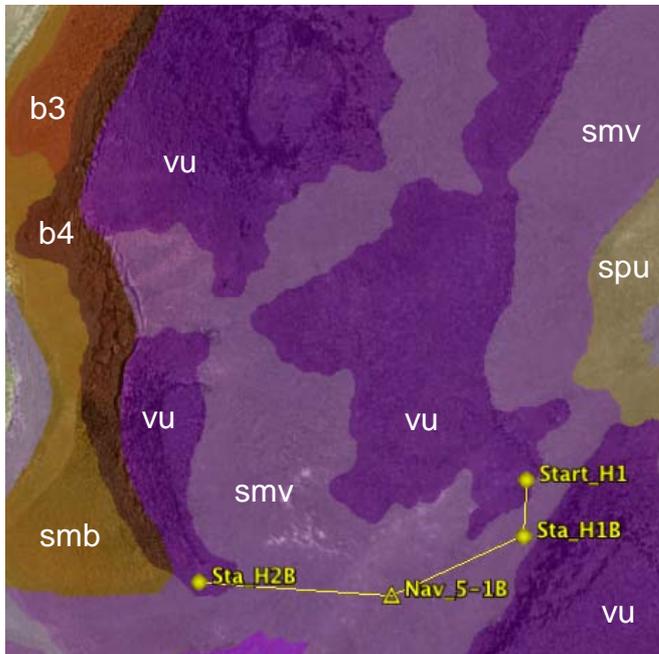
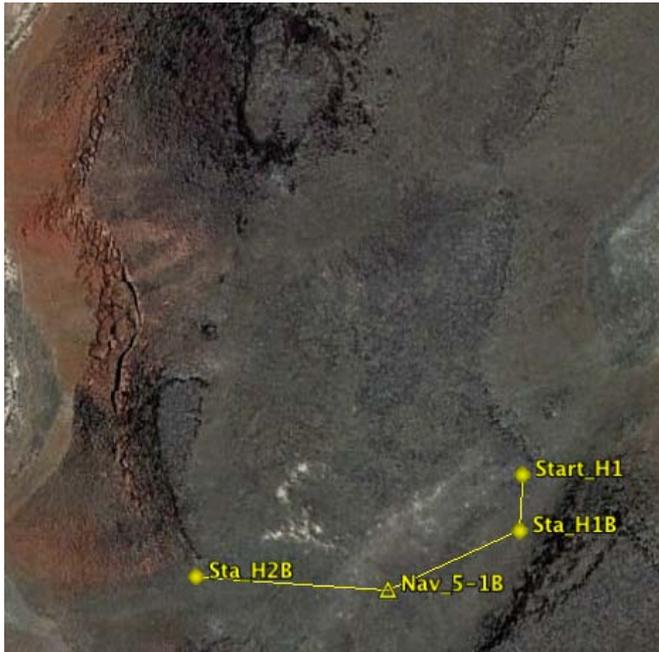
### Station H2B (~ 15-20 minutes)

**Primary objective** – describe the geologic setting/nature of the red-colored basement rocks (b4); can you see two different basement units as depicted at other locations on the geologic map (b3, b4)?; if so, is there a genetic association between the two; collect representative outcrop rock samples

**Primary objective** - describe the volcanic nature of the local, small promontory (vu); collect representative outcrop samples

Describe the volcanic-derived material mantling the surface (smv) in the area); does it look like a thin flow, or alluvium/colluvium?; collect representative rock or soil samples

Describe the basement-derived material mantling the surface (smb) in the area; collect representative rock or soil



## Test Day 5, Condition 7 Crew B2 (SEV-B), Afternoon

### Stations H3B, H4B, H5B, H6B, H7B

(Note: Drive SEV as close as possible to the rock outcrops of the volcanic promontories)

**Primary objective** - describe the volcanic nature of the local outcrops and the large promontory (vu); can you see any evidence for a local eruptive process (e.g., bombs, stream-lined shapes)?; collect representative outcrop samples

