Hog Pen stratigraphic section. This section consists of conglomerate overlain by a sequence of trachyandesite flows. Section described on the west face of an escarpment east of Water Canyon campground. Measured and described by Shari Kelley and Daniel Koning on September 23, 2011, using an Abney level and Jacob staff. UTM coordinates of base: 422001 m E, 3708769 m N (Zone 13, NAD 27). UTM coordinates of top: 422503 m N, 3708564 m E (Zone 13, NAD 27).

Unit	Description	Thickness (m) (Unit)	(Total)
	Top of extended section: 422503 m E; 3708564 m N.		
	Three Rivers Formation, Rattlesnake Member		
E-EE	**Plagioclase-phyric flow--**Flow is fine-grained, with 5% plagioclase phenocrysts that are 0.5-4.0 mm-long and subhedral.	not measured	
E-DD	**Covered**	1.5	349.5
E-CC2	**Plagioclase-phyric flow--** Flow is gray and fine-grained, with variable plagioclase phenocrysts (up to 10% of rock area). The plagioclase phenocrysts are 0.5-5.0 mm-long and subhedral. @ 18.5-20.0 m: 10-12% plagioclase phenocrysts (0.5-4.0 mm and subhedral).	5.0	349.0
E-CC1	**Plagioclase-phyric flow breccia**	4.5	344.0
	Hog Pen Formation	~340	~ 340
E-BB3	**Fine-grained trachyte flow, upper flow breccia**	3.0	339.5
E-BB2	**Fine-grained trachyte flow** *Base of extended section: 422480 m E; 3708579 m N. About 3 m of estimated error in shifting to here from base of BB2 flow in section to the south.* *Top of section approximately coincides with a NE-down fault. UTM coordinates of top of section: 422480 m E, 3708531 m N. This fault is seen in a mine shaft to the northwest (UTM coordinate: 422464 m E; 3708560 m N), where the fault trends 317° and dips 73°. An extended section was measured above here on October 3, 2011*	7.6	336.5
BB2	**Trachyte** – Crystal poor, olive-gray (5Y 4/1) on weathered surface, dark gray (N3) on fresh surface. Phenocryst content: <1% pyroxene and plagioclase. Plagioclase phenocrysts <2 mm long. Sample 11HP18. *@ 336.4 m: Above here, I use a trend of 104° and a dip of 10°E.*	11.1	340
BB1	**BB basal flow breccia** *UTM coordinates of **base** of flow breccia: 422442 m E, 3708542 m N.*	7.5	328.9
AA2	**Porphyritic pyroxene-phyric lava flow --** Olive-gray (5Y 4/1) on weathered surface, dark gray (N3) on fresh surface. Phenocryst content: 5% pyroxene and plagioclase. Plagioclase phenocrysts < 3 mm long. Skeletal, greenish black pyroxene phenocrysts < 7 mm across. Sample 11HP17. Lower contact is irregular and not well-exposed. @315.4 m: Middle of a light tan trachyte dike. Dike is 3 m wide and trends 320°. *@309 m: Change to a 135° trend and use a 12°E dip.*	16.7	321.4
AA1	**AA basal flow breccia--** Lower contact is obscured.	4.3	304.7

Unit	Description	Thickness (m) (Unit)	(Total)
	UTM coordinates of base of flow breccia: 422425 m E and 3708546 m N.		
Z2	**Sparsely porphyritic pyroxene- and plagioclase- phyric lava flow --** Olive-gray (5Y 4/1) on weathered surface, dark gray (N3) on fresh surface. Phenocryst content: 3% pyroxene and plagioclase. Plagioclase phenocrysts < 2 mm long. Pyroxene phenocrysts < 2 mm across. Overall this is a fine-grained rock. Sample 11HP16. Lower contact is wavy and has up to 0.5 m of relief.	4.7	300.4
Z1	**Z flow basal breccia --** lower contact is obscured.	8.0	295.7
	UTM coordinates of lower Z flow basal breccia: 422404 m E, 3708545 m N.		
Y2	**Porphyritic pyroxene-phyric lava flow --** Olive-gray (5Y 4/1) on weathered surface, dark gray (N3) on fresh surface. Phenocryst content: 7-10% pyroxene and plagioclase. Plagioclase phenocrysts < 5 mm long. Greenish black pyroxene phenocrysts < 10 mm across. About half of the pyroxene phenocrysts are rounded, embayed, or skeletal; the remainder are euhedral. Sample 11HP15.	14.3	287.7
	Between 280.9 and 285.4 m: tan, fine-grained, trachyte dike. It is ~6 m wide and trends 297°.		
Y1	**Y flow basal breccia**	0.9	273.4
	UTM coordinates of base of lower Y flow breccia:: 422385 m E, 3708542 m N.		
X	**Clayey-sandy conglomerate --** Reddish brown (7.5R 5/2) and massive. Clasts are angular to subangular, poorly sorted, and composed of pyroxene- and plagioclase-phryic lava types. Matrix consists of clayey very fine- to very coarse-grained sand. Estimate 15-20% clay. Sand is very fine- to very coarse-grained, angular to subangular, poorly sorted, and composed of plagioclase and pyroxene crystals. Unit is well -cemented. Lower contact is sharp and scoured, with 1 dm of relief.	6.6	272.5
	Between 270.4 and 271.9 m: a greenish, equigranular dike cross-cuts strata. It is ~ 1m wide and trends 050°. UTM coordinates of middle of the green, equigranular dike: *422354 m E, 3708607 m N*.		
	UTM coordinate of X basal contact: 422379 m E, 3708539 M N.		
	@258.4 m: Shift section line to the south along the top of the W flow. Estimate ~1 m of stratigraphic height error in this shift. UTM coordinates at north end of step: 422374 m E, 3708577 m N (WPTS 166 and 167). Coordinates at south end of step: 422415 m E, 3708332 m N.		
W1	**Upper flow breccia of unit W** Olive-gray (5Y 4/1) on weathered surface, dark gray (N3) on fresh surface. Phenocryst content: 10% pyroxene and plagioclase. Plagioclase phenocrysts < 5 mm long. Greenish black pyroxene phenocrysts < 3 mm across. The ratio of plagioclase to pyroxene is 4:1. 10% of the feldspar phenocrysts are equant and zoned, with a gray core. Sample 11HP14. *422424 mN, 3708386 mE.*	7.9	265.9
W	**Porphyritic pyroxene-phyric lava flow --** Olive-gray (5Y 4/1) on weathered surface, dark gray (N3) on fresh surface. Phenocryst content: 3-5% pyroxene and plagioclase. Plagioclase phenocrysts < 3-4 mm long. Pyroxene phenocrysts < 10 mm across. The smaller (<3 mm) pyroxene phenocrysts are altered to Fe-oxide. The larger pyroxene phenocrysts are greenish black; a few have a skeletal texture. Sample 11HP13. *422415 mN, 3708387 mE*.	9.0	258.0
	@258.4 m: Above here, we use a trend of 080° and a dip of 8°E. *@255 m: Above here, we use a trend of 110° and a dip of 10°E.*		

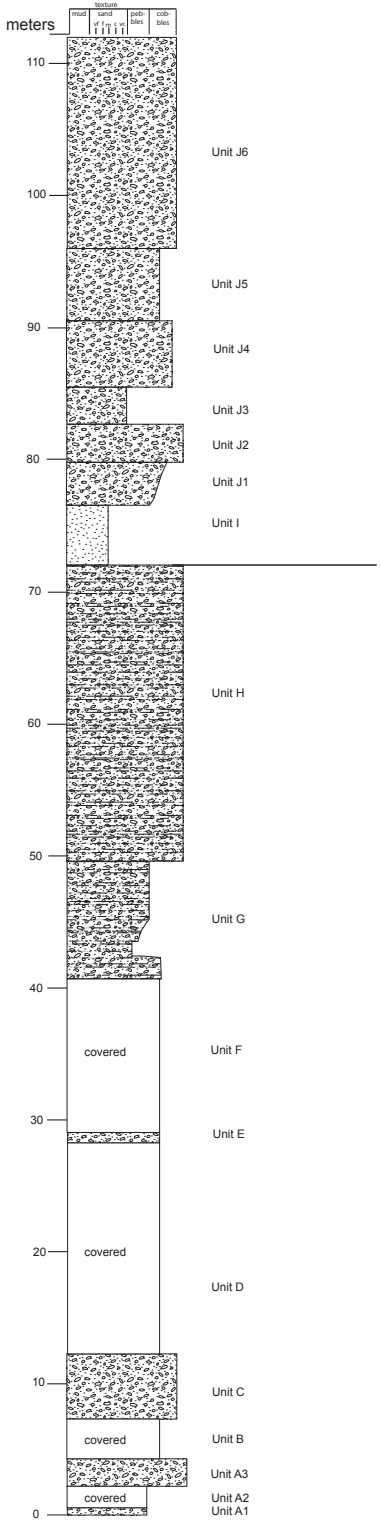
Unit	Description	Thickness (m) (Unit)	(Total)
V1	**Basal flow breccia of unit V --** Lower contact is irregular. @229.5 m: Middle of a green, equigranular dike. The dike is 1 m-wide and trends 062° *422399 m E 3708400 m N.*	4.5	249.0
V	**Porphyritic pyroxene-phyric lava flow --** Olive-gray (5Y 4/1) on weathered surface, dark gray (N3) on fresh surface. Phenocryst content: 5% pyroxene and plagioclase. Plagioclase phenocrysts < 5 mm long. Pyroxene phenocrysts < 6 mm across. Most of the pyroxene is black and is altered to Fe-oxide. About 10% of the pyroxene is green and has a skeletal texture. Basal contact is obscured. Sample 11HP12. *422403 mE, 3708406 m N.* *UTM coordinates of contact between V flow and U flow: 422363 m E, 3708600 m N.* *@237 m: Change trend to 120°; use dip of 11° E.*	9.0	244.5
U	**Porphyritic pyroxene-phyric lava flow --** Olive-gray (5Y 4/1) on weathered surface, dark gray (N3) on fresh surface. Phenocryst content: 5% pyroxene and plagioclase. Plagioclase phenocrysts < 2 mm long. Greenish black and skeletal euhedral black pyroxene phenocrysts < 8 mm across. Sample 11HP11. 422382 *m E* 3708411 *m N* *@229.5 m: From here, we use a trend of 135° and a dip of 12°E.*	9.0	235.5
U1	**Basal flow breccia for unit U2-** thin red sandstone at base**.** *UTM coordinates of contact between U basal breccia and the T flow: 422353 m E, 3708612 m N.* *@205.7 m: Southward shift in section. UTM coordinates of north end: 422339 m E, 3708632 m N. UTM coordinates of south end: 422334 m E, 3708622 m N. Estimate ~0.5 m potential stratigraphic height error in this shift*	5.0	226.5
T	**Porphyritic pyroxene-phyric lava flow --** Olive-gray (5Y 4/1) on weathered surface, dark gray (N3) on fresh surface. Phenocryst content: 3-5% pyroxene and plagioclase. Plagioclase phenocrysts < 3 mm long. Skeletal euhedral pyroxene phenocrysts < 5 mm across. The pyroxene size increases to 1 cm and the phenocryst content increases to 7% at the top of the flow. Sample 11HP10. 422370 *m E* 3708438 *m N.*	10.0	221.5
T1	**T flow basal flow breccia –** Fine-grained, <1% phenocrysts pyroxene and plagioclase. Basal contact exhibits ~1 m of irregular relief.	4.5	211.5
S	**Porphyritic pyroxene-phyric lava flow --** Olive-gray (5Y 4/1) on weathered surface, dark gray (N3) on fresh surface. Phenocryst content: 3-5% pyroxene and plagioclase. Plagioclase phenocrysts < 5 mm long. Black pyroxene phenocrysts < 5 mm across at base. Sample 11HP9. *422354 mE, 3708435 mN.* *UTM coordinates of contact between Flow S and Flow R: 422305 m E, 3708643 m N* .	14.5	207.0
R	**Fining-upward conglomerate --** 10R 4/3, sandy pebbles-cobbles, with slight clay content. Gravel are subrounded and heterolithic. Unit grades upwards into clayey-pebbly very fine- to very coarse-grained sand (mostly coarse and very coarse sand). Probably stream-flow.	2.9	192.5
Q	**Porphyritic pyroxene-phyric lava flow --** Lower contact is sharp and wavy, with 1 dm of relief. Olive-gray (5Y 4/1) on weathered surface, dark gray (N3) on fresh	6.0	188.6

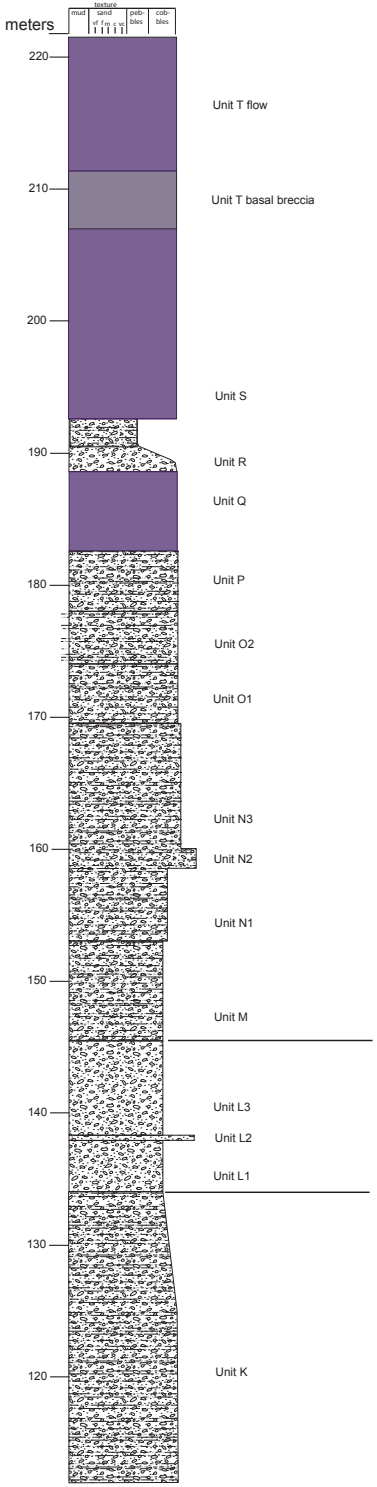
Unit	Description	Thickness (m) (Unit)	(Total)
	surface. Phenocryst content: 3-5% pyroxene and plagioclase. Plagioclase phenocrysts < 2 mm long. Pyroxene phenocrysts < 2 mm across. Pyroxene altered. Vesicles, which make up < 1% of rock, are filled with calcite. Sample 11HP8. 422327 mE, 3708448 mN		
P	**Clayey-sandy conglomerate (pebbles through boulders) --** Reddish brown (2.5YR 6/1), massive, clayey-sandy conglomerate. Clasts consist of pebbles (mostly), cobbles, and boulders. Gravel are subangular to subrounded (mostly subrounded). Sand is mostly medium-lower to very coarse-upper in size. Lower contact is planar and gradational. Interpreted as debris flows.	4.6	182.6
	UTM coordinates of contact between Q flow and Unit P conglomerate: 422299 m E; 3708654 m N.		
O	**Clayey-sandy conglomerate (pebbles through boulders) --** Slightly reddish gray (10R 5/2), poorly sorted, matrix-supported, clayey-sandy conglomerate. Pebbles are the most abundant clast size. Gradational lower contact. Interpreted as debris flows.	**8.4**	**178.0**
O1	Strata are in thin to thick, tabular beds.	4.0	178.0
O2	Strata are massive.	4.4	174.0
	UTM coordinates of contact between O conglomerate and N conglomerate: 422286 m E; 3708649 m N.		
N	**Clayey-sandy conglomerate (pebbles through boulders)** -- Gray to reddish brown, massive, clayey conglomerate. Clasts are subangular and range from pebbles to boulders in size, but strata below 158.5 m lack boulders. Lower contact is sharp. Interpreted as debris flows. Unit subdivided based on texture, as follows:	16.6	169.6
N3	Bouldery bed.	9.6	169.6
N2	Massive clayey-sandy conglomerate. Clasts are pebble- to cobble-size.	1.5	160.0
N1	Clayey-sandy conglomerate (pebbles and lesser cobbles)	5.5	158.5
M	**Clayey-sandy clayey-sandy conglomerate. Clasts are pebble- to boulder-size. --** Reddish brown (5R 5/1), clayey-sandy conglomerate. Poorly bedded; beds are mostly medium to thick. Sand is very fine- to very coarse grained, but mostly fine-upper to very coarse-upper. Clasts include pebbles and cobbles (pebbles>cobbles), together with minor boulders, and are matrix-supported. Lower contact is obscured. Interpreted as a debris flow.	7.6	153.0
L	**Sandy conglomerate (pebbles through cobbles) --** Light gray (bottom) to reddish gray (top); poorly bedded. Gravel are matrix-supported, subangular, and range from pebbles to cobbles. ~1% boulders. Less clayey than Unit K. Lower contact obscured. Interpreted as a debris flow. The presence of a boulder-rich bed allows subdivision of this unit, as follows:	10.4	145.4
L3	Reddish gray (10R 5/1), otherwise similar to subunit L1.	7.1	145.4
L2	Boulder-rich, matrix-supported bed that is 40 cm thick.	0.4	138.3
L1	Light gray and poorly bedded. Gravel are matrix-supported, subangular, and range from pebbles to cobbles. ~1% boulders.	2.9	137.9
K	**Intercalated clayey-sandy conglomerate (pebbles-cobbles) and sandstone** -- 7.5YR 6/2. Medium to thick, tabular beds. About subequal: 1) matrix-supported, clayey, sandy pebbles through cobbles; and 2) clayey very fine- to very coarse-grained	23.0	135.0

