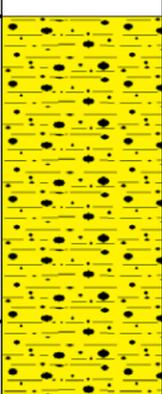
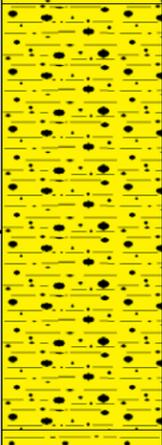
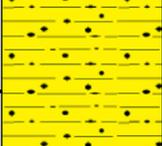
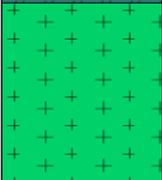


Nye County Early Warning Drilling Program

Summary Lithologic Log

BOREHOLE ID: NC-EWDP-29P

Depth	LITHOLOGY	DESCRIPTION
0		(0 to 125 feet [ft]) WELL-GRADED SAND WITH SILT, CLAY AND GRAVEL (SW-SM/SC): The interval consists primarily of layers of well-graded sand with silt, clay and gravel (SW-SM/SC) up to 52.5 feet thick. Thin layers of well-graded sand with gravel (SW) occur from 7.5 to 10, 27.5 to 30, and 37.5 to 40 ft. Fines display low to moderate plasticity. Gravel clasts are volcanic in origin, rounded from 0 to 47.5 ft, and subrounded from 47.5 to 125 ft. Sediment colors range from predominantly reddish gray (5YR 5/2) to yellowish red (5YR 5/6), reddish brown (5YR 4/4, 5/3), and dark reddish gray (5YR 4/2). Cementation ranges from none to moderate. Sediments react strongly to 10 percent (%) hydrochloric acid (HCl) from 0 to 35 ft, and display no reaction from 35 to 125 ft. All drill cuttings samples are dry. Moisture is observed in a drive core sample from 100 ft.
100		(125 to 265 ft) INTERBEDDED SILTY, CLAYEY SAND WITH GRAVEL (SM/SC) AND WELL-GRADED SAND WITH SILT, CLAY AND GRAVEL (SW-SM/SC): The interval consists of layers of silty, clayey sand with gravel (SM/SC) up to 17.5 ft thick interbedded with layers of well-graded sand with silt, clay and gravel (SW-SM/SC) up to 7.5 ft thick. Fines display low to moderate plasticity. Gravel clasts are volcanic in origin, subangular from 125 to 180 ft, and subrounded from 180 to 265 ft. Sediment colors range from predominantly reddish gray (5YR 5/2) to yellowish red (5YR 5/6), and brown (7.5YR 5/3). Cementation ranges from none to moderate. Sediments display no reaction to 10% HCl. Samples of drill cuttings are dry from 125 to 180 ft, and moist from 180 to 265 ft. Moisture is observed in a drive core sample from 180 ft.
200		(265 to 320 ft) SILTY, CLAYEY SAND WITH GRAVEL (SM/SC): The interval consists of a uniform sequence of silty, clayey sand with gravel (SM/SC). Fines display low to high plasticity. Gravel clasts are volcanic in origin, subangular from 265 to 312.5 ft, and angular from 312.5 to 320 ft. Sediment colors range from predominantly reddish gray (5YR 5/2) to yellowish red (5YR 5/6), reddish brown (5YR 5/3), and light brown (7.5YR 6/4). Strong cementation is observed from 312.5 to 320 ft, with the remainder of the interval exhibiting no to weak cementation. Sediments display no reaction to 10% HCl from 265 to 305 ft, and display a weak to strong reaction from 305 to 320 ft. All samples are moist.
300		(320 to 378 ft) ASH-FLOW TUFF (TIVA CANYON TUFF): The tuff is dark brown (10YR 4/2), devitrified and densely welded from 320 to 370 ft, and moderately welded from 370 to 378 ft. The tuff is slightly weathered from 320 to 325 ft, unweathered from 325 to 375 ft, and moderately weathered from 375 to 378 ft. The tuff matrix is dense/nonporous from 325 to 365 ft and open/porous from 365 to 378 ft. The tuff contains 1% gray brown (10YR 6/2) pumice clasts up to 4 millimeters (mm) in diameter from 320 to 355 ft and 2 to 5% brown (5YR 3/4) pumice clasts 2 to 4 mm in diameter from 355 to 380 ft. The tuff is generally lithic-poor, except from 335 to 345 ft, where there are 1% gray brown (10YR 6/4) lithic fragments up to 3 mm in diameter. The tuff also contains 1% colorless feldspar up to 3 mm long, 1 to 2% colorless to white (N9) quartz phenocrysts up to 3 mm in diameter from 340 to 360 and 370 to 378 ft, and 1 to 2% dark green (5GY 3/2) euhedral biotite phenocrysts up to 3 mm in diameter from 320 to 360 ft. Samples are dry to 355 ft, moist from 355 to 360 ft, and wet beyond 360 ft. The lower contact is sharp with the underlying ash-fall tuff.
400		(378 to 410 ft) ASH-FALL TUFF (PRE-TIVA CANYON TUFF): The tuff is light brown (10YR 5/4) from 378 to 400 ft and reddish brown (10R 5/4) from 400 to 410 ft. The tuff is nonwelded, devitrified, slightly weathered, and displays an open/porous matrix. The tuff is probably poorly consolidated. The tuff is pumiceous, with 5 to 20% light to dark brown (10YR 5/4-4/2) pumice clasts up to 12 mm in diameter and 2% olive gray (10Y 6/2) and dark brown (5YR 3/4) pumice clasts up to 4 mm in diameter. The tuff contains 2 to 5% colorless and chatoyant feldspar phenocrysts up to 4 mm long, 1% colorless quartz phenocrysts up to 3 mm long, and 1% dark brown (10YR 2/2) biotite crystals. The lower contact appears to be gradational with the underlying ash-flow tuff from 408 to 412 ft.