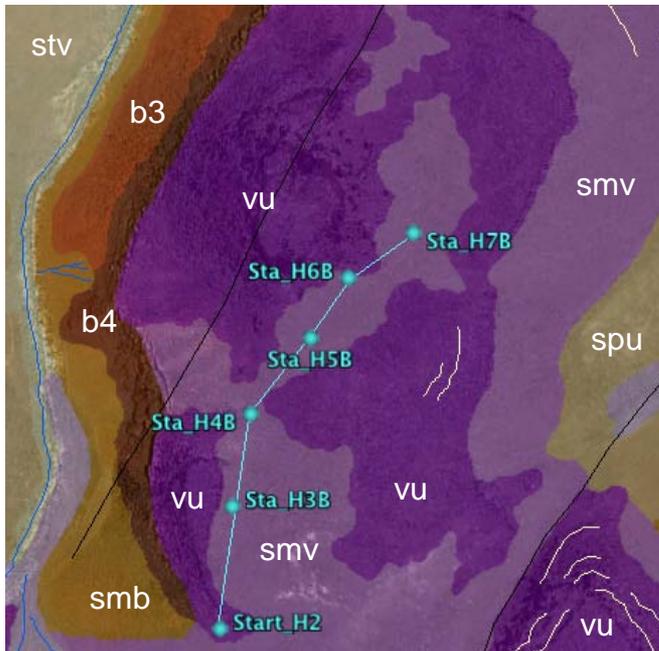
**Primary objective** – describe any indication of local faulting

Describe the volcanic-derived material mantling the surface (smv) in the area; does it look like a thin flow, or alluvium/colluvium?; collect representative rock or soil samples

### Approximate Station Times

H3B, H4B, H5B, H6B (~ 15 minutes each)

H7B (~ 30 minutes)



Test Day 7

Note: High priority sites in yellow

## Crew A (AM-free flying mode, 2 crew EVA, SEV-B)

Start at H9

Traverse to station H1A (0.3 m/s, also between stations) [5 min]

SEV IVA Prep [10 min]

Egress/Get Tools (one EV to APS, one on Super-SAFER) [15 min]

Station H1A science ops [25 min]

Traverse to station H2A [5 min]

Station H2A science ops [15 min]

Traverse to station H3A [5 min]

Station H3A science ops [15 min]

Traverse to station H4A [5 min]

Station H4A science ops [20 min]

Traverse to station H5A [5 min]

Station H5A science ops [15 min]

Stow Tools/Samples/Ingress [10 min]

Total time 150 min

[Note: above stations are suggested stations, EV on APS should have flexibility to sample where needed anywhere along free flying path]

## Crew A (PM-anchoring mode, 2 crew EVA, SEV-B)

Start at H10

Traverse to station H6A (0.3 m/s) [5 min]

ANCHOR/IVA Prep [20 min]

Egress/Get Tools [15 min]

Station H6A science ops (circle = 25 m radius) [20 min]

Stow Tools & Samples/Ingress/DETACH ANCHOR [20 min]

Traverse to station H7A (0.6 m/s) [5 min]