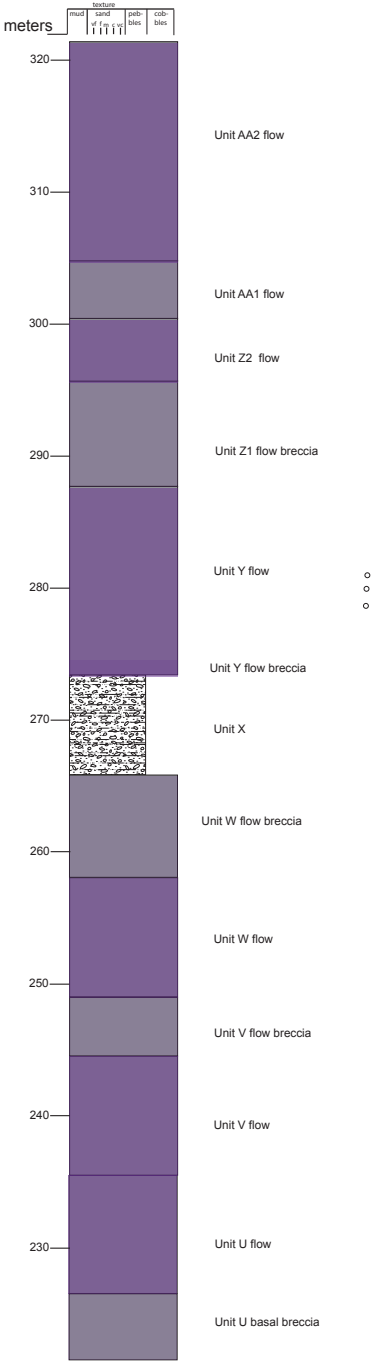
Unit	Description	Thickness (m) (Unit)	(Total)
	sandstone (mostly medium-grained). Minor boulders present in lower half, but upper half generally lacks boulders. The pronounced fining upward trend seen in many beds of the underlying Unit J is no longer present. This unit is similar to Unit J, but overall is more matrix supported. Lower contact is obscured. Interpreted as debris flow deposits. *UTM coordinates of contact between J conglomerate and K conglomerate: 422209 m E; 3708687 m N.*		
J	**Sandy conglomerate (pebbles through boulders)** -- Gray (10YR 6/1-5/3). Medium to thick beds of matrix-supported pebbles through boulders. Minor beds of pebbly sandstone, sandstone, and clayey sandstone. Beds are internally massive. Mainly interpreted as debris flow deposits, but locally these debris flow deposits are capped by finer-grained, relatively thin, stream-flow sediment.	**35.5**	**112.0**
J6	**Sandy conglomerate (pebbles through boulders)** -- Beds are 1-2 m-thick and rich in cobbles and boulders; internally massive and matrix (mostly) to clast-supported. The base of the beds are sharp. Each bed fines-upwards into a finer-grained interval that are typically ~2 dm-thick and consists of pebbly sandstone, sandstone, and clayey sandstone. Interpreted as debris flows grading upward into finer-grained stream-flow deposits. Subunits of Unit J are presented below:	16.0	112.0
J5	Medium to thick beds of matrix-supported pebbles-cobbles (interpreted as probable debris flows). Minor beds of pebbly sandstone, sandstone, and clayey sandstone (interpreted as probable stream-flows).	4.5	96.0
J4	Matrix-supported, pebbles-cobbles. Local boulder-rich zones. No internal bedding. Interpreted as a debris flow. Lower contact obscured.	6.0	91.5
J3	Thin to thick, tabular (?) beds of intercalated sandstone and sandy pebble-cobble conglomerate; the two rock types are approximately subequal in volume. Possibly a stream-flow deposit.	2.8	85.5
J2	Matrix-supported, pebble-cobble-boulder debris flow with no internal bedding. Interpreted as a debris flow. *@82.5 m: Change trend to 109° degrees; change dip to 10° E.*	2.9	82.7
J1	Thick, tabular beds of clast- to matrix-supported, subrounded to subangular, pebbles-cobbles. Upper 10 cm of a given bed is commonly clay-rich and less gravelly than underlying part of the bed. The cobbles at the base of each fining-upward succession are < 10 cm in diameter, rounded to angular, and composed of detritus from pyroxene-phyric, plagioclase-phyric, and fine-grained lavas. The basal conglomeratic contact for each bed is variably sharp and scoured to ill-defined. A few 1 to 1.5 m boulders are present. Sample 11HP6. Clast size increases up-section within this subunit. Interpreted as debris flows grading upward into finer-grained hyperconcentrated or stream-flow deposits. *UTM coordinates of contact between J conglomerate and I sandstone: 422147 m E; 3708725 m N.*	3.3	79.8
I	**Sandstone:** Medium-grained sandstone and clayey very fine- to fine-grained sandstone. Color of 7.5YR 6/1. Thin to thick (mostly thick) tabular, massive beds. Lower contact is slightly scoured, with 2 dm of scour relief. Interpreted at a fluvial deposit. Sample 11HP5.	4.5	76.5
H	**Clayey-sandy conglomerate (pebbles through boulders) --** Deeper reddish-brown than unit G; color is 5-7.5YR 5/3. Lower contact is scoured and wavy. This conglomerate contains large, angular to rounded clasts of pyroxene-phyric lava up to 1.1 to 1.5 m in diameter. The unit is poorly sorted and is matrix supported. The size of the clasts decreases to <0.5 m up section. Sample 11HP4. Interpreted as a debris	22.5	72

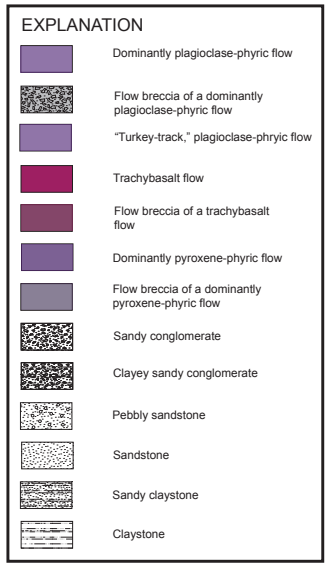
Unit	Description	Thickness (m) (Unit)	(Total)
	flow. @67.5 m: *Change trend to 110° and use 11° E dip.* @63 m: SE margin of a trachybasalt dike. @60 m: NW margin of an altered trachybasalt dike. This dike trends 088° and is ~ 3 m wide. *Change trend to 112° and use 11° E dip.* *@54 m: Change trend to 138° and use 12° E dip.*		
G	**Clayey-sandy pebble conglomerate --** Upper 2 m are greenish and altered. Below, this unit is redder (5R 6/2-3). The reddish-brown pebble to cobble conglomerate is cut by an equigranular to fine-grained trachybasalt dike and a small fault. The reddish brown sandstone south of the fault contains granules of plagioclase, pyroxene, and lava. The sandy bed is overlain by a boulder conglomerate with pyroxene-phyric lava clasts that are 20 to 30 cm across. Sample 11HP3. *@46.5 m: Change trend to 113° and use 10° E dip.* @42 m: SE side of a 1.4 m-wide dike that trends 070°. Small fault on NW side of dike.	8.9	49.5
F	**Covered**	11.6	40.6
E	**Sandy conglomerate (pebbles through cobbles) similar to units A and C**	0.8	29.0
D	**Covered**	16	28.2
C	**Sandy conglomerate (pebbles through boulders) --** similar to unit A, contain blocks of pyroxene-phyric lava up to 60 cm across. Unit C fines upward into a sandy conglomerate with lava clasts less than 1 cm in diameter. The matrix contains crystals of pyroxene up to 0.5 cm across; another boulder bed lies above the sandy interval.	4.9	12.2
B	**Not exposed**	3.0	7.3
A3	**Sandy conglomerate:** (pebbles through boulders) clasts of angular pyroxene-phyric lava that are up to 50 cm in diameter; poorly-sorted, clast-supported, greenish-gray sandy matrix. Sample 11 HP2.	2.1	4.3
A2	**Covered**	1.6	2.2
A1	**Sandy pebble conglomerate:** Clasts consist of rounded pyroxene-phyric lava that are 2-5 cm in diameter; poorly-sorted, clast-supported, greenish-gray sandy matrix. Sample 11HP1. *Base of section is in an arroyo east-southeast of Water Canyon campground. UTM coordinates of: 422001 m E, 3708569 m (Zone 13, NAD 27). From here, we use a trend of 104° and dip of 10° E (down-dip). Underlying Sanders Canyon Formation is not exposed here, but it is exposed ~350 m to north (at waypoint 422034 m E; 3708919 m N).*	0.6	0.6

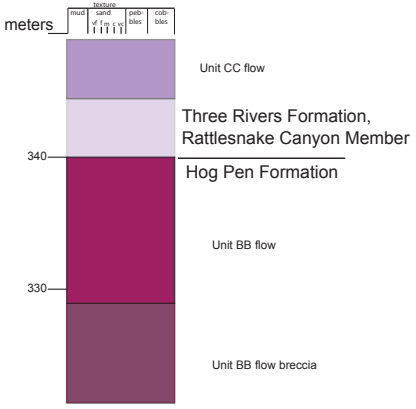
Hog Pen stratigraphic section











Three Rivers stratigraphic section. This section consists of plagioclase- and pyroxene-phyric lava flows of the upper Hog Pen Formation, conformably overlain by reddish volcaniclastic sedimentary deposits and plagioclase-phyric trachyandesite flows of the Rattlesnake Member of the Three River Formation. Section described on the ridge northwest of Dry Canyon, a tributary of Three Rivers Canyon. Measured and described by Shari Kelley and Daniel Koning on October 19, 2011 and November 16, 2011, using an Abney level and Jacob staff. UTM coordinates of base: 419076 m E, 3696870 m N (Zone 13, NAD 27). UTM coordinates of top: 420624 m E, 3698096 M N (Zone 13, NAD 27).

Unit	Description	Thickness (m) (Unit)	(Total)
	Taylor Windmill Member of the Three Rivers Formation	177	740
	The Taylor Windmill Member is not described in detail here. The thickness of the Taylor Windmill Member is estimated using the distance between waypoint 126 and peak west of White Horse Hill, which is capped by Taylor Windmill Member (4267 ft.). Using a 3° dip, this translates to 220 ft. of section. Elevation difference is 9440-9080 = 360 ft. Estimated thickness from end of section to top of this hill is 580 ft. (177 m).		
	End of section coincides with west margin of Three Rivers stock (alkali granite). Top of section: UTM coordinates: 420624 m E, 3698096 M N (Zone 13, NAD 27).		
50	**Fine-grained lava flow.** Dark gray, Aphanitic matrix. Phenocryst content: <1 % plagioclase and pyroxene. Plagioclase phenocrysts < 1 mm long. Pyroxene phenocrysts < 1 mm across.	106	563
49	**Fine-grained lava flow.** Dark gray, Aphanitic matrix. Phenocryst content: <1 % plagioclase and pyroxene. Plagioclase phenocrysts < 2 mm long. Pyroxene phenocrysts < 2 mm across . *UTM coordinates of top of unit: 420427 m E, 3697827 m N*	~15	457
	Rattlesnake Member of Three Rivers Formation		
48	**Porphyritic Lava Flow with Large Plagioclase Phenocrysts ("turkey track").** Phenocryst content: 30% plagioclase. Plagioclase phenocrysts < 12 mm long. Pyroxene phenocrysts < 2 mm across. Ratio of plagioclase to pyroxene = 20:1. " *UTM coordinates of top of unit: 420368 m E, 3697759 m N (Waypoints 117 and 118).*	16.2	441.9
47	**Syenite dike.** Dike is cream-colored and contains ~15% feldspar phenocrysts up to 2 mm-long. Dike trends 020 degrees. *@ 413 m: Change bearing to 020 degrees and use 3.5 degree E down-dip. UTM coordinates: 420323 m E, 3697661 m N (Waypoint 116).*	14.0	425.7
46	**Porphyritic Lava Flow.** Phenocryst content: 10-15% plagioclase and pyroxene. Plagioclase phenocrysts < 6 mm long. Pyroxene phenocrysts < 2 mm across. Ratio of plagioclase to pyroxene = 2:1. Basal contact is obscured and poorly constrained. *@407.4 m: Change bearing to 038 degrees and use 4.0 degree E down-dip.*	15.8	411.7
45	**Porphyritic Lava Flow.** Medium gray (N5). Phenocryst content: 10% plagioclase and pyroxene. Plagioclase phenocrysts < 7-8 mm long. Pyroxene phenocrysts < 2 mm across. Ratio of plagioclase to pyroxene = 5:1	6	395.9

Unit	Description	Thickness (m) (Unit)	(Total)
44	**Poor exposure of syenite dikes.** .	7.2	389.9
43	**Porphyritic Lava Flow.** Medium gray (N5). 15 % plagioclase and pyroxene. Plagioclase < 7 mm. Pyroxene < 2 mm across. Ratio of plagioclase to pyroxene = 20:1.	1.8	382.7
42	**Covered, includes a dike in lower 2 m.** The dike is light green and contains 1-5% feldspar phenocrysts up to 2.0 mm long; dike is altered. Lower contact is obscured and its position is not well-constrained.	5.2	380.9
41	**Porphyritic lava flow.** Medium gray (N5). 2 % plagioclase and pyroxene. Plagioclase < 3 mm. Pyroxene < 3 mm across. Ratio of plagioclase to pyroxene = 1:1. *@363.9 m: Top of ledge, but the flow continues up-section. From here we go 054 degrees and use a 4.0 degree E down-dip.*	14.9	375.7
40	**Vesicular flow top of Unit 38.**	2.2	360.3
39	**Covered**	2.1	358.1
38	**Porphyritic Lava Flow.** Medium gray (N5). 3 % plagioclase and pyroxene. Plagioclase < 3 mm. Pyroxene < 2 mm across. Ratio of plagioclase to pyroxene = 1:1.	2.0	356.0
37	**Porphyritic Lava Flows with Large Plagioclase Phenocrysts ("turkey track").** Medium gray (N5). 15-20 % plagioclase and pyroxene. Plagioclase < 20 mm. Pyroxene < 2 mm across. Ratio of plagioclase to pyroxene = 20:1. Lower part of interval includes two dikes. The lower dike is at 300.9 m and is greenish-yellow, trending 281°; fine-grained trachyte. The upper dike is at 302.4-303.9 m and is a greenish yellow, fine-grained trachyte that parallels the ridge crest (081°); dike is altered and 2-3 m wide. *@350.4 m: Change bearing to 061 degrees and use a 4.0 degree E down-dip.* *@347.4 m: Change bearing to 085 degrees and use a 5 degree E down-dip.* *@335.4 m: Change bearing to 046 degrees and use a 4.0 degree E down-dip.* *@324.9 m: Change bearing to 060-063 degrees and keep 4.0 degree E down-dip.* *Between 316 m and 325 lie numerous dikes that were not described.* *@315.9 m: The next shot is a long one (20-30 m).* *@ 305.4 m: Change bearing to 038 degrees and use a 4.0 degree E down-dip.*	58.9	354.0
36	**Crystal-rich, Porphyritic Lava Flow.** Medium gray (N5). 20 % plagioclase and pyroxene. Plagioclase < 7 mm. Pyroxene < 2 mm across. Ratio of plagioclase to pyroxene = 20:1.	15.2	295.1
35	**Basal flow Breccia of Unit 36**	0.3	279.9
34	**Crystal-rich, Porphyritic Lava Flow.** Medium gray (N5). 15 % plagioclase and pyroxene. Plagioclase < 9 mm. Pyroxene < 2 mm across. Ratio of plagioclase to pyroxene = 20:1. Two dikes are present in this interval. The lower is at 272.6 m and is tan, trachytic, and fine-grained; trends 278 degrees and is 3meters wide. The upper is at 275.7 m and was not described. *@275.4 m, change trend to 068 degrees and use a 4.5 degree down-dip.*	11.7	279.6
33	**Sandstone. Red (**5YR 4/1-2) silstone-claystone with 10-20% clasts of plagioclase-pyroxene-phyric lava. Lava similar to that in unit 32. Base of unit is sharp and irregular,	1.2	267.9