500		(410 to 640 ft) ASH-FLOW TUFF (TOPOPAH SPRING TUFF): The tuff ranges from reddish brown (10R 4/6) to black (N1) to moderate brown (5YR 3/4, 4/4). The tuff is generally densely welded, devitrified and has widely spaced zones of weak vapor-phase alteration that may correspond to lithophysal zones. The upper and lower vitrophyre zones are well represented. The zones are as follows: 410 to 425 ft (UPPER MODERATELY WELDED ZONE): The zone is reddish brown (10R 4/6), vitric, and weakly to moderately welded with an open/porous matrix. The zone contains 1 to 3% colorless feldspar phenocrysts up to 4 mm long, up to 1% colorless to very light gray (N8) quartz phenocrysts, and up to 2% olive green (10Y 5/4) biotite up to 3 mm long. Welding increases toward the sharp contact with the underlying vitrophyre. 425 to 503 ft (UPPER VITROPHYRE): The zone is comprised of a black (N1), densely welded, glassy tuff with a dense/nonporous matrix. The zone contains 3 to 8% colorless feldspar up to 4 mm long and 1% black (N1) biotite from 460 to 465 ft. Locally, feldspars are chatoyant or opalescent. The vitrophyre is interlayered with soft, zeolitized material from 465 to 495 ft. The lower contact is gradational with the underlying welded tuff. 503 to 600 ft (MIDDLE NONLITHOPHYSAL ZONE): The zone is moderate brown (10YR 3/4) from 503 to 595 ft and dark brown (10YR 2/2) from 595 to 600 ft. The tuff is moderately welded from 503 to 515 ft, densely welded from 515 to 600 ft, devitrified, and displays a dense/nonporous matrix. Traces of vapor-phase alteration occur at 520 to 525, 550 to 555, 565 to 570, and 585 to 595 ft. Weak spherulitic development is observed from 570 to 575 ft. The tuff contains 2 to 3% colorless feldspar phenocrysts up to 3 mm long, 1% very light gray (N8, N9) to colorless quartz phenocrysts to 3 mm in diameter from 500 to 560 and 585 to 595 ft, and 1% bronze biotite up to 1 mm long from 505 to 525, 535 to 540, and 575 to 595 ft. The tuff also contains 1 to 2% medium gray (N5) lithic clasts up to 8 mm in diameter from 505 to 555 and 565 to 595 ft. Welding increases beyond 585 ft toward the gradational contact with the underlying basal vitrophyre. 600 to 611 ft (BASAL VITROPHYRE): The zone is comprised of a black (N1), densely welded, glassy tuff with a dense/nonporous matrix. No phenocrysts or lithic clasts are observed. The rock is granular due to grinding from the drill bit. The lower contact is sharp with the underlying vitroclastic tuff. 611 to 640 ft (LOWER MODERATELY WELDED ZONE): The zone is light brown (5YR 4/4) and densely to moderately welded with a dense/nonporous matrix. A distinctive vitroclastic texture is evident, with stretched shards of "root beer bottle" glass up to 4 mm long. The tuff contains 1% colorless feldspar up to 3 mm long and 1 to 2% greenish yellow (5Y 8/4) to grayish pink (5YR 7/2) pumice clasts up to 10 mm in diameter. The contact with the underlying ash-fall tuff is sharp.
600		(640 to 700 ft) ASH-FALL TUFF (PRE-TOPOPAH SPRING TUFF AND PRE-WAHMONIE FORMATION BEDDED TUFF): The tuff is brown (5YR 3/4) to grayish orange brown (10YR 7/4), nonwelded, devitrified, and has an open/porous matrix. The tuff appears slightly weathered throughout. The tuff contains 1 to 2% brown (5YR 7/2) pumice clasts up to 4 mm in diameter from 640 to 655 ft; 1% colorless feldspar phenocrysts up to 2 mm long, 1 to 10% very light gray (N7, N9) quartz phenocrysts 2 to 4 mm in diameter that are concentrated toward the base of the unit from 680 to 695 ft, and 2 to 5% black biotite up to 4 mm long. Bedding is inferred in the unit based on the variation in colors observed. The lower contact is sharp with the underlying volcanoclastic sandstone.
700		(700 to 790.7 ft Total Depth) VOLCANICLASTIC SANDSTONE (PRE-WAHMONIE FORMATION BEDDED TUFF): The sandstone is dark to light brown (10YR 4/2 - 5YR 5/6) and consists of well-sorted and well-rounded grains of fine quartz, feldspar, volcanic glass, and biotite that represent epiclastic/volcanoclastic reworking of unwelded tuffs. The sandstone is cemented with coarse, greater than 2 centimeter, sparry calcite throughout much of the interval; however, sections are uncemented and the borehole produces abundant sand, especially in the interval from 700 to 720 ft. It is also likely that seams of uncemented sand occur within the sandstone below 720 ft. The borehole was stopped in this unit due to drilling problems as a result of flowing sand.