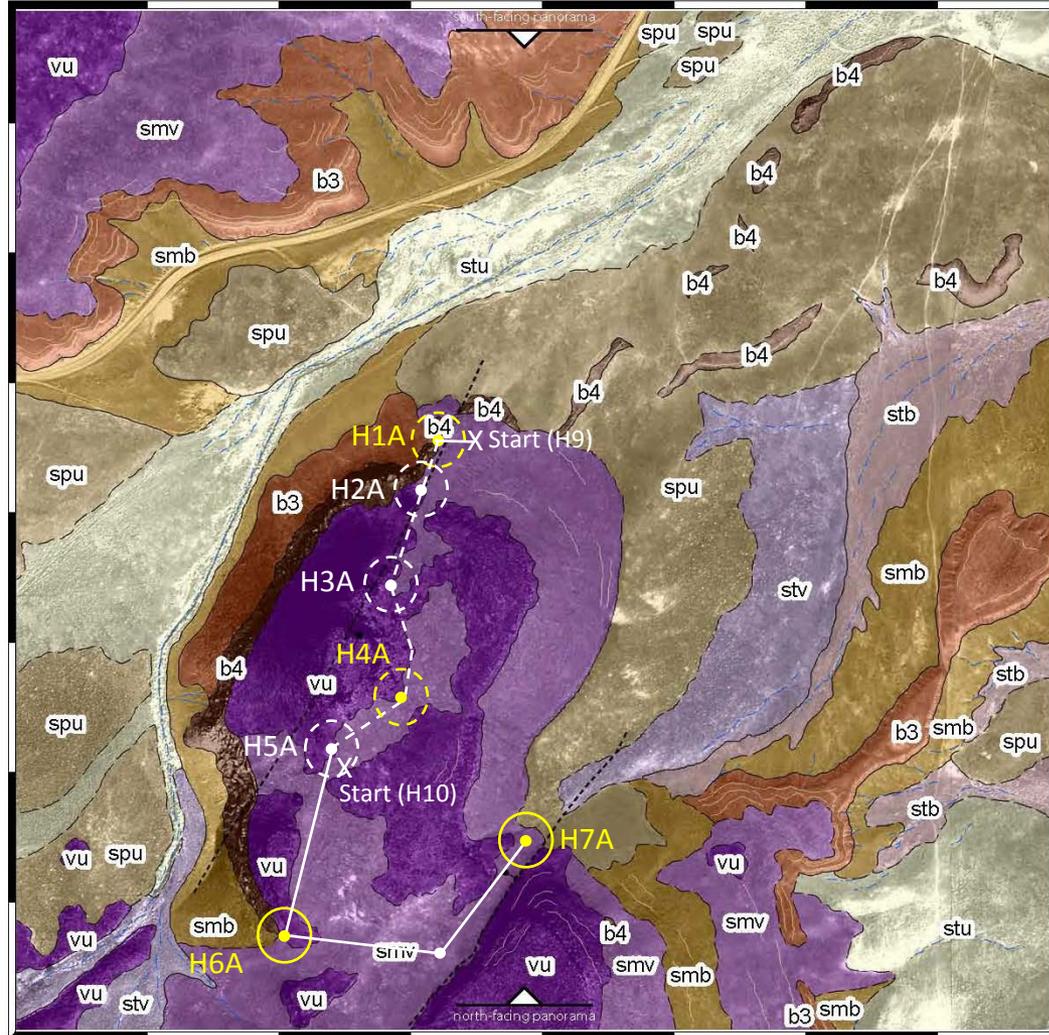
ANCHOR/IVA Prep [20 min]

Egress/Get Tools [15 min]

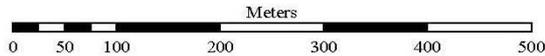
Station H7A science ops [20 min]

Stow Tools & Samples/Ingress/DETACH ANCHOR [20 min]

Total Time 160 min



1:5,000 scale  
(1 millimeter map = 5 meters ground)