Unit	Description	Thickness (m) (Unit)	(Total)
	with ~10 cm of vertical relief.		
32	**Vesicular Porphyritic Lava Flow.** Medium gray (N5). 7 % plagioclase and pyroxene. Plagioclase < 4 mm. Pyroxene < 2 mm across. Ratio of plagioclase to pyroxene = 5:1. 10% vesicles. Interval includes a 1 m-wide dike at 263.4 m; dike is fine-grained and gray. *Base of next segment: UTM coordinates: 419808 m E, 7697311 m N. +/- 1 m of error in stepping to the base of this segment from the last segment.* *Top of ridge. UTM coordinates: 419734 m E, 3697243 m N. Above here, we use a trend of 037 degrees and 4 degrees dip.*	16.8	266.7
31	**Crystal-rich porphyritic lava flow.** Medium gray (N5). 20 % plagioclase and pyroxene. Plagioclase < 4 mm. Pyroxene < 7-12 mm across. Ratio of plagioclase to pyroxene = 5:1. Plagioclase is zoned, with a gray core.	2.7	249.9
30	**Altered Basal Breccia of Unit 31.**	5.0	247.2
29	**Covered**	0.7	242.2
28	**Porphyritic lava flow.** Medium gray (N5). 15 % plagioclase and pyroxene. Plagioclase < 4 mm. Pyroxene < 2 mm across. Ratio of plagioclase to pyroxene = 10:1.	17.7	241.5
27	**Altered Basal Flow Breccia of Unit 28.**	2.0	223.8
26	**Red Volcaniclastic Conglomerate.** 5YR 4/1-2 silstone-claystone with 10-20% clasts of plagioclase-pyroxene-phyric lava	0.6	221.8
25	**Porphyritic Lava Flow.** Medium gray (N5). 20 % plagioclase and pyroxene. Plagioclase < 9 mm. Pyroxene < 2 mm across. Ratio of plagioclase to pyroxene = 10:1.	2.9	221.2
24	**Covered.** Float of red 5R6/2-5/3 mudstone with 15-20% subangular plagioclase grains (fU-cL sand-size). Basal contact not exposed.	2.6	218.3
23	**Covered.**	4.5	215.7
22	**Porphyritic Lava Flow.** Medium gray (N5). 15 % plagioclase and pyroxene. Plagioclase < 7 mm. Pyroxene < 2 mm across. Ratio of plagioclase to pyroxene = 10:1.	3.9	211.2
21	**Lower Flow Breccia of Unit 22**	0.8	207.3
20	**Porphyritic Lava Flow.** Medium gray (N5). 5 % plagioclase and pyroxene. Plagioclase < 7 mm. Pyroxene < 2 mm across. Ratio of plagioclase to pyroxene = 10:1.	2.1	206.5
19	**Covered, probably a flow breccia**	2.9	204.4
18	**Porphyritic Lava Flow.** Medium gray (N5). 5 % plagioclase and pyroxene. Plagioclase < 7 mm. Pyroxene < 2 mm across. Ratio of plagioclase to pyroxene = 10:1.	6.7	201.5
17	**Covered**	7.1	194.8

Unit	Description	Thickness (m) (Unit)	(Total)
	Top of Hog Pen Formation		
16	**Porphyritic Lava Flow.** Medium gray (N5). 7 % plagioclase and pyroxene. Plagioclase < 4 mm. Pyroxene < 3 mm across. Ratio of plagioclase to pyroxene = 1.5:1.	1.2	187.7
15	**Porphyritic Lava Flow.** Medium gray (N5). 10 % plagioclase and pyroxene. Plagioclase < 4 mm. Pyroxene < 4 mm across. Ratio of plagioclase to pyroxene = 1.5:1.	2	186.5
14	**Covered**	1.2	184.5
13	**Porphyritic lava flow.** Medium gray (N5). 7-10 % plagioclase and pyroxene. Plagioclase < 4 mm. Pyroxene < 2 mm across. Ratio of plagioclase to pyroxene = 1.5:1.	2.3	183.3
12	**Covered**	3.7	181.0
11	**Porphyritic Lava Flow.** Medium gray (N5). 10 % plagioclase and pyroxene. Plagioclase < mm. Pyroxene < 3 mm across. Ratio of plagioclase to pyroxene = 1:1.	5.3	177.3
10	**Porphyritic Lava Flow.** Medium gray (N5). 20% plagioclase and pyroxene. Plagioclase < 3 mm. Pyroxene < 3 mm across. Ratio of plagioclase to pyroxene = 1:1.	1.8	172.0
9	**Covered**	1.1	170.2
8	**Pyroxene-phyric Lava Flow.** Medium gray (N5). 25 % plagioclase and pyroxene. Plagioclase < 3 mm. Pyroxene <3 mm across. Ratio of plagioclase to pyroxene = 2:1.	2.4	169.1
7	**Covered**	1.7	166.7
6	**Flow Breccia.** Medium gray (N5). 7-10 % plagioclase and pyroxene. Plagioclase < 4 mm. Pyroxene <2- 3 mm across. Ratio of plagioclase to pyroxene = 2:1.	1.5	165
	Infer that the top of unit 5 correlates to top of unit TT (163.5 m).		
5	**Porphyritic Lava Flow** Medium gray (N5). Phenocryst content: 5% pyroxene and plagioclase. Plagioclase phenocrysts < 2 mm long. Pyroxene phenocrysts < 2 mm across. Equigranular matrix. Grades up into a zone with 10% 1-2 mm plagioclase phenocrysts. Possibly correlative to Unit TT.	5.6	
4	**Covered**	1.1	
3	**Porphyritic Lava Flow.** Olive-gray (5Y 4/1) on weathered surface, medium gray (N5) on fresh surface. Phenocryst content: 20% plagioclase and 2% pyroxene. Plagioclase phenocrysts < 3 mm long. Pyroxene phenocrysts < 4 mm across. Possibly correlative to Unit QQ.	1.8	
2	**Covered**	3.4	
1	**Porphyritic Lava Flow.** Olive-gray (5Y 4/1) on weathered surface, medium gray (N5) on fresh surface. Phenocryst content: 7% plagioclase and pyroxene. Plagioclase phenocrysts < 3 mm long. Pyroxene phenocrysts < 3 mm across. Equigranular matrix. Possibly correlative to Unit PP.	2.9	
	Started section here on 11/16/11. The discovery of a fault between this point and our end point on 10/19/11 caused us to begin the upper part of the section here. Base of offset segment placed at the base of the lowest flow. Below is a long interval of		

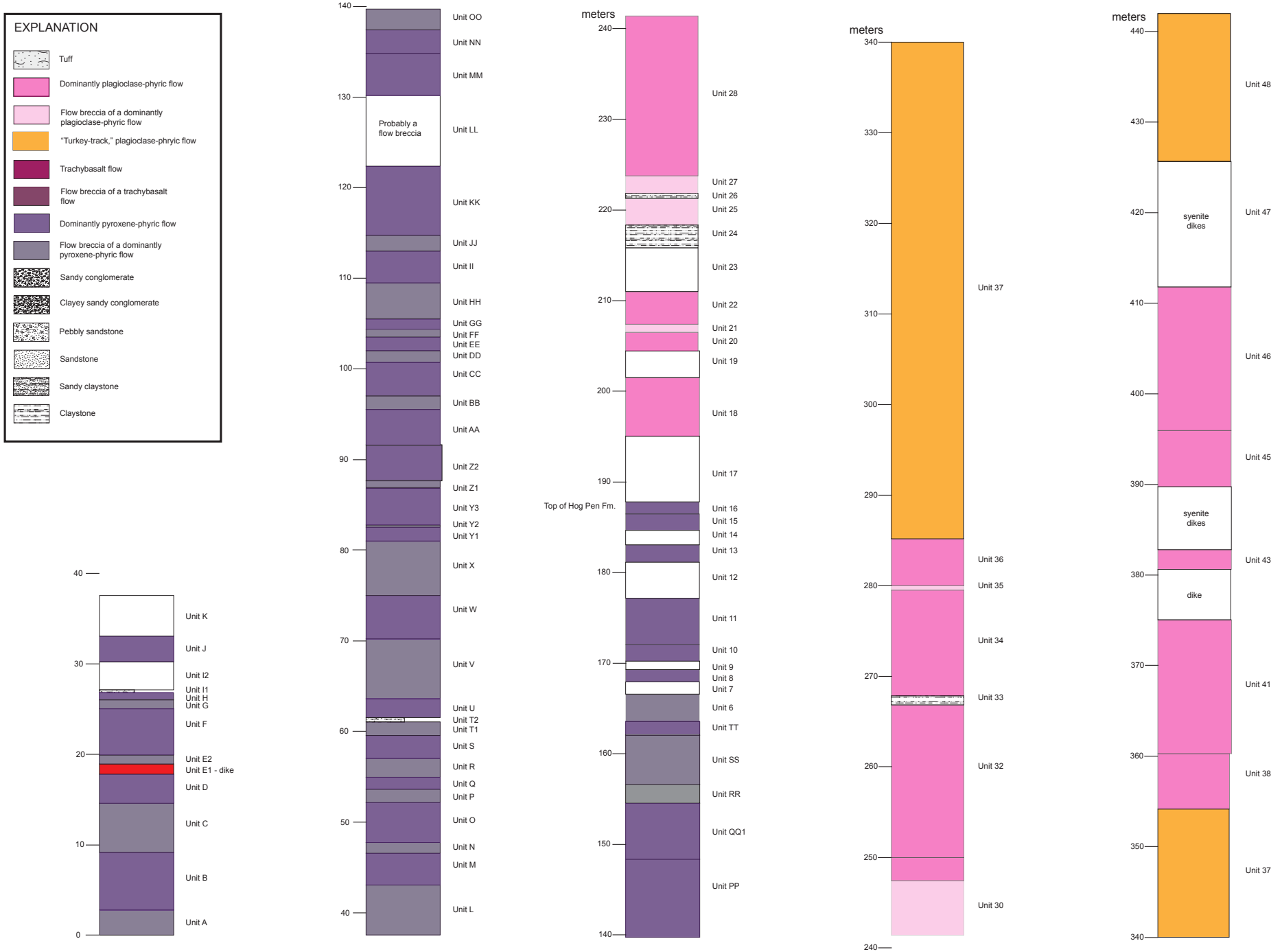
Unit	Description	Thickness (m) (Unit)	(Total)
	colluvium. UTM coordinates of: 419801 m E, 3697086 m N. Inferred overlap between units 1-5 of 11/16/11 section and PP-TT of 10/19/11 section. Above here, we use a trend of 335 degrees and 1.5 degrees down-dip. Cairn built at base.		
	End of section that was measured on October 18, 2011 @163.5 m: Cairn built on top of this point. UTM coordinates of: 419469 m E 3697081 n N. Dips 3-4° N. Ridge steps to left east of here. Here, red volcaniclastic sediment appears to lie above this flow.		
TT	**Pyroxene-phyric Porphyritic Lava Flow**. Olive-gray (5Y 4/1) on weathered surface, medium gray (N5) on fresh surface. Phenocryst content: 5% pyroxene and plagioclase. Plagioclase phenocrysts < 3 mm long. Pyroxene phenocrysts < 3 mm across. Ratio of plagioclase to pyroxene = 1:2. Pyroxene altered.	1.5	163.5
SS	**Flow breccia.** As in unit QQ1.	6.4	162.0
RR	**Porphyritic Lava Flow.** Olive-gray (5Y 4/1) on weathered surface, medium gray (N5) on fresh surface. Phenocryst content: 10-15% plagioclase and pyroxene. Plagioclase phenocrysts < 3 mm long. Pyroxene phenocrysts < 3 mm across. Ratio of plagioclase to pyroxene = 1.5:1. Most pyroxene altered to iron oxide, but 5 % are green or are skeletal. Calcite filled vesicles < 1 % of rock.	1.1	155.6
QQ1	**Flow breccia** Discontinuous, coarse plagioclase-phyric lava appears to have "rafted" on the breccia. 1.1 m thick here, but is 2.5 m thick to the southeast, beyond which it pinches out.	6.2	154.5
PP	**Porphyritic Lava Flow**. Olive-gray (5Y 4/1) on weathered surface, medium gray (N5) on fresh surface. Phenocryst content: 15% plagioclase and pyroxene. Plagioclase phenocrysts < 3 mm long. Pyroxene phenocrysts < 3 mm across. Ratio of plagioclase to pyroxene = 1.5:1.	8.6	148.3
OO	**Flow breccia**	2.3	139.7
NN	**Porphyritic Lava Flow**. Olive-gray (5Y 4/1) on weathered surface, medium gray (N5) on fresh surface. Phenocryst content: 15% plagioclase and pyroxene. Plagioclase phenocrysts <4 mm long. Pyroxene phenocrysts < 2 mm across. Ratio of plagioclase to pyroxene = 1.5:1.	2.6	137.4
MM	**Pyroxene-phyric Porphyritic Lava Flow**. Olive-gray (5Y 4/1) on weathered surface, medium gray (N5) on fresh surface. Phenocryst content: 5% pyroxene and plagioclase. Plagioclase phenocrysts < 3 mm long. Black pyroxene phenocrysts < 3 mm across. Ratio of plagioclase to pyroxene = 1:2.	4.6	134.8
LL	*Covered, but probably a flow breccia*	7.9	130.2
	@127.0-127.5 m: Flow breccia -- Clasts are gray, contain 40% plagioclase phenocrysts (by surface area) that are 0.5-3.0 mm in size and euhedral to subhedral; 7% pyroxene phenocrysts (brown color; 0.5-1.5 mm in size and subhedral to euhedral). One xenolith of coarse-plagioclase-phyric lava (1-6 mm long plagioclase phenocrysts).		
KK	**Porphyritic Lava Flow.** Medium gray (N5) on fresh surface. Phenocryst content: 15% plagioclase. Plagioclase phenocrysts < 4 mm long. Pyroxene phenocrysts < 1 mm across and makes up %0% of the equigranular matrix. Ratio of plagioclase to pyroxene = 20:1. Pyroxene altered.	7.6	122.3

Unit	Description	Thickness (m) (Unit)	(Total)
JJ	**Flow breccia**	1.7	114.7
II	**Porphyritic Lava Flow**. Medium gray (N5) on fresh surface. Phenocryst content: 10-15% plagioclase and pyroxene. Plagioclase phenocrysts < 4 mm long. Pyroxene phenocrysts < 2 mm across. Ratio of plagioclase to pyroxene = 2:1. Matrix equigranular to fine-grained.	3.5	113.0
HH	**Flow breccia**	4.0	109.5
GG	**Porphyritic Lava Flow**. Olive-gray (5Y 4/1) on weathered surface, medium gray (N5) on fresh surface. Phenocryst content: 7-10% pyroxene and plagioclase. Plagioclase phenocrysts < 4 mm long. Pyroxene phenocrysts < 2 mm across. Ratio of plagioclase to pyroxene = 1:1. Pyroxene altered. Basal contact has ~30 cm of relief.	1.1	105.5
FF	**Flow breccia**	0.9	104.4
EE	**Porphyritic Lava Flow**. Olive-gray (5Y 4/1) on weathered surface, medium gray (N5) on fresh surface. Phenocryst content: 15% pyroxene and plagioclase. Plagioclase phenocrysts < 4 mm long. Pyroxene phenocrysts < 2 mm across. Ratio of plagioclase to pyroxene = 1:1.	1.5	103.5
DD	**Flow breccia**	1.3	102.0
CC	**Porphyritic Lava Flow**. Medium gray (N5) on fresh surface. Phenocryst content: 7-10% plagioclase and pyroxene. Plagioclase phenocrysts < 4 mm long. Pyroxene phenocrysts < 2 mm across. Ratio of plagioclase to pyroxene = 2:1.	3.7	100.7
BB	**Flow breccia.** Lower contact has about 1 m of relief.	1.5	97.0
AA	**Porphyritic Lava Flow**. Medium gray (N5) on fresh surface. Phenocryst content: 15% plagioclase and pyroxene. Plagioclase phenocrysts < 4 mm long. Pyroxene phenocrysts < 2 mm across. Ratio of plagioclase to pyroxene = 10:1.	3.9	95.5
Z2	**Sparsely Porphyritic Lava Flow.** Dusky red (5R ¾) on fresh surface. Phenocryst content: 2-3% plagioclase and pyroxene. Plagioclase phenocrysts < 2 mm long. Pyroxene phenocrysts < 1 mm across. Ratio of plagioclase to pyroxene = 2:1. Pyroxene altered.	4.0	91.6
Z1	**Flow breccia.** Red clay in interstices.	0.8	87.6
Y3	**Porphyritic Lava Flow.** Olive-gray (5Y 4/1) on weathered surface, medium gray (N5) on fresh surface. Phenocryst content: 20% pyroxene, plagioclase. Plagioclase phenocrysts < 3 mm long. Pyroxene phenocrysts < 4 mm across. Ratio of plagioclase to pyroxene = 1:1. Pyroxene skeletal. Locally as thin as 0.5 m.	4.0	86.8
Y2	**Flow breccia.** Top contact has ~3 m of relief.	0.3	82.8
Y1	**Porphyritic Lava Flow**. Olive-gray (5Y 4/1) on weathered surface, medium gray (N5) on fresh surface. Phenocryst content: 20% pyroxene, plagioclase. Plagioclase phenocrysts < 3 mm long. Pyroxene phenocrysts < 4 mm across. Ratio of plagioclase to pyroxene = 1:1. Pyroxene skeletal.	1.5	82.5
X	**Flow breccia**	6.0	81.0

Unit	Description	Thickness (m) (Unit)	(Total)
W	**Porphyritic Lava Flow.** Medium gray (N5) on fresh surface. Phenocryst content: 15-20% plagioclase and pyroxene. Plagioclase phenocrysts < 4 mm long. Green pyroxene phenocrysts < 2 mm across. Ratio of plagioclase to pyroxene = 6:1. Sample 11. *@79.5 m: Change trend to 082° and use a dip value of 4.0°. UTM coordinates: 419172 m E, 3697037 m N.*	4.8	75.0
V	**Flow breccia**	6.4	70.2
U	**Porphyritic Lava Flow.** Medium gray (N5) on fresh surface. Phenocryst content: 10-15% plagioclase and pyroxene. Plagioclase phenocrysts < 4 mm long. Green pyroxene phenocrysts < 2 mm across. Ratio of plagioclase to pyroxene = 10:1.	2.1	63.6
T2	**Red clayey sand.** Sand is medium- to very coarse-grained and composed of euhedral crystals of plagioclase and pyroxene. Estimate 35% clay. Upper 10 cm is a red claystone.	0.5	61.5
T1	**Flow breccia**	1.5	61.0
S	**Porphyritic Lava Flow.** Olive-gray (5Y 4/1) on weathered surface, medium gray (N5) on fresh surface. Phenocryst content: 3-5% pyroxene and plagioclase. Plagioclase phenocrysts < 4 mm long. Dark green, rounded pyroxene phenocrysts < 3 mm across. Ratio of plagioclase to pyroxene = 1:1. Vesicles (1-2 % of rock) filled with calcite.	1.5	59.5
R	**Flow breccia**	2.1	57.0
Q	**Porphyritic Lava Flow.** Olive-gray (5Y 4/1) on weathered surface, medium gray (N5) on fresh surface. Phenocryst content: 5-7% pyroxene and plagioclase. Plagioclase phenocrysts < 2 mm long. Pyroxene phenocrysts < 2 mm across. Sparse skeletal pyroxene grains. Ratio of plagioclase to pyroxene = 1:1.	1.3	54.9
P	**Flow breccia**	1.5	53.6
O	**Porphyritic Lava Flow**. Medium gray (N5) on fresh surface. Phenocryst content: 10-15% pyroxene and plagioclase. Plagioclase phenocrysts < 2 mm long. Larger plagioclase phenocrysts are zoned with a gray core. Black pyroxene phenocrysts < 3 mm across. Ratio of plagioclase to pyroxene = 2:1. Pyroxene altered.	4.4	52.1
N	**Flow breccia**	1.2	47.7
M	**Porphyritic Lava Flow**. Olive-gray (5Y 4/1) on weathered surface, medium gray (N5) on fresh surface. Phenocryst content: 10-15% pyroxene and plagioclase. Plagioclase phenocrysts < 2 mm long. Pyroxene phenocrysts < 2 mm across. . Sparse skeletal pyroxene grains. Ratio of plagioclase to pyroxene = 1:1. Vesicles (1 % of rock) filled with calcite and botryoidal hematite. Pyroxene altered.	3.5	46.5
L	**Flow breccia**	5.5	43.0
K	**Covered**	4.5	37.5
J	**Porphyritic Lava Flow.** Olive-gray (5Y 4/1) on weathered surface, medium gray (N5) on fresh surface. Phenocryst content: 10-15% pyroxene and plagioclase. Plagioclase	2.8	33.0

Unit	Description	Thickness (m) (Unit)	(Total)
	phenocrysts < 2 mm long. Pyroxene phenocrysts < 2-3 mm across. Sparse skeletal pyroxene grains. Ratio of plagioclase to pyroxene = 1:1. Pyroxene altered.		
I2	**Covered**	3.1	30.2
I1	**Clayey sandstone.** Red. Sand is very fine- to coarse-upper, angular to subangular, poorly sorted, and composed of plagioclase crystals (mostly euhedral) with minor volcanic lithics and mafics.	0.3	27.1
H	**Porphyritic Lava Flow**. Olive-gray (5Y 4/1) on weathered surface, medium gray (N5) on fresh surface. Phenocryst content: 7% pyroxene and plagioclase. Plagioclase phenocrysts < 3 mm long. Pyroxene phenocrysts < 3 mm across. . Sparse skeletal pyroxene grains. Ratio of plagioclase to pyroxene = 1:1. Pyroxene altered.	0.8	26.8
G	**Flow breccia?**	1.0	26.0
F	**Porphyritic Lava Flow.** Olive-gray (5Y 4/1) on weathered surface, medium gray (N5) on fresh surface. Phenocryst content: 5% pyroxene and plagioclase. Plagioclase phenocrysts < 2 mm long. Pyroxene phenocrysts < 3 mm across. Both skeletal black pyroxene and green pyroxene altered to Fe-oxide are present. Ratio of plagioclase to pyroxene = 1:2.	5.1	25.0
E2	**Flow breccia**	1.0	19.9
E1	**Dike.** Greenish gray, with 0.1-0.3 mm grain size. Composed entirely of plagioclase that are 0.1-0.3 mm. 3-7% vesicles (by surface area) up to 5 mm long .	1.1	18.9
D	**Porphyritic Lava Flow**. Olive-gray (5Y 4/1) on weathered surface, medium gray (N5) on fresh surface. Phenocryst content: 7-10% pyroxene and plagioclase. Plagioclase phenocrysts < 3 mm long. Pyroxene phenocrysts < 3 mm across. Both skeletal black pyroxene and green pyroxene altered to Fe-oxide are present. Ratio of plagioclase to pyroxene = 2:1.	3.2	17.8
C	**Flow breccia**	5.4	14.6
B	**Porphyritic Lava Flow.** Olive-gray (5Y 4/1) on weathered surface, medium gray (N5) on fresh surface. Phenocryst content: 10% pyroxene and plagioclase. Plagioclase phenocrysts < 1 mm long. Pyroxene phenocrysts < 1 mm across. Ratio of plagioclase to pyroxene = 1:1	6.4	9.2
A	**Flow breccia** *UTM coordinates of base of section: 419076 m E, 3696870 m N. From here we use a trend of 032° and a dip of 3.5° NE. Cairn built here and three yellow ribbons tied to a bush.*	2.8	2.8
	The thickness of the Hog Pen Formation below this point is calculated using a distance of 3083 ft from base of section and lowest point in canyon to west that is still on fault footwall (UTM 418138 m E, 3696793 m N, NAD 27). A true dip of 4 degree E, striking N, was measured. Accordingly, the thickness across this interval is 215 ft. The Elevation change is [7780 ft-6640 ft.] = 1140 ft. +/- 50 ft.	-215	-215

Three Rivers stratigraphic section



Taylor Windmill section. This section primarily consists of volcanic flows (porphyrtic trachybasalt overlain by crystal-rich, porphyritic trachyandesite, which, in turn, is overlain by sparsely porphytitic to aphanitic trachybasalt) and volcaniclastic sedimentary rock (the latter predominating in the upper part). Measured and described in the proximal piedmont, interspersed with bedrock hills, northeast of the windmill (Taylor Windmill) that is 2 km southeast of Jackass Mountain, northeast Oscura 7.5-minute quadrangle. Measured and described by Shari Kelley and Daniel Koning on August 18, 2011 using an Abney level and Jacob staff. UTM coordinates of base: 404124 m E, 3699416 m N (Zone 13, NAD 27). UTM coordinates of top: 405128 m E, 3699205 m N (Zone 13, NAD 27).

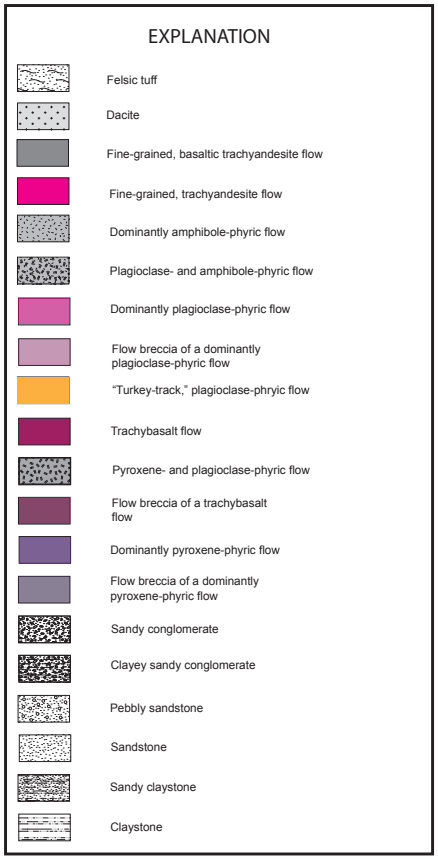
Unit	Description	Thickness (m) (Unit)	(Total)
FF	**Covered**		
EE	**Buck Pasture Tuff:** Basal 5 m has 5-7% flattened porphyritic clots up to 30-40 cm long that contain 3-5% feldspar phenocrysts. Tuff contains 5-15% lithic fragments of pophryritic and aphanitic lava. Fine-grained ashy matrix surrounds 10% sanidine, < 1% pyroxene, and < 1% biotite. Sparse pumice fragments are altered. *This unit measured using a Jacob Staff and Abney level. Utilized trend of 90° and a dip of 22° E (based on attitude of fiame from Palisades Tuff to east). Measured section between the following UTM coordinates: 405089 m E; 3699198 m N (bottom); 405128 m E, 3699205 m N (top).*	28.5	458
		19	429.5
DD	**Covered**		
CC	**Trachyandesite:** Brownish gray (5 YR4/1), vesicular lava. <1% plagioclase and pyroxene in aphanitic matrix. Plagioclase phenocrysts < 2 mm long. Pyroxene phenocrysts < 2 mm across. Calcite fills vesicles and fractures. Plutonic xenolith ~7 mm across. *This unit measured using a Jacob Staff and Abney level. Utilized trend of 90° and a dip of 22° E (based on attitude of fiamme from Palisades Tuff to east). Measured section between the following UTM coordinates: 405041 m E, 3699229 m N (base); 405053 m E, 3699228 m N (base).*	7.5	410.5
BB	**Covered** *@ UTM coordinates: 405028 m E; 3699230 m N -- farthest east that we see of the red clayey conglomerate.*	31	403
AA	**Reddish clayey conglomerate:** Massive and moderately cemented by clay. Gravel is very fine to very coarse, subangular to subrounded, and composed of altered plagioclase-phyric lava clast types and trachybasalt clast types. Maximum clast sizes of 10 x 10 cm and 13 x 6 cm. Ground mass is a dusky red (5R 3/4) and consists of subequal clay and sand. Sand is very fine- to very coarse-grained, subangular, poorly sorted, and composed of volcanic grains and feldspar (probably plagioclase) crystals. *Base of semi-continuous exposure (in gully bottom) is at UTM coordinates: 404870 m E, 3699254 m N.* @ UTM coordinates: 404990 m E, 3699236 m N -- Dusky red colluvium, almost certainly from reddish clayey conglomerate. Above here are scattered exposures of reddish clayey pebble-conglomerate. **Poor exposure of Tvs at UTM 404835 m E, 3699376 m N:** Dusky red (5 R 3/4), conglomeratic clayey very fine grained sandstone with <3% rounded granules, pebbles, and cobbles of porphyritic to aphanitic lava.	60	372

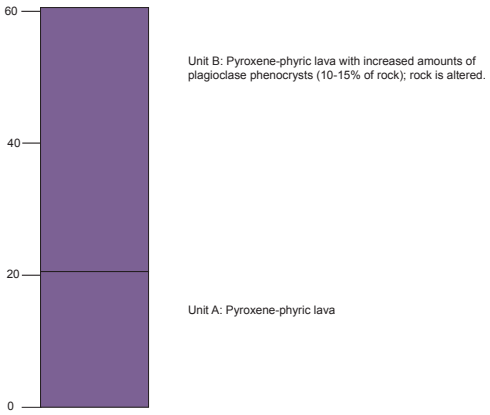
Unit	Description	Thickness (m) (Unit)	(Total)
Z	**Covered. Most of this unit is probably Tvs.** Unit not measured using Jake staff, but its thickness is estimated using the UTM coordinates of its upper and lower contact.	38.5	312
Y	**Trachybasalt:** Dark gray (N3). Distinctive spotted texture on weathered surface. <1% plagioclase and pyroxene in aphanitic matrix. Plagioclase phenocrysts < 2 mm long. Pyroxene phenocrysts < 2 mm across.	8.0	273.5
	@ 273.5 m: Cairn built on top of Y unit. UTM coordinates: 404728 m E, 3699337 m N.		
X	**Covered. Colluvium has reddish color so unit is probably red volcaniclastic sediment.**	16.5	265.5
W	**Trachybasalt:** Dark gray (N3). Distinctive spotted texture on weathered surface. <1% plagioclase and pyroxene in aphanitic matrix. Plagioclase phenocrysts < 2 mm long. Pyroxene phenocrysts < 2 mm across.	2.0	249
V	**Poorly exposed siltstone and very fine-grained sandstone:** Dusky red (5 R 3/4), localized calcite cement.	13	247
	@ 240 m: This is located at the following UTM coordinates: 404651 m E, 3699356 m N.		
U	**Trachybasalt:** Dark gray (N3). Distinctive spotted texture on weathered surface. <1% plagioclase and pyroxene in aphanitic matrix. Plagioclase phenocrysts < 2 mm long. Pyroxene phenocrysts < 2 mm across.	3.0	234
T	**Covered** *Top of unit T is located at the following UTM coordinates: 404629 m E, 3699369 m N.*	3.5	231
S	**Trachybasalt:** Dark gray (N3). Distinctive spotted texture on weathered surface. <1% plagioclase and pyroxene in aphanitic matrix. Plagioclase phenocrysts < 2 mm long. Pyroxene phenocrysts < 2 mm across.	7.5	227.5
R	**Poorly exposed siltstone:** Dusky red (5 R 3/4), localized calcite cement.	19	220
	@ 210 m: One clast of red volcaniclastic sediment sampled at the following UTM coordinates: *404570 m E and 3699385 m N*.		
Q	**Trachybasalt:** Dark gray (N3). Distinctive spotted texture on weathered surface. <1% plagioclase and pyroxene in aphanitic matrix. Plagioclase phenocrysts < 2 mm long. Pyroxene phenocrysts < 2 mm across.	6.0	201
P	**Poorly exposed siltstone:** Dusky red (5 R 3/4), localized calcite cement.	6.0	195
O	**Trachybasalt:** Dark gray (N3). Distinctive silky sheen on weathered surface. Slightly porphyritic 1-2% plagioclase and pyroxene. Plagioclase phenocrysts < 2 mm long. Pyroxene phenocrysts < 2 mm across.	4.0	189
	Top of Unit N is the top of the Rattlesnake Canyon Fm.		
N2	**Rubbly flow top:** Grayish red (5 R 4/2). Phenocryst content: 15-20% plagioclase and pyroxene (ratio plagioclase: pyroxene = 5:1). Plagioclase phenocrysts < 3 mm long. Pyroxene phenocrysts < 2 mm across. Pyroxene forest green.	8.5	185