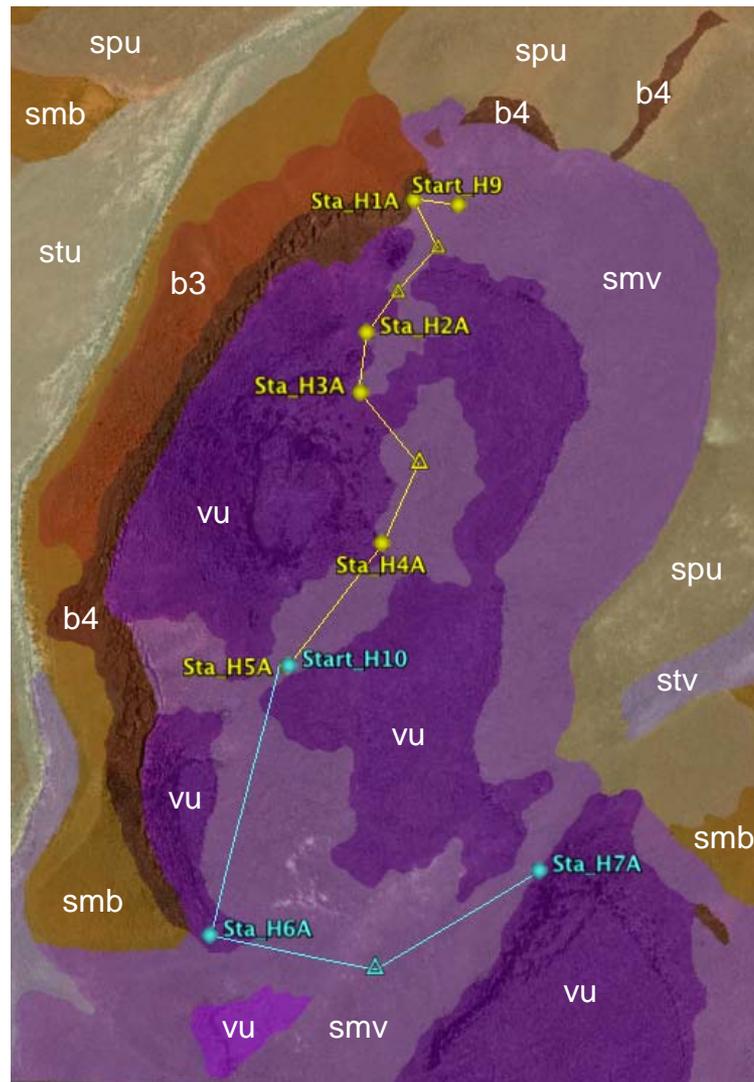
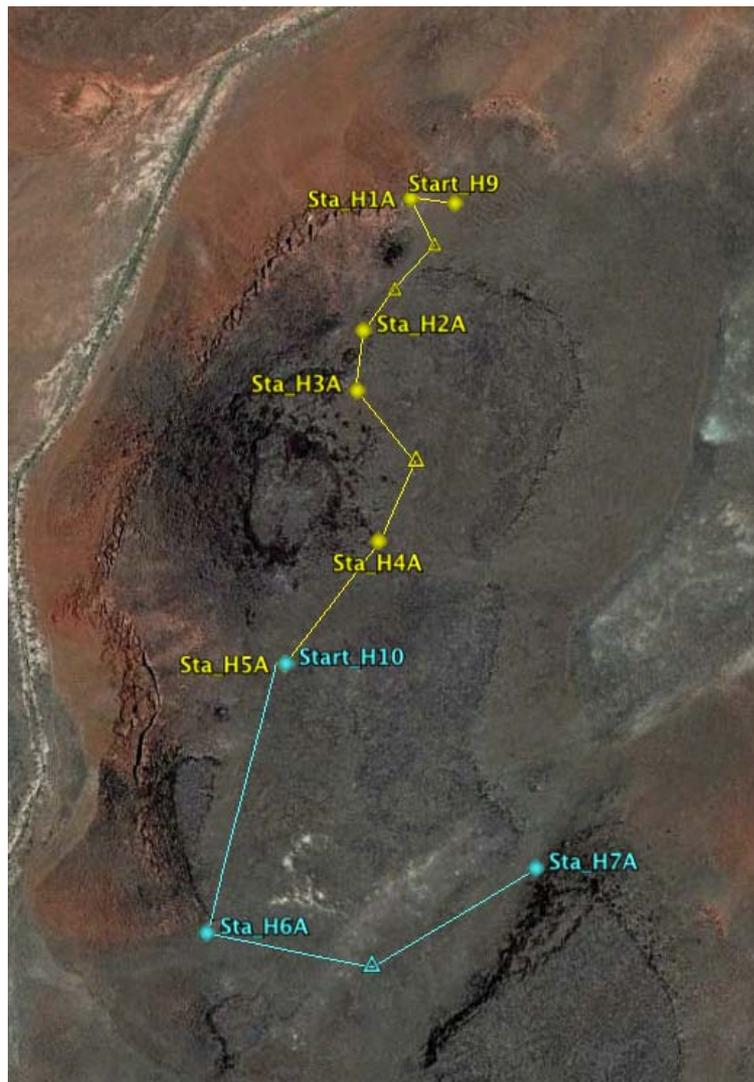
Photogeologic Map of the Hot Dog Hill Site, DRATS 2011