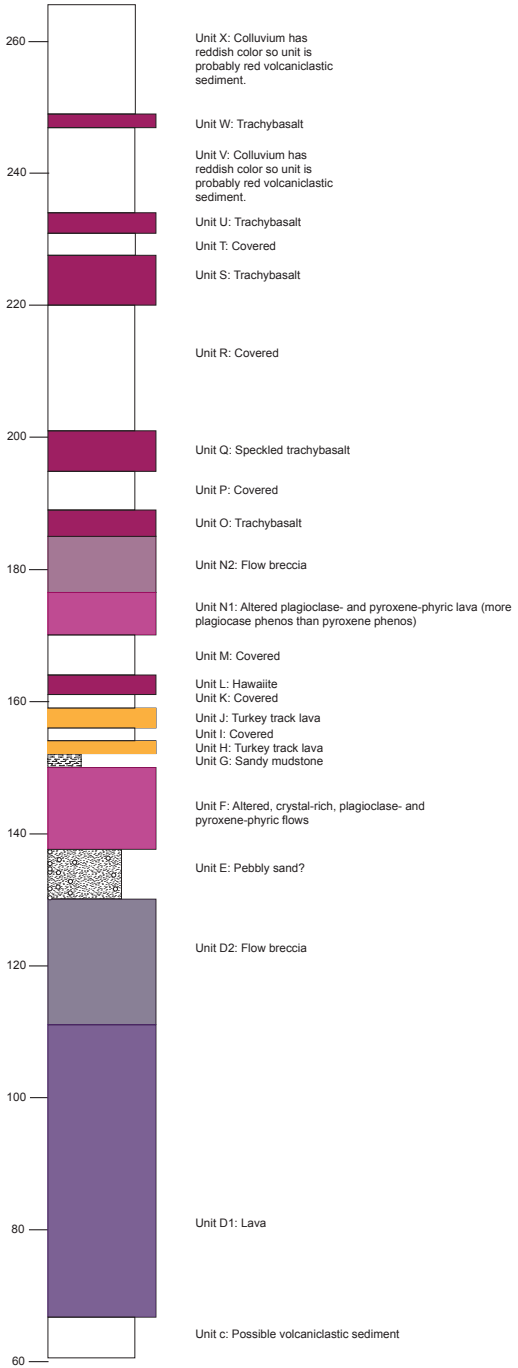
Unit	Description	Thickness (m) (Unit)	(Total)
	@ 185 m: Change trend to 100°. Still use 20° E dip.		
N1	**Plagioclase- and pyroxene-phyric porphyritic lava:** Olive-gray (5Y 4/1) on weathered surface, medium gray (N5) on fresh surface. Phenocryst content: 3-5% plagioclase and pyroxene (ratio plagioclase: pyroxene = 2:1). Plagioclase phenocrysts < 3 mm long. Pyroxene phenocrysts < 2 mm across. Pyroxene altered.	6.5	176.5
M	**Covered**	6.0	170
L	**Trachybasalt:** Medium gray (N5). Distinctive spotted texture on weathered surface. Slightly porphyritic 3-5% plagioclase and pyroxene (ratio plagioclase: pyroxene = 2:1). Plagioclase phenocrysts < 2 mm long. Pyroxene phenocrysts < 2 mm across.	3.5	164
K	**Covered**	1.5	160.5
J	**Crystal-rich porphyritic, plagioclase-phyric lava:** Medium light gray (N6). Phenocryst content: 10-15% plagioclase and pyroxene. Plagioclase phenocrysts < 17 mm long. Pyroxene phenocrysts < 3 mm across. Pyroxene makes up < 2% of the phenocrysts. Distinctive "turkey track" texture.	3.0	159
I	**Covered**	1.5	156
H	**Crystal-rich porphyritic, plagioclase-phyric lava:** Medium light gray (N6). Phenocryst content: 20% plagioclase and pyroxene. Plagioclase phenocrysts < 20 mm long. Pyroxene phenocrysts < 3 mm across. Pyroxene makes up < 2% of the phenocrysts. Distinctive "turkey track" texture.	2.5	154.5
G	**Sandy mudstone:** Dusky red (5 R 3/4), sand-sized grains make up ~7% of the unit and include pyroxene, biotite, and plagioclase. *Top of unit G is located at the following UTM coordinates: 404448 m E and 3699423 m N.* ***Top of Unit F is the top of the Hog Pen Fm.***	2.0	152
F	**Altered, crystal-rich, porphyritic plagioclase- and pyroxene-phyric flows:** Medium gray (N5). Phenocryst content: 10% plagioclase and pyroxene. Gray plagioclase phenocrysts < 7 mm long. Pyroxene phenocrysts < 3 mm across. Pyroxene altered. *Top of unit F is located at the following UTM coordinates: 404447 m E, 3699425m N.*	12.5	150
E	**Dusky red (5 R 3/4) pebbly sand?** *Top of unit E is located at the following UTM coordinates: 404423 m E and 3699433 m N.*	7.5	137.5
D2	**Upper porphyritic flow breccia:** Medium gray (N5). Phenocryst content: 10-15% plagioclase and pyroxene. Plagioclase phenocrysts < 3 mm long. Pyroxene phenocrysts < 3 mm across. Pyroxene altered. *Above 111 m: Use trend of 110° and dip of 21° E (down-dip).*	19	130
D1	**Pyroxene-phyric, porphyritic lava**: Unit D1 described along north arroyo wall and projected into the section line. Olive-gray (5Y 4/1) on weathered surface, medium gray (N5) on fresh surface. Phenocryst content: 3-7% pyroxene, plagioclase and olivine (?). Plagioclase phenocrysts < 2 mm long. Pyroxene phenocrysts < 2 mm across. Pyroxene	44.2	111

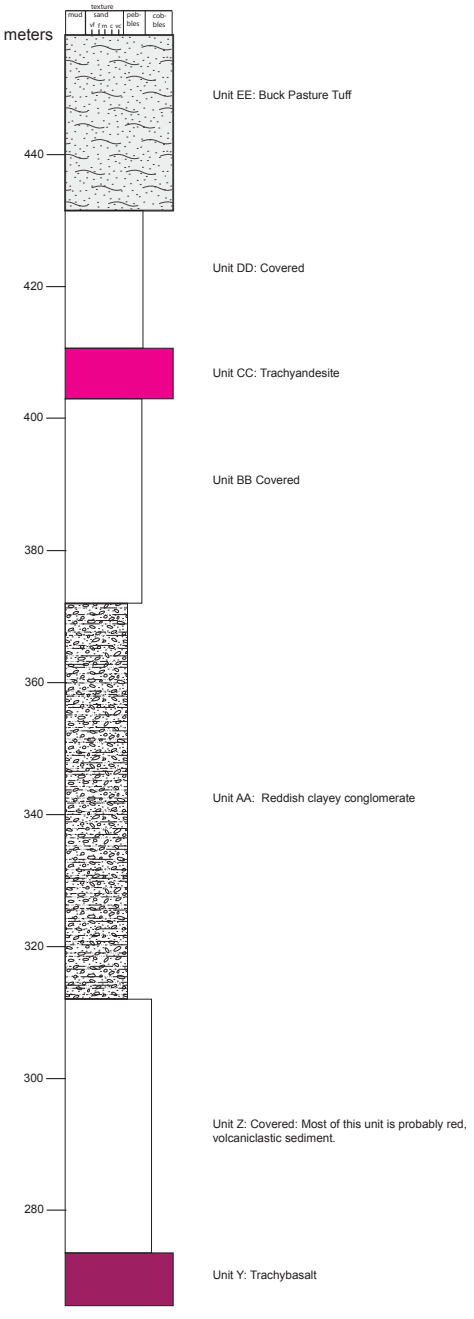
Unit	Description	Thickness (m) (Unit)	(Total)
	altered. *Last exposure of unit D in arroyo just south of E-W fault is at UTM coordinates: 404350 m E and 3699547 m N. This is still not the top of unit D.* *Top of unit D1 is at the following UTM coordinates: 404367 m E and 3699451 m N.* *@ 104 m: Description of top of Unit D.* *@ 90 m: This is at the following UTM coordinates: 404356 m E and 3699455 m N* *@75 m: This is at the following UTM coordinates: 404291 m E and 3699474 m N*		
C	**Not exposed: Possible volcaniclastic sediment**	6.5	66.8
B	**Pyroxene-phyric porphyritic lava with increased amounts of plagioclase phenocrysts (7-10% of rock); rock is altered.** Olive-gray (5Y 4/1) on weathered surface, medium gray (N5) on fresh surface. Phenocryst content: 7-10% plagioclase and pyroxene (plagioclase: pyroxene ratio = 2:1). Plagioclase phenocrysts < 3 mm long. Pyroxene phenocrysts <3 mm across. Pyroxene altered.	39.8	60.3
A	*@ 60 m: cairn built. UTM coordinates: 404254 m E and 3699486 m* **Pyroxene-phyric porphyritic lava:** Olive-gray (5Y 4/1) on weathered surface, medium gray (N5) on fresh surface. Phenocryst content: 3% pyroxene, plagioclase, olivine (?). Plagioclase phenocrysts <3-5 mm long. Pyroxene phenocrysts <2-5 mm across. Gabbro xenolith < 3 mm in diameter. *@ 13.5 m, offset of section line between the following UTM coordinates: 404153 m E and 3699412 m N; 404170 m E and 3699503 m N. The offset is along a trend of 005°.* *Base of section is in the arroyo immediately north of Taylor windmill. UTM coordinates of: 404124 m E, 3699416 m (Zone 13, NAD 27). From here, we use a trend of 110° and use 21° E (down-dip).*	20.5	20.5

Taylor Windmill Stratigraphic section









Double Diamond stratigraphic section. This section consists of largely of plagioclase- and pyroxene-phyric flows. The lower part contains variable volcaniclastic sedimentary deposits interbedded with these flows. This package rests on top of a thick tuff informally referred to as the tuff of Argentine Springs. Section consists of a lower and upper segment. The northern segment trends south-southeast up a canyon immediately northeast of Little Diamond Peaks. The southern segment ascends the south slope of little Diamond Peak. There is overlap between these two sections. Measured and described by Colin Cikoski and Daniel Koning on September 28, 2011, using a Brunton compass and Jacob staff. UTM coordinates of base of northern segment: 426672 m E, 3714460 N. UTM coordinates of top of northern segment: 426694 m E, 3714401 m E. UTM coordinates of base of southern segment: 426602 m E, 3714170 m N. UTM coordinates of top of southern segment: 426590 m E, 3714289 m N. All UTM coordinates are in Zone 13 and NAD 27.

Unit	Description	Thickness (m) (Unit)	(Total)
	SOUTHERN SEGMENT OF STRATIGRAPHIC SECTION		
	Top of northern segment of stratigraphic section located at UTM coordinates: 426590 m E, 3714289 m E.		
	Flow-dominated map unit		
U	**Plagioclase-phyric flow --** Light bluish gray (weathering to dark bluish gray, brown, and reddish brown) plagioclase porphyry. Moderately weathered faces exhibit 5-15% plagioclase lathes up to 1 mm long, and <1% irregular dark ferromagnesian minerals that are <1 mm across.	0.7	42.9
T	**Basal flow breccia of overlying plagioclase-phyric flow--** Greenish gray, weathering to orangish beige and light brown, plagioclase-phyric flow breccia. Aside from color and degree of brecciation, this lava is similar to unit U.	0.7	42.2
S	**Plagioclase- and amphibole-phyric flow --** Medium gray, weathering to dark brown and dark reddish brown, plagioclase and amphibole porphyry. Flow contains 15-25% clear to translucent-white plagioclase lathes that are up to 1 mm long, and 5-10% dark red amphiboles up to 1 mm long.	2.8	41.5
R	**Plagioclase-phyric flow --** Bluish gray, weathering to light brown and reddish brown, plagioclase porphyry. Similar to unit N, but containing only 10-15% plagioclase lathes.	1.5	38.7
Q	**Amphibole-phyric flow --** Light reddish gray, weathering to orange and light brown, amphibole porphyry. Flow contains ~10% elongate amphibole phenocrysts with black cores and dark greenish rims (amphibole up to 1 mm long), as well as <<1% white plagioclase lathes (all <1 mm long) and <1% irregular white calcite amygdules (up to 5 mm across).	1.1	37.2
P	**Plagioclase-phyric flow --** Light gray, weathering light brown, plagioclase porphyry. Very similar to unit N, with 15-25% plagioclase lathes. Also contains 1-5% vesicles up to 3 mm long.	1.4	36.1
O	**Upper flow breccia of underlying plagioclase-phyric flow --** Greenish gray, weathering to light brown, plagioclase-phyric flow breccia. Highly fractured, but otherwise similar to (N).	1.9	34.7
N	**Plagioclase-phyric flow --** Medium gray (weathering dark gray, reddish gray, and brown) plagioclase porphyry. Very similar to unit L. Local splotchy greenish gray alteration in brecciated areas.	1.6	32.8
M	**Plagioclase- and amphibole-phyric flow --** Dark gray, weathering reddish dark	2.0	31.2

Unit	Description	Thickness (m) (Unit)	(Total)
	brown, plagioclase and amphibole porphyry. Flow contains 1-3% clear to translucent-white plagioclase lathes that are all <1mm long, and another 1-3% black amphibole crystals up to 3 mm across.		
L	**Plagioclase-phyric flow --** Reddish gray, weathering dark gray, plagioclase porphyry. Flow is 20-30% chalky white plagioclase lathes, up to 1 mm long.	1.5	29.2
K	**Pebbly sandstone --** Greenish brown, massive, pebbly sandstone. Sandstone is dominantly poorly sorted and medium- to coarse-grained, with minor (5-10%) clay-silt. Pebbles occupy 20-40% of rock and are very poorly sorted and subangular to rounded, mostly 4 mm to 2 cm across but up to 5 cm across, and are dominantly clasts of fine plagioclase porphyry with lesser (~30% of pebbles) aphyric clasts.	2.0	27.7
J	**Plagioclase-phyric flow --** Medium gray to bluish gray, weathering to light to medium brown, fine plagioclase porphyry. Flow contains 10-20% white plagioclase lathes and rare blocks, all <1 mm across, as well as 1% very fine dark clots that may be aggregates of ferromagnesian microphenocrysts.	2.4	25.7
I	**Volcanic flow with plagioclase and ferromagnesian phenocrysts --** Medium gray, weathering light to dark reddish gray and dark reddish brown, plagioclase and ferromagnesian porphyry. Flow contains <1-5% white plagioclase laths and blocks, all <1 mm across, ~1-2% dark reddish blocky ferromagnesian minerals up to 1 mm across, and 1-3% vesicles up to 5 mm long.	2.1	23.3
H	**Volcanic flow with fine plagioclase phenocrysts --** Medium gray to bluish gray, weathering very light brown, plagioclase porphyry. Flow contains 10-20% white plagioclase lathes, up to 1 mm long, and ~1% dark red blocky ferromagnesian crystals. Top of outcrop is a rubbly flow breccia with splotchy greenish gray alteration.	4.0	21.2
G	**Volcanic flow with plagioclase and ferromagnesian phenocrysts --** Medium gray, weathering dark grayish brown, plagioclase and ferromagnesian porphyry. Flow contains 2-10% clear to white plagioclase lathes, up to 1 mm long, and 1-5% dark red blocky ferromagnesian minerals, less the 1 mm across, that are likely degraded amphiboles.	1.9	17.2
F	**Volcanic flow with fine plagioclase phenocrysts --** Medium gray, weathering dark gray and reddish gray, plagioclase and ferromagnesian porphyry. Flow contains 1-10% white blocky feldspars that are likely plagioclase, and very rare (<1%) dark reddish blocky ferromagnesian crystals (<1 mm across) that are likely degraded amphiboles.	3.1	15.3
E	**Volcanic flow with sparse, fine ferromagnesian phenocrysts --** Medium gray, weathering brown, orangish-brown, and dark gray, fine grained lava. Flow contains ~1% dark red and dark orangish red blocky ferromagnesian crystals, all <1 mm across, that are likely degraded amphiboles. Moderately weathered faces also show very sparse (<1%), very fine (<1 mm long) white plagioclase lathes.	1.7	12.2
D	**Plagioclase-phryic flow --** Light gray, weathering dark bluish gray, plagioclase porphyry. Flow contains 5-30% chalky white plagioclase lathes up to 1 mm long.	3.6	10.5
C	**Medium-grained volcanic flow with sparse plagioclase and ferromagnesian phenocrysts --** Medium gray, weathering dark brown, reddish brown, and locally black, plagioclase and ferromagnesian porphyry. Flow contains up to 5% white plagioclase lathes, all <1 mm long, and ~1% black blocky ferromagnesian crystals, all	2.4	6.9

Unit	Description	Thickness (m) (Unit)	(Total)
	<1 mm across that could be either amphiboles or pyroxenes.		
B	**Upper fine-grained volcanic flow --** Medium gray, weathering to dark brown and reddish brown, fine grained lava. Flow contains 1-2% very fine (<1 mm across) reddish blocky crystals that are likely degraded ferromagnesian minerals.	1.0	4.5
A	**Lower fine-grained volcanic flow --** Medium gray, weathering to brown and reddish brown, aphyric lava. Fresh faces are 30-60% covered in light brown spots up to 1 mm across that may be aggregates of plagioclase microphenocrysts. Flow also contains very rare (<1%) amygdules of calcite.	3.5	3.5
	Base of southern segment of stratigraphic section located immediately east of top of a great exposure of red volcaniclastic sedimentary deposit, at UTM coordinates: 426602 m E, 3714170 m N. We use a trend of 355° and a dip of 0°. Note that section is poorly exposed (outcrops are typical less than 50 cm in height) and contacts between units could not be observed. The basis of a horizontal dip is the map attitude of N-S and 4°E. Because of likely discontinuity of flows and overlap with the northern segment, we use letters to designate units.		
	NORTHERN SEGMENT OF STRATIGRAPHIC SECTION		
	Top of northern segment of stratigraphic section located at UTM coordinates: 426694 m E, 3714401 m E.		
	Flow-dominated map unit		
19	**Fine-grained flow --** Medium gray, weathering brown, fine grained lava. Flow contains <1 to 5% clear to white plagioclase lathes up to 1 mm long, and <1 to 1% elongate reddish masses generally <1 mm across but up to 4 mm across that appear to be degraded amphiboles. Very rare, irregular, thin, calcite masses are probably fracture fill or degraded amygdules. Lower contact is irregular, exhibiting ~20 cm of relief.	2.4	63.2
18	**Plagioclase-phyric flow --** Poorly exposed, medium gray, weathering dark gray with greenish gray alteration zones, plagioclase porphyry. Flow contains 5-8% chalky white plagioclase lathes, all <1 mm long. Outcrop is dominantly of flow breccia, with solid lava core only locally present (and then only up to 30 cm thick). Obscured lower contact.	5.1	60.8
17	**Plagioclase-phyric flow (sparse amphibole) --** Bluish gray, weathering brown, plagioclase and amphibole porphyry. Flow contains ~5% clear to white plagioclase lathes up to 1 mm long, and ~1% irregular black crystals up to 2 mm long that are likely amphiboles. Outcrop is solid lava, with no associated flow breccia. Very local dark reddish stringers appear to be iron oxidation or oxides following thin fractures. Lower contact exhibits 10-30 cm of irregular relief.	4.5	55.7
16	**Plagioclase-phyric flow --** Light bluish gray, weathering medium to dark gray and brown, plagioclase-phyric flow (sparse amphibole) and flow breccia. Rock contains ~5% white plagioclase lathes up to 1 mm across, 1-5% amygdules of pale greenish white calcite 1-3 mm across, and ~1% blocky dark red crystals <1 mm across that are likely degraded ferromagnesian minerals. Outcrop shows roughly 40-45 cm of solid flow core, with ~1 m thick breccia zones on either side. Obscured lower contact.	1.0	51.2
15	**Plagioclase- and amphibole-phyric flow --** Medium gray, weathering brown, plagioclase and amphibole porphyry lava. Flow contains 1-7% black irregularly-shaped amphiboles up to 3 mm across, and 1-4% clear to white plagioclase laths up to 1 mm long. Obscured lower contact.	4.0	50.2

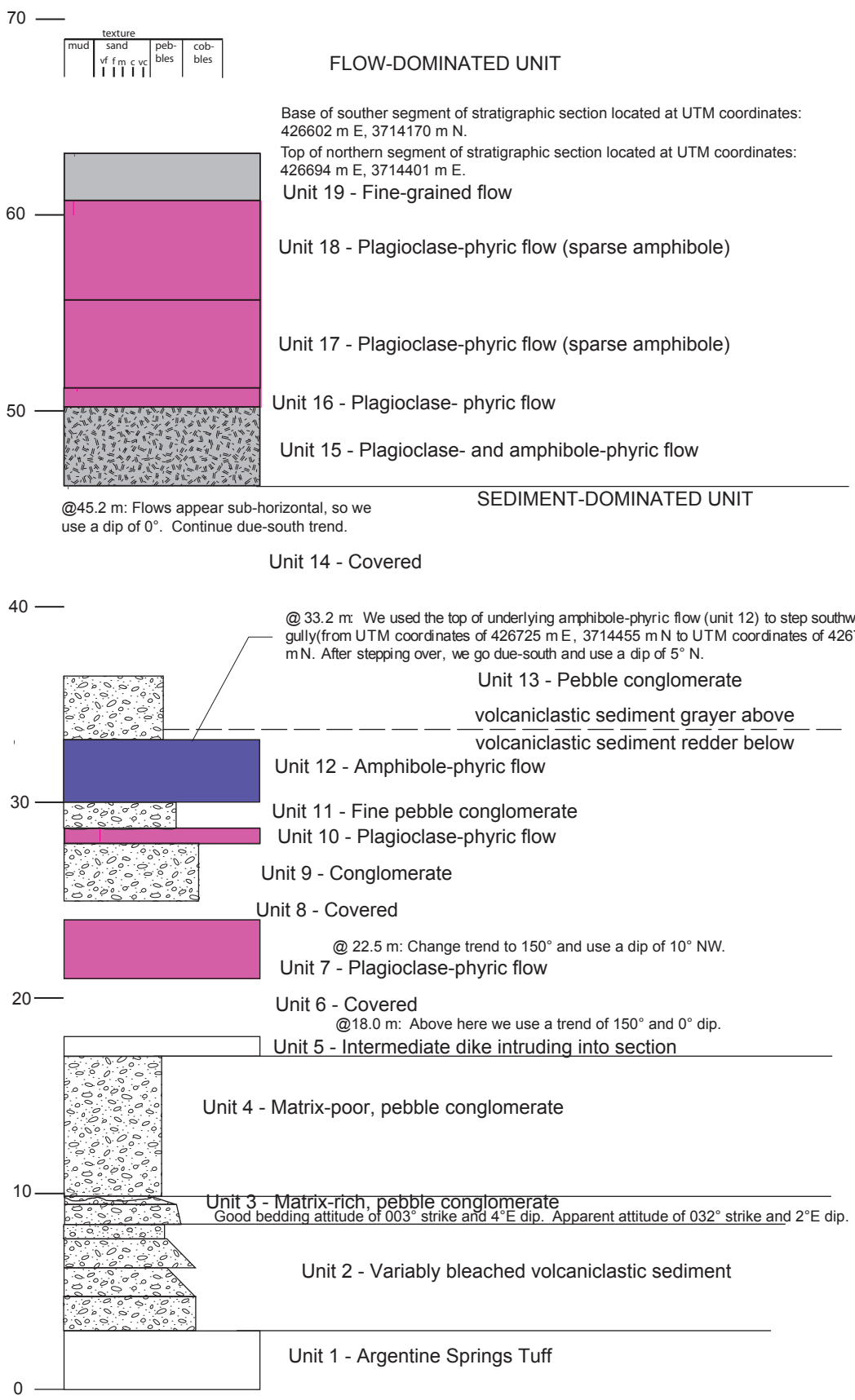
Unit	Description	Thickness (m) (Unit)	(Total)
	Sediment-dominated map unit		
14	**Covered --** Colluvium consists of angular pebbles to rare boulders of Double Diamond flow rocks with very rare bleached syenitic and intermediate intrusive clasts. Max clast size of 40 cm across. Fine-grained matrix material is a soft brown color and dominantly sand. We infer predominately volcaniclastic sediment below the colluvium, with uppermost part possibly covering flow of unit 15. *@45.2 m: Flows appear sub-horizontal, so we use a dip of 0°. Continue due-south trend.*	9.7	46.2
13	**Pebble conglomerate --** Bluish gray to light purplish gray, clast-supported pebble conglomerate. Distinct purplish color, but 0.5 m above its base the unit becomes grayer (N6\). Massive. Very poorly sorted, subangular to subrounded, fine to coarse pebbles (mostly 2 to 9 mm across, but up to 5 cm across) of dominantly bluish gray (~60% of rock by volume) and reddish gray (~20%) aphyric lava composition, with lesser bleached, degraded clasts (~2%) and plagioclase porphyries (~1%). Matrix material (~15% of rock) is subequal parts mud, fine sand, and medium sand. Photo 2. *@33.2 m: We used the top of underlying amphibole-phyric flow (unit 12) to step southwest into next gully(from UTM coordinates of 426725 m E, 3714455 m N to UTM coordinates of 426720 m E, 3714458 m N. After stepping over, we go due-south and use a dip of 5° N.*	3.3	36.5
12	**Amphibole-phyric flows --** Amphibole- and plagioclase- and amphibole-phyric flows. Lower flow is medium gray, weathering dark gray and brownish gray, and contains 5-15% elongate amphibole phenocrysts up to 2 mm long, black to dark reddish and dark greenish in color. Upper flow is bluish gray, weathering to greenish gray, and variably brecciated and altered. Solid chunks of flow rock contain 1-5% plagioclase lathes up to 1 mm long that are clear to white in color, and <1% amphibole lathes up to 2 mm long that are mostly greenish gray in color. Lower contact is sharp and slightly irregular.	3.2	33.2
11	**Fine pebble conglomerate --** Purplish gray (5R 6/1-7/2), massive, fine pebble conglomerate. Similar to (3), with clasts up to 2 cm across. Lower contact is sharp, with 10-20 cm of irregular relief.	1.3	30.0
10	**Plagioclase-phyric flow --** Medium gray (5PB 5\), weathering dark gray, sparse fine plagioclase porphyry flow. Plagioclase occupies up to 2% (by volume) of rock and is up to 1 mm long, clear to white to greenish white in color. Flow also contains up to 3% vesicles and amygdules of calcite. Local iron oxide staining along thin fractures. Flow is 0.5 to 1 m thick. Sharp lower contact, with 50 cm of irregular relief.	0.8	28.7
9	**Conglomerate --** Purplish gray to gray (5R 6/2), massive, fine pebbly to cobbly conglomerate. Very poorly sorted, angular to subrounded, fine pebbles to cobbles (max clast of 12 cm across) of dominantly aphyric lava composition, with rare plagioclase porphyries (1-2%) and very rare Argentina Springs clasts (<1%). Clast-rich (85-95% clasts), with a poorly sorted matrix of dominantly silty fine sand. Obscured lower contact.	2.9	27.9
8	**Covered --** Colluvium is similar to unit 6, but with up to 3% clasts of tuff of	1.0	25.0

Unit	Description	Thickness (m) (Unit)	(Total)
	Argentina Springs and <1% dried cow pies.		
7	**Plagioclase-phyric volcanic flow --** Medium gray (5Y 5-6/1), weathering dark brown (2.5Y 5/3), plagioclase porphyry composed of 5-15% plagioclase lathes in an aphyric matrix. Lathes are up to 6 mm long and slender (<1 to 2 mm across), and clear to white color. Flow also contains <<1% very fine, amorphous dark masses that may be ferro-magnesium minerals. Obscured lower contact. *@ 22.5 m: Change trend to 150° and use a dip of 10° NW. UTM coordinates of: 426700 m E, 3714495 m N.*	3.0	24.0
6	**Covered --** Colluvium consists of very poorly sorted fine pebbles to boulders of mostly Double Diamond Member-type lavas from the top of the ridge. Also contains rare Double Diamond Member conglomerate clasts (~1%) and very rare bleached syenitic(?) blocks (<1%). Clasts are up to 1 m across, and angular to subangular. Finer matrix material is a soft brown color and composed of poorly sorted fine to coarse sands. *@18.0 m: Above here we use a trend of 150° and 0° dip. UTM coordinates of: 426701 m E, 3714485 m N.*	3.0	21.0
5	**Intermediate dike intruded into section --** Salt-and-pepper, weathering brown, intermediate dike with an ophitic-like texture. Rock contains subequal amounts of thin, small white lathes (<1 to 1 mm long) of plagioclase and black mafic material (enveloping the lathes? individual mafic crystals were not observed), causing the ophitic-like texture. Rock also contains <1 to locally 5% amorphous, white, chalky masses up to 5 mm across that could be calcite amygdules or possibly degraded plagioclase phenocrysts. A near-vertical, N40E-trending fabric suggests a NE trend for the dike.	1.0	18.0
4	**Matrix-poor, pebble conglomerate --** Gray (N6\), massive to poorly bedded pebble conglomerate. Clast-supported, poorly sorted, angular to subrounded, fine to coarse pebbles (mostly <1 to 1 cm across; up to 4 cm across) of dominantly bluish gray to purplish gray aphyric lavas, with lesser plagioclase porphyries (~1-2% by volume), bleached clasts (~1%) and reworked volcaniclastic sediments (<<1%). Outcrop is ~10-20% matrix material, which is mostly poorly sorted fine to coarse sands and about 30% muds. Outcrop is ~1% bleached and iron oxide stained, with alteration concentrated along thin fractures. Lower contact exhibits 40 cm or less of scour relief.	7.1	17.0
3	**Matrix-rich, pebble conglomerate --** Purplish gray, matrix-rich, dominantly massive pebble conglomerates. ~2 m thick, vaguely fining up-section into a locally well bedded sandstone top (sandy channel?). Matrix color of 7.5YR 8/3-4, locally 7.5YR 7/6. Base is ~75% pebbles (by volume) mostly 4 mm to 1 cm across, but up to 4 cm across, that are very poorly sorted and subangular to subrounded. Aphyric lavas are the dominant clast compositions, plagioclase porphyries (1-10% by volume) and bleached clasts of unknown composition (~1%) are also present. Matrix is mostly muddy, with a few percent fine to medium sands. Outcrop vaguely fines upwards, with the top being ~60% pebbles that are mostly 1 mm to 1 cm across. Locally at the very top is a thin (up to 40 cm thick) well bedded sandstone that may be a local channel (laminated to very thin, horizontal-planar beds). Beds are 2-4 cm thick and dominantly of very poorly sorted very fine to very coarse sand by with 30-50% clay-silt. Sand grains are dominantly lithics, but ~1% of grains are plagioclase crystals. Lower contact is sharp to gradational (over a vertical distance of 1 cm). *Good bedding attitude of 003° strike and 4°E dip. Apparent attitude of 032° strike and*	1.5	9.9