By  
J. A. Skinner, Jr. and C. M. Fortezzo  
2011

# Test Day 7, Condition 6, Crew A (SEV-B)

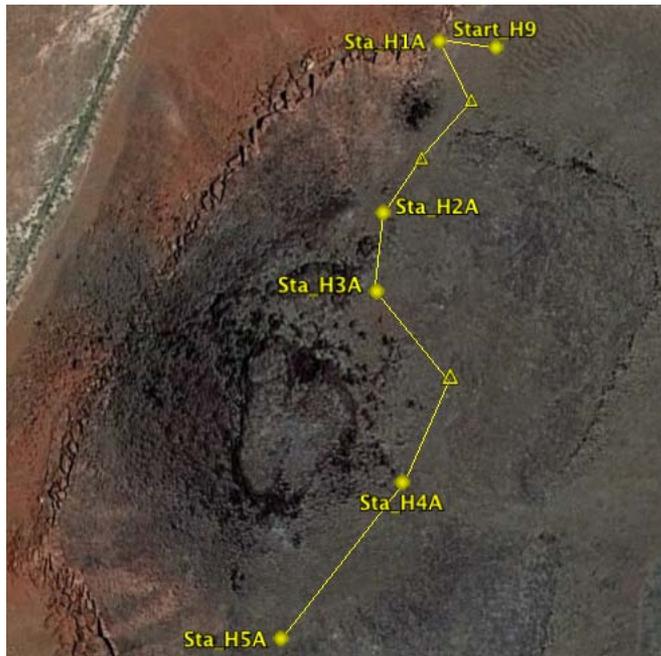
morning traverse = yellow

afternoon traverse = blue



# Test Day 7, Condition 6

## Crew A (SEV-B), Morning

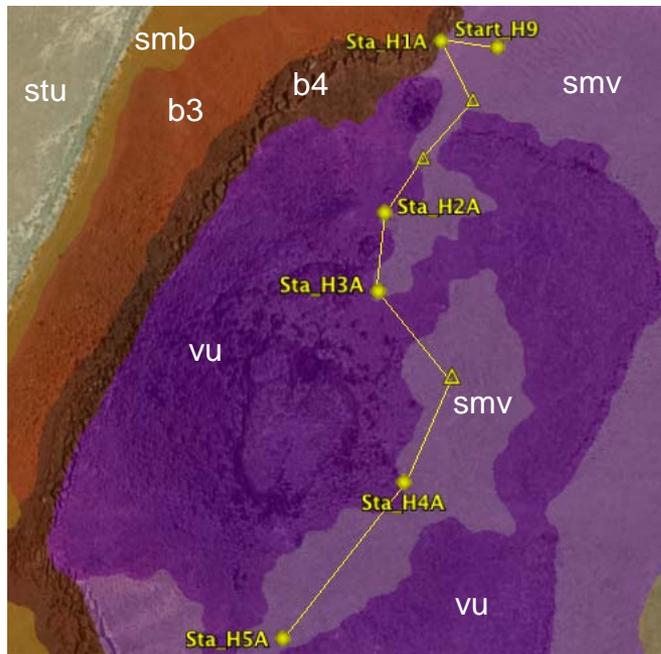


### Station H1A (~25 minutes)

**Primary objective** – describe the geologic setting/nature of the red-colored basement rocks (b3,b4); can you see two different basement units as depicted in the geologic map?; if so, is there a genetic association between the two; collect representative outcrop rock samples

**Primary objective** – describe any indication of local faulting

Describe the volcanic-derived material mantling the surface (smv) in the area; does it look like a thin flow, or alluvium/colluvium?; collect representative rock or soil samples



### Station H2A, H3A, H4A (~15 minutes each)

**Primary objective** - describe the volcanic nature of the large promontory (vu); can you see any evidence for a local eruptive process (e.g., bombs, stream-lined shapes)?; collect representative outcrop samples

**Primary objective** – describe any indication of local faulting

Describe the volcanic-derived material mantling the surface (smv) in the area; does it look like a thin flow, or alluvium/colluvium?; collect representative rock or soil samples

### Station H5A (~15 minutes)

Describe the volcanic-derived material mantling the surface (smv) in the area; does it look like a thin flow, or alluvium/colluvium?; collect representative rock or soil samples

## Test Day 7, Condition 6 Crew A (SEV-B), Afternoon



### Station H6A (~20 minutes)

**Priority** – describe the geologic setting/nature of the red-colored basement rocks (b4); can you see two different basement units as depicted at other locations on the geologic map (b3, b4)?; if so, is there a genetic association between the two; collect representative outcrop rock samples

**Priority** - describe the volcanic nature of the local, small promontory (vu); collect representative outcrop samples

Describe the volcanic-derived material mantling the surface (smv) in the area; does it look like a thin flow, or alluvium/colluvium?; collect representative rock or soil samples

Describe the basement-derived material mantling the surface (smb) in the area; collect representative rock or soil samples

### Station H7A (~25 minutes)

**Priority** - describe the volcanic nature of the local, large promontory (vu); collect representative outcrop samples

Describe the volcanic-derived material mantling the surface (smv) in the area; does it look like a thin flow, or alluvium/colluvium?; collect representative rock or soil samples