Unit	Description	Thickness (m) (Unit)	(Total)
	2°E dip.		
2	**Variably bleached volcaniclastic sediment --** Variably bleached, generally massive, very pale beige to pale orange (10YR 8/2-8/8) to locally light purplish gray volcaniclastic sediments. Bleaching is strongest at the base, where alteration impacts both the matrix material and the clasts themselves; this decreases up-section, first with progressively less alteration to clasts, then with only local alteration to the matrix. This coincides with a fining upwards, and an increase in bedding. The base of the deposit is clast-supported conglomerate, with very poorly sorted, very fine to very coarse pebbles (max clast diameter of 15 cm) with angular to rounded shapes, mostly of aphyric lava but with lesser clasts of plagioclase porphyry (5-20% by volume), tuff of Argentina Springs (0-15%%), and rare vesicular lavas (~1%). Matrix material is clearly altered, but appears to be very poorly sorted silts to medium sands. No clear bedding is present, but two fining upwards sequences, each about 1.5 m thick, are present that may be separate beds. This conglomerate section is capped by a thinly bedded (beds 0.5 to 2 cm thick) fine pebbly to sandy interval that is ~0.75 m thick. Pebbles are poorly to moderately sorted, with a max clast size of 1 cm across, and are mostly of aphyric lava composition, with about 10% plagioclase porphyries. Sandstones are poorly sorted and rich in clay-silt. Only about half of this section is altered by bleaching and iron oxide staining. Obscured lower contact.	5.4	8.4
1	**Tuff of Argentine Springs --** Very pale beige to pale orange welded tuff (10YR 8/4-7/6). Color results from pervasive bleaching and iron oxide-staining; 'Liesegang' banding is locally strongly developed, and absent elsewhere. Outcrops contain 5 to 20% feldspar crystals up to 2 mm across, with approximately ¾ having lathe shapes (plagioclase) and ¼ having cubic shapes (k-spar? likely a mix of plag and k-spar). The majority of feldspars have been bleached to a white color, with a few percent having chalky textures, suggesting degredation to clays; only about 1% of feldspars appear fresh. Outcrops also contain <1 to locally 25% lithic fragments up to 1 cm across, with subangular to subrounded shapes and aphyric lava to medium plagioclase (up to 2 mm across) porphyritic rock type. Flow foliation is locally apparent and strongly developed; with scarcity of foliation is rare for this tuff, and we suggest the bleaching and iron oxide staining is masking the foliation. Near the top of the unit, a steeply dipping, internal contact separates hard, resistant tuff (northwest) from less resistant tuff (southeast).. *Base of northern segment of stratigraphic section is located at bottom of arroyo immediately northeast of Little Diamond Peak. UTM coordinates of: 426672 m E, 3714460 N. Cairn built at base of section. From here, we proceeded up-canyon along a trend of 170 and 0° dip (based on attitude on map of N-S\4° E).*	3.0	3.0

Double Diamond stratigraphic section (lower part)

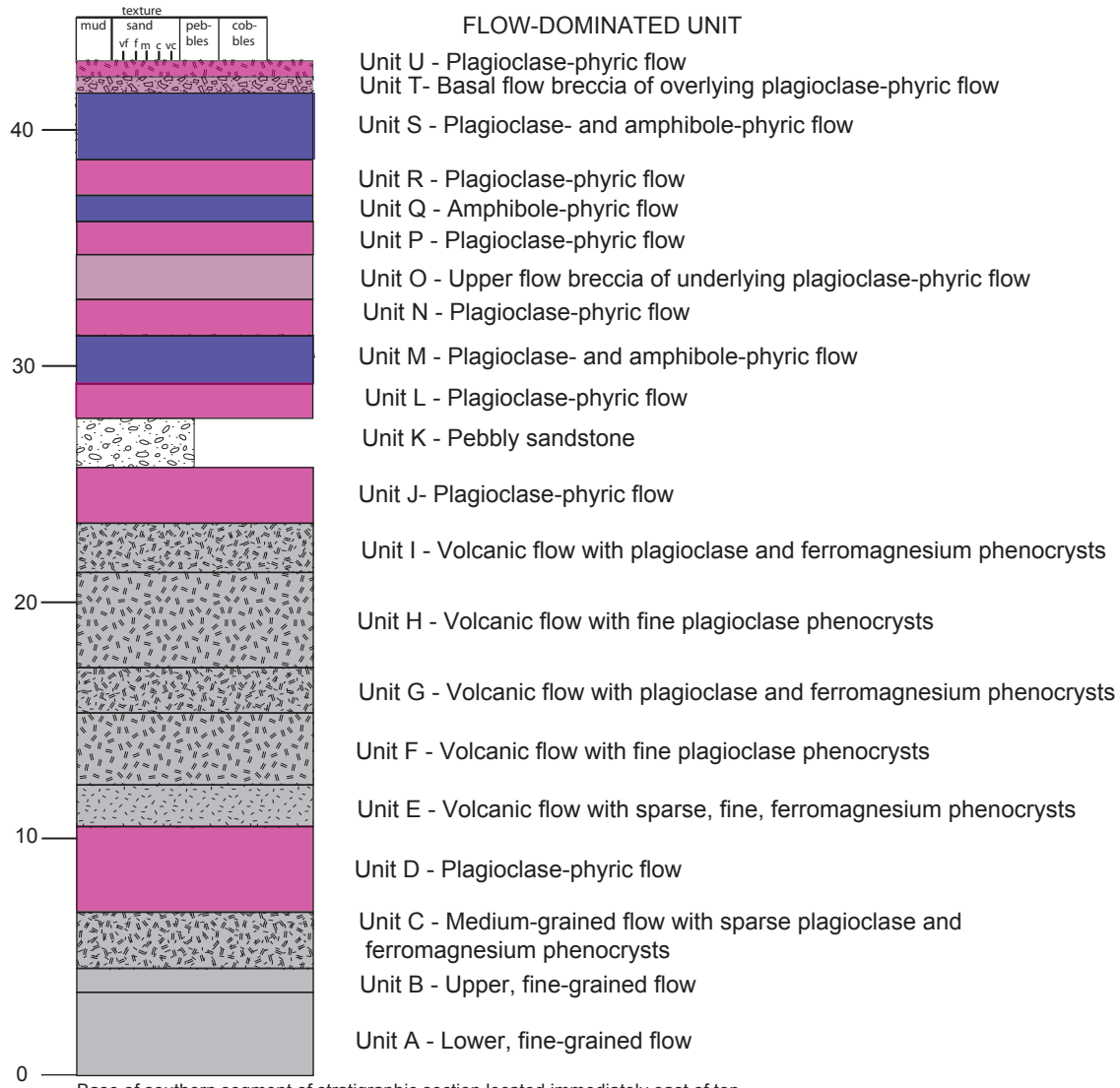
Three Rivers Formation, Double Diamond Unit



Base of northern segment of stratigraphic section is located at bottom of arroyo immediately northeast of Little Diamond Peak. UTM coordinates of : 426672 m E, 3714460 N. Cairn built at base of section. From here, we proceeded up-canyon along a trend of 170 and 0° dip (based on attitude on map of N-S\4° E).

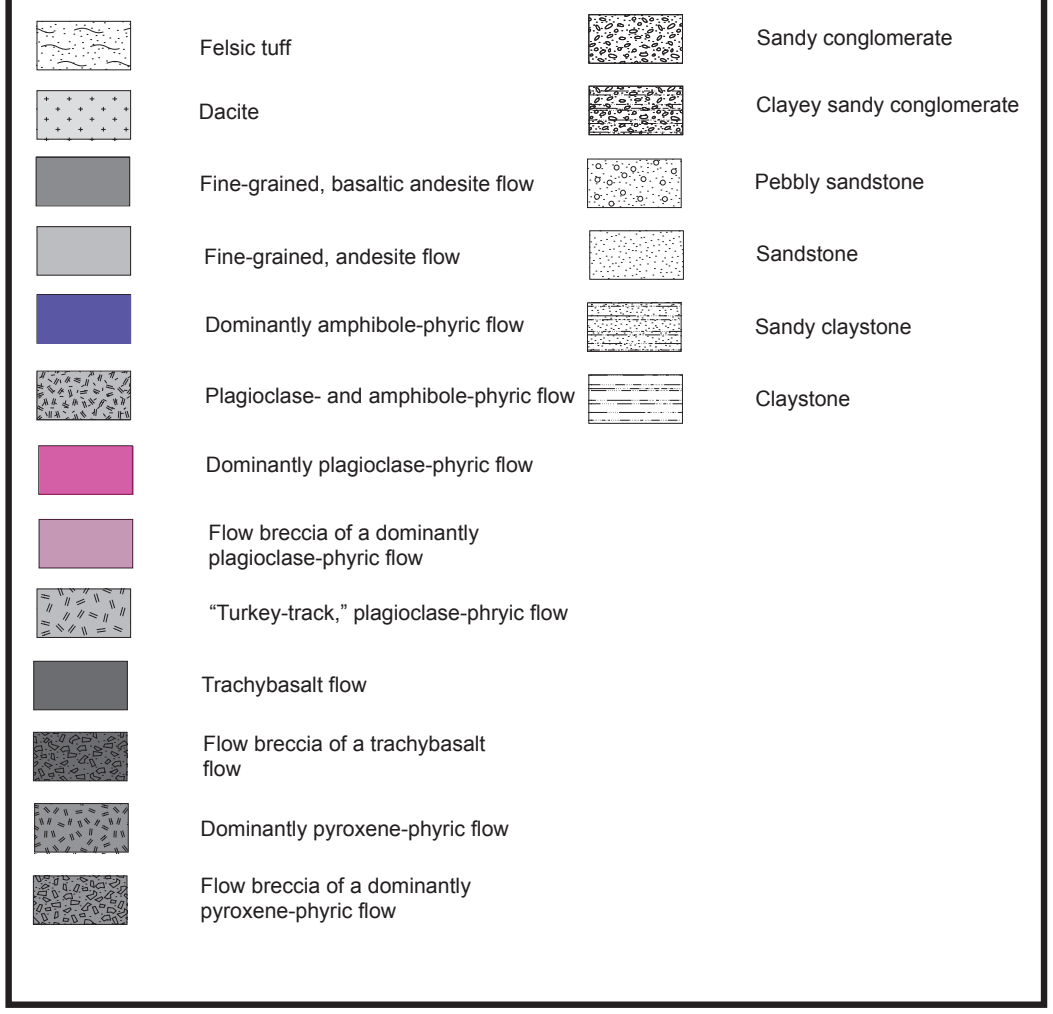
Double Diamond stratigraphic section (upper part)

Three Rivers Formation, Double Diamond Unit



Base of southern segment of stratigraphic section located immediately east of top of a great exposure of red volcaniclastic sediment, at UTM coordinates: 426602 m E, 3714170 m N. We use a trend of 355° and a dip of 0°. Note that section is poorly exposed (outcrops are typical less than 50 cm in height) and contacts between units could not be observed. The basis of a horizontal dip is the map attitude of N-S and 4°E.

EXPLANATION



Lopez Spring section. This stratigraphic section is the type section for the Lopez Spring Formation. Its base is at the top of >8 m-thick basaltic andesite flow, which is included in the Lopez Spring Formation. The formal base of the Lopez Spring Formation is not exposed here, but would correspond to the top of the Buck Pasture Tuff. In the southern Godfrey Hills, the Lopez Spring Formation has a lower, sediment-dominated unit (92 m thick) and an upper, volcanic flow-dominated unit (112 m thick). The lower sedimentary unit is generally tuffaceous, biotite-bearing, and derived from erosion of dacite flows and tuffs. The upper volcanic unit consists of dacite, andesite, and basaltic andesite flows. The Palisades Tuff measured in this stratigraphic section, but the tuff is included in the Husk Windmill Formation. This tuff overlies the Lopez Spring Formation and is 23 m thick. The breccia unit of the Husk Windmill Formation overlies the Palisades Tuff, but only a few m of this unit was measured. Section measured and described by Kirt Kempter and Daniel Koning on January 15, 2010, using a Brunton compass and Jacob staff. UTM coordinates of base of section: 405614 m E, 3695316 m N. UTM coordinates of top of section (NAD27): 405860 m E, 3695394 m N. All UTM coordinates are in Zone 13 and NAD 27.

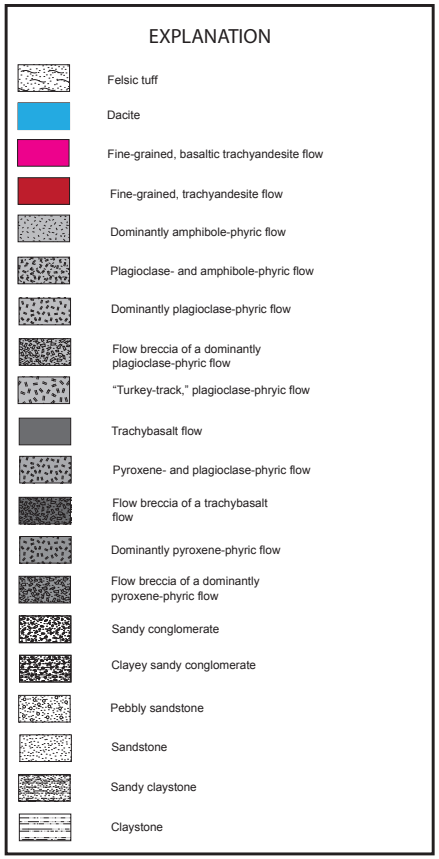
Unit	Description	Thickness (m) (Unit)	(Total)
	Rose Peak Trachyte of Husk Windmill Formation		
	Trachyte -- Massive, flow-banded, medium-gray lava with 5-10% phenocrysts of plagioclase and sanidine; minor mafic minerals.	12	240
	Top of section is placed at the top of the Palisades Tuff. UTM coordinates: 405860 m E, 3695394 m E.		
	Palisades Tuff of Husk Windmill Formation (204-228 m)	**23**	**228**
34	**Colluvium and talus overlying the Palisades Tuff**	5.5	228
33	**Palisades Tuff --** Densely welded.	12.5	222.5
	From 220.5-228 m: White, altered tuff that is still densely welded..		
	@222.5 m: Attitude of 338°\31° E (UTM coordinates: 405850 m E, 3695379 m N.		
32	**Colluvium and talus overlying the Palisades Tuff --** Exposure 75 m to SE exhibits the Palisades Tuff.	6	210
	Volcanic Upper Unit of Lopez Spring Formation (92-204 m)	**112**	**204**
31	**Colluvium and talus overlying lava --** Exposure 75 m to SE exhibits lavas similar to that described in unit 30.	13.5	204
30	**Trachyandesite or basaltic trachyandesite flow --** Medium gray, vesicular lava with 5% phenocrysts of plagioclase. Composition is inferred.	12	190.5
	@178.5 m: Section steps to the south from point A to point B. Above here we use a 60° bearing and 25° E dip. UTM coordinates of point A: 405821 m E, 3695392 m N. UTM coordinates of point B: 405828 m E, 3695379 m N.		
29	**Covered**	8	178.5
28	**Trachydacite flow --** Reddish and oxidized. Possibly part of the underlying trachydacite flow.	1.5	170.5
27	**Trachydacite flow --** Light gray, porphyritic dacite with 25-35%, medium-size phenocrysts of plagioclase, biotite, and hornblende.	10	169
26	**Covered**	4	159

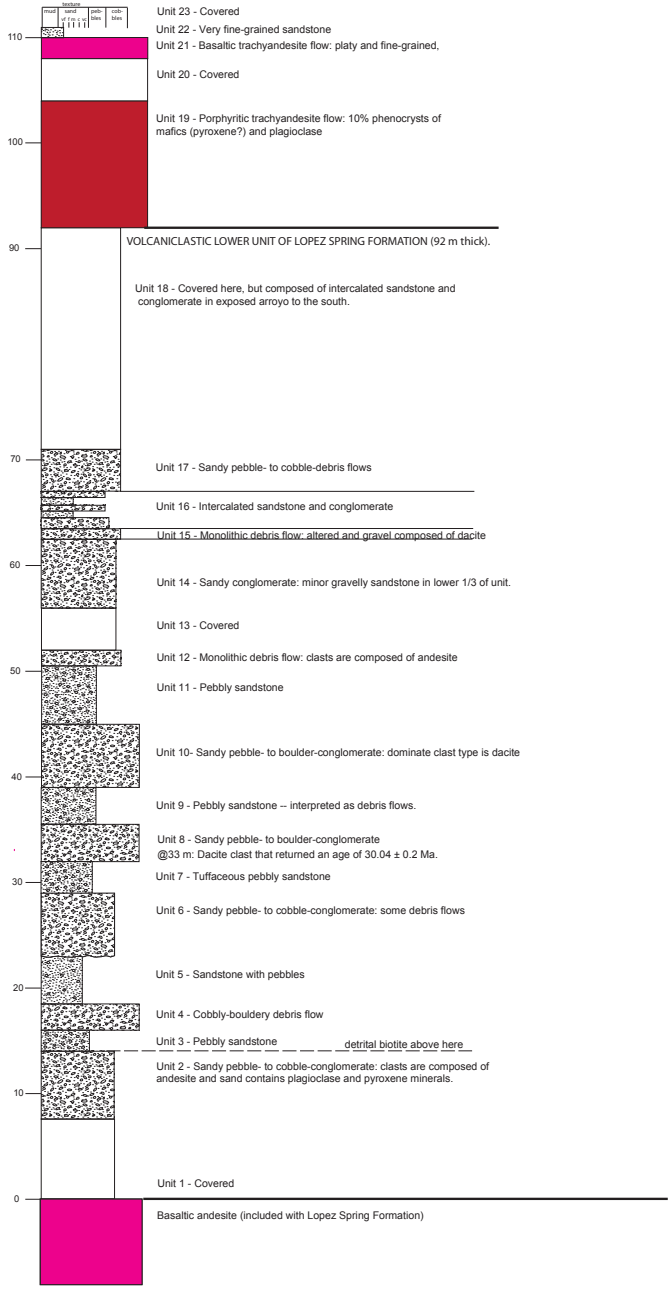
Unit	Description	Thickness (m) (Unit)	(Total)
25	**Basaltic trachyandesite --** Flow is similar to that described below, but fills a paleovalley. From 127.5-155 m: In some places, the contorted flow bands are altered to reddish brown colors. *@127.5 m: Above here we use a 65° bearing and 25° E dip.*	35.5	155
24	**Basaltic trachyandesite --** Brown, platy, and porphyritic. Matrix is fine-grained. 1-5% phenocrysts of plagioclase and pyroxene.	5.5	119.5
23	**Covered** *@111 m: Above here we use an 85° bearing and 23° E dip.*	3	114
22	**Sandstone --** Pink to light gray to gray and very fine-grained.	1	111
21	**Basaltic trachyandesite flow --** Lava is platy and contains a fine-grained, "sugary" matrix. Classification of basaltic andesite is inferred.	2	110
20	**Covered**	4	108
19	**Porphyritic trachyandesite flow --** Medium-dark gray. "Sugary," very fine-grained crystalline groundmass. 10% phenocrysts that are 0.5-1.0 mm in size; these are composed of altered, brown, mafic minerals (pyroxene?) and plagioclase. *@92 m: Above here we use a 65° bearing and 24° E dip.* Base of unit corresponds to UTM coordinates: 405726 m E, 3695351 m N. ***Volcaniclastic Lower Unit of Lopez Spring Formation (0-92 m).*** All units are hard and moderately cemented.	12 **92**	104 **92**
18	**Covered here, but intercalated sandstone and conglomerate to south --** In an arroyo about 30 m south of here, this unit consists of interbedded sandstone (3/4) and conglomerate (1/4). Sandstone is white (N8\), very fine- to medium-grained, well to moderately sorted, subangular, and composed of plagioclase with 5% biotite; 1-5% estimated tuff. Conglomerate intervals are thick to very thick (up to 6 m) and massive. Gravel consists mostly of pebbles (mostly) through boulders (lesser) that are subrounded (mostly) to subangular and very poorly sorted. Sand in the conglomerate matrix is white, very fine- to very coarse-grained, subangular to angular, poorly sorted, and contains an estimated 15-20% tuff. *@80 m: **Sample O-2**; UTM coordinates: 405724 m E, 3695342 m N. Not submitted for age analysis.* *@71 m: Base of unit corresponds to UTM coordinates: 405707 m E, 3695350 m N.*	21	92
17	**Sandy pebble- to cobble-debris flows --** Matrix-supported with an estimated 15% tuff in the matrix; clasts are composed predominately of dacite.	4	71
16	**Intercalated sandstone and conglomerate --** Conglomerate is light gray and contains a poorly sorted, plagioclase-bearing, sand matrix. Sandstone is tuffaceous (est. 5% tuff), very fine- to medium-grained, heterolithic, and contains 10% biotite and other mafic minerals.	3.5	67

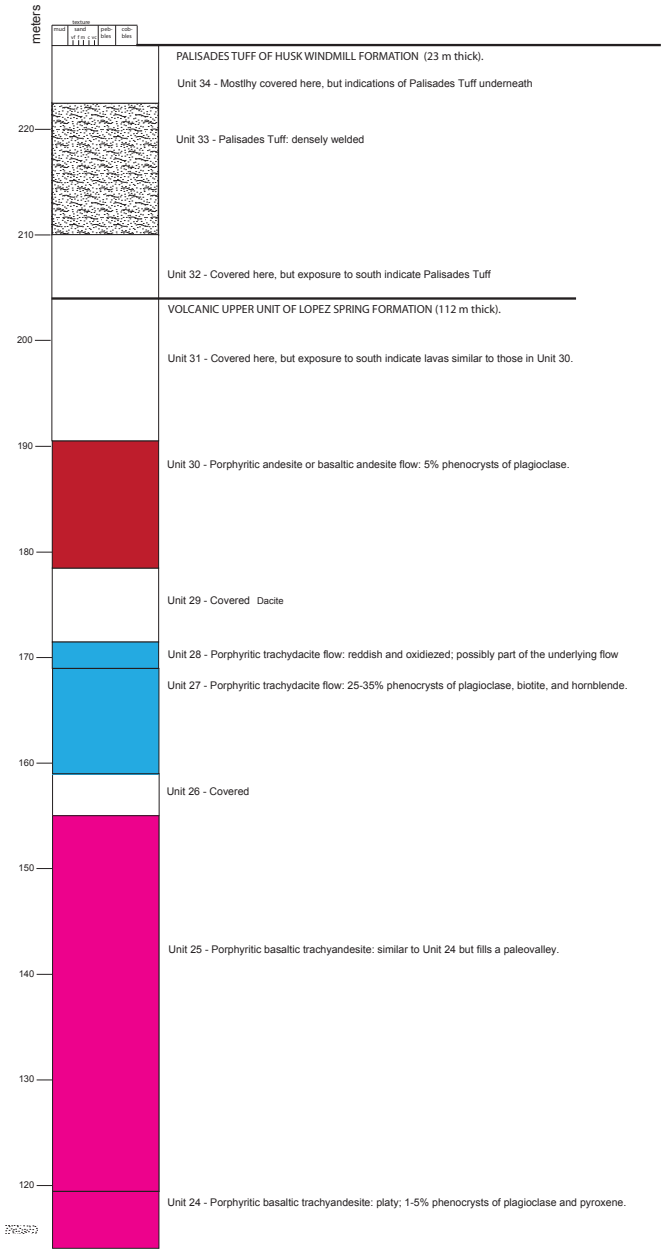
Unit	Description	Thickness (m) (Unit)	(Total)
	@66 m: A bedding attitude measured of 319° \ 27° NE. Above here we use an 80° bearing and 24° E dip.		
15	**Monolithic debris flow** -- Altered; gravel composed of dacite.	1.0	63.5
14	**Sandy conglomerate --** Minor beds of gravelly sandstone in lower 1/3 of unit.	6.5	62.5
13	**Covered**	4	56
	@52 m: Above here we use a 70° bearing and 23° E dip.		
12	**Monolithic debris flow --** Dark-colored. Clasts are composed exclusively of andesite clasts.	1.5	52
11	**Pebbly sandstone --** No bedding in lower half, but minor horizontal-planar bedding in upper half.	5.5	50.5
10	**Sandy pebble- to boulder-conglomerate --** Poorly sorted and dominant clast type is dacite. Matrix is light gray and contains 5-10% tuff.	6	45
	@ 39 m: Above here we used a 75° bearing and 23° E dip.		
9	**Pebbly sandstone --** Poorly bedded. About 10% pebbles. Matrix is derived from a dacitic source and is mostly very fine- to fine-grained sand. Interpreted as debris flows.	3.5	39
8	**Sandy pebble- to boulder-conglomerate --** Matrix is fine- to medium-grained sand. Gravel consists of subangular, poorly sorted dacite.	3.5	35.5
	@33 m: **Sample O-1**; this is a dacite clast that returned a $^{40}Ar/^{39}Ar$ age of 30.04 ± 0.2 Ma.		
7	**Tuffaceous pebbly sandstone --** Poorly bedded.	3	32
6	**Sandy pebble to cobble conglomerate --** Matrix dominated by very fine- to fine-grained sand. Gravel composed of dacite and andesite clasts. Some debris flows. Lower contact is scoured.	6	29
5	**Sandstone with pebbles --** Poorly bedded, with local horizontal-planar bedding. Sand is very fine- to coarse-grained (mostly fine- to medium-grained), moderately sorted, subangular to angular, and derived from dacitic source (based on presence of plagioclase, pyroxene, amphibole, and biotite). 1-5% scattered, hornblende-dacite and pebble-cobble-size clasts.	4.5	23
4	**Cobbly-bouldery debris flow --** Clasts are pebble to cobble to boulder in size. Matrix contains biotite and was derived from a dacitic source area.	2.5	18.5
3	**Pebbly sandstone --**Pebbles are moderately to poorly sorted and very fine to medium in size. Sandstone is light gray to white (7.5YR 7-8/1), very fine- to fine-grained (mostly) to medium- to very coarse-grained (minor), poorly to moderately sorted, subangular to angular, and a litharenite containing biotite.	2.0	16
	Obtain two good bed attitudes: 329°\ 29°E and 323°\30°E.		

Unit	Description	Thickness (m) (Unit)	(Total)
2	**Sandy pebble- to cobble-conglomerate.** Poorly bedded. Gravel is subangular to subrounded, poorly sorted, and composed of andesite. Matrix is slightly clayey and composed of very fine- to very coarse-grained sand that is angular to subangular, poorly sorted, and a lithic arenite; positive identification of plagioclase and pyroxene minerals.	6.5	14
1	**Covered**	7.5	7.5
	At top of this unit, we switch to a 85° bearing and 23° E dip.		
	Base of section located at the top of basaltic andesite flow (described below). UTM coordinates of: 405611 m E, 3695304 m N. From here, we proceed along a trend of 55° and a dip of 25° E, based on a regional strike of 326 and true dip of 25° E. **Basaltic andesite --** Medium- to dark-gray, fine-grained basaltic andesite. Flow bands are ~1 cm thick. 5% phenocrysts of plagioclase and an unknown mafic mineral (0.1-0.2 mm across). Very minor porphyritic texture. Upper 2 m of flow is medium-gray and contains abundant quartz-filled vugs that are <8 mm long. Epidote is also present.	-8	-8
	Note that the Lopez Spring Formation probably continues below this basaltic andesite.		

LOPEZ SPRING STRATIGRAPHIC SECTION





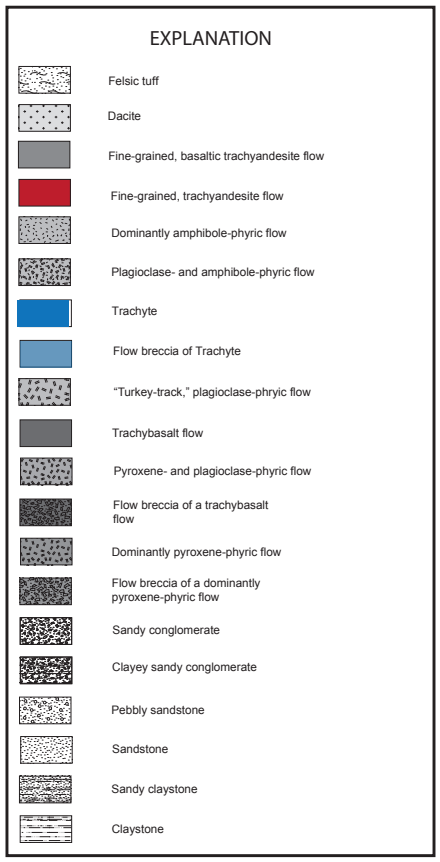


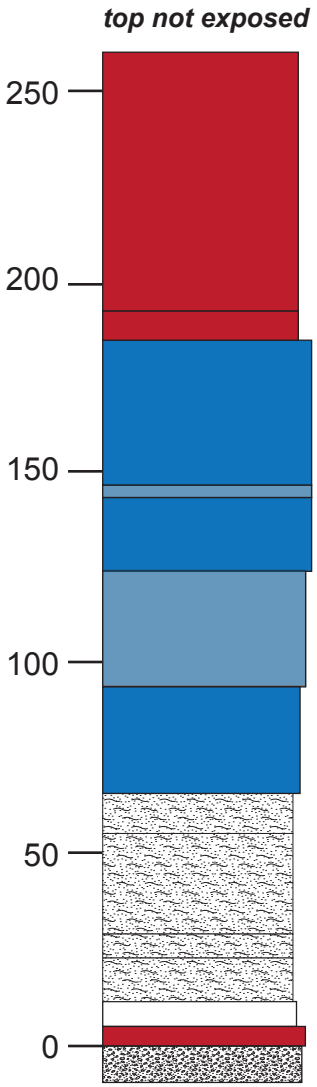
Husk Windmill section. The top of the Lopez Formation and the basal units in the Husk Windmill Formation are measured in this section. Measured and described by Shari Kelley, Daniel Koning, and Kate Zeigler on September 21, 2009, using a Brunton compass and Jacob staff. UTM coordinates of base of section: 405484 m E, 3699234 m N. UTM coordinates of top of section (NAD27): 405938 m E, 3699197 m N. Bends are located at 405589 m E, 3699246 m N; 405706 m E, 3699266 m N; and 405806 m E, 3699288 m N. All UTM coordinates are in Zone 13 and NAD 27.

Unit	Description	Thickness (m) (Unit)	(Total)
	Top not exposed		
	Crawford Canyon Trachyte		
N	**Fine-grained Trachyte to Trachyandesite.** Gray lava with a pronounced platy and contorted flow foliation. Unit consists of multiple flows with basal breccia and vesicular flow tops; vesicles are elongated; the flow breaks have yellow to red alteration. Each flow is 1 to 3 m thick.	69	271.95
M	**Flow Breccia for Unit N**.	7.5	202.95
	Rose Peak Trachyte (76-195 m; 119 m thick)		
L	**Trachyte Flows.** Gray, sparsely porphyritic lava flows with 7% phenocrysts of sanidine, plagioclase, and pyroxene similar to unit H.	38.3	195.45
K	**Block-and-ash Trachyte Breccia.** Well-rounded to subrounded, <50 cm blocks of sparsely porphyritic trachyte set in an ashy matrix similar to unit I.	3	157.15
J	**Trachyte Flows.** Gray, sparsely porphyritic lava flows with 7% phenocrysts of sanidine, plagioclase, and pyroxene similar to unit H. Matrix here is medium-grained.	23.4	154.15
I	**Block-and-ash Trachyte Breccia.** Well-rounded to subrounded, <50 cm blocks of sparsely porphyritic trachyte set in an ashy matrix.	27.3	130.75
H	**Trachyte Flows.** Gray, sparsely porphyritic lava flows with 7% phenocrysts of sanidine, plagioclase, and pyroxene; plagioclase phenocrysts are 10 mm long; elongated vesicles are common at the flow tops in this succession of flows.	27.2	103.45
	Palisades Tuff (21-76 m; 55 m thick)		
G	**Welded Tuff.** Tan, otherwise similar to unit F.	10.5	76.25
F	**Welded Tuff.** Gray, 15-20% phenocrysts of sanidine, plagioclase, biotite, 1-3% lithic fragmenst of a variety of porphyritic andesite types, white segregations ca. 1 cm thick; top has vapor phase alteration of the pumice.	26.25	65.75
E	**Vitrophyre.** Black to red glass, 7 to 15% sanidine, plagioclase, biotite, flattened pumice	7.5	39.5
D	**Unwelded Tuff.** Tan, very fine-grained matrix, <1% biotite phenocrysts; <1% andesitic lithic fragments; < 1% pumice, pumice flattened 10:1 neat the top of this interval.	11	32

Unit	Description	Thickness (m) (Unit)	(Total)
	Lopez Formation		
C	Covered	6	21
B	**Trachyandesite Lava Flow. B**rown lava with 10% phenocrysts of plagioclase and pyroxene. Plagioclase is mostly < 1 mm but a few plagioclase phenocrysts are up to 4 mm long. Vesicles are filled with calcite.	5	15
A	**Volcaniclastic Sediments**. Sandy conglomerate with subangular to subround dacitic to dioritic clasts.90% of the clasts are pebbles to cobbles and the rest are boulders; the sand is fine- to very coarse-grained, poorly-sorted, well-consolidated subangular litharenite; no distinct bedding.	10	10

Jackass Mountain Stratigraphic Section





Unit N: Aphanitic trachyte to trachyandesite

Unit M: Aphanitic trachyte to trachyandesite flow breccia

Unit L. Trachyte with 7% phenocrysts sanidine, plagioclase, and pyroxene

Unit K: Brecciated trachyte with 7% phenocrysts

Unit J: Trachyte with 7% phenocrysts sanidine, plagioclase, and pyroxene

Unit I: Brecciated trachyte with 7% phenocrysts

Unit H: Trachyte with 7% phenocrysts sanidine, plagioclase, and pyroxene

Unit G: Tan, welded Palisades Fuff

Unit F: Gray, welded Palisades Tuff

Unit E: Palisades Tuff vitrophyre

Unit D: Unwelded Palisades Tuff

Unit C: Covered

Unit B: Lopez Formation trachyandesite

Unit A: Lopez Formation volcaniclastic sediments