

Summary Lithologic Log for NC-EWDP-13P

Depth	Lithology	Description
1 in:52ft		
0		(0 to 87 feet (ft)) WELL-GRADED SAND WITH SILT AND GRAVEL (SW-SM): Interval consists of well-graded sand with silt and gravel (SW-SM) and two layers of silty sand with gravel (SM) from 17.5 to 20 ft and 72.5 to 75 ft. Unit generally becomes finer with depth. Fines within the unit are nonplastic. Gravel clasts are volcanic in origin and angular to subangular. Sediment color ranges from light brownish gray (5YR 6/1) to brownish gray (5YR 4/1) and moderate brown (5YR 4/4) from 0 to 27.5 ft, and from grayish brown (5YR 3/2) to pale brown (5YR 5/2) from 27.5 to 62.5 ft, and pale yellowish brown (10YR 6/2) to dark yellowish brown (10YR 2/2) from 62.5 to 87 ft. No cementation was observed. Sediments react strongly to 10% hydrochloric acid (HCl). All samples were dry.
100		(87 to 132.5 ft) BASALT (YOUNGER TERTIARY BASALT OF CRATER FLAT [Tby]): Two basalt lava flows compose this interval. The upper flow extends from 87 to 107.5 ft and the lower flow extends from 107.5 to 132.5 ft. Vesicular textures were observed from 87 to 97 ft, 110 to 122.5 ft, and 130 to 132.5 ft. The lower section of the lower flow from 132.5 to 140 ft was not recovered during drilling as a result of encountering an apparent void from 132.5 to 135 ft. The basalt unit is only slightly to moderately weathered from 87 to 100 ft and from 110 to 120 ft; and is highly weathered from 105 to 110 ft, at the contact between the two flows. The basalt is black (N 1) in color. The upper flow (87 to 105 ft) has 5 to 8% altered mafic minerals that are light brown (5YR 5/6) and up to 1.5 millimeters (mm) in length. The lower flow (107.5 to 132.5 ft) has 1 to 2% altered light brown (5YR 5/6) to dark greenish yellow (10Y 6/6) olivine phenocrysts up to 2 mm in diameter. Samples from 87.5 to 90 ft and 102.5 to 105 ft react strongly to 10% HCl, and samples from the vesicular zones react weakly. The massive cores of the basalt flows from 97.5 to 102.5 ft and from 122.5 to 130 ft display no reaction to 10% HCl. The lower contact with the underlying alluvium is indeterminate due to lost circulation/no recovery from 132.5 to 162.5 ft. All samples were dry.
		(132.5 to 162.5 ft) NO RECOVERY 132.5 TO 140 ft (BASALT) Interpreted from natural gamma and density logs. 140 TO 162.5 ft (ALLUVIUM) Interpreted from natural gamma and density logs.
200		(162.5 to 180 ft) SILTY SAND WITH GRAVEL (SM): Interval consists of a thick layer of silty sand with gravel (SM). Fines are nonplastic from 162.5 to 170 ft, have low plasticity from 170 to 175 ft, moderate plasticity from 175 to 177.5 ft, and are highly plastic from 177.5 to 180 ft. Gravel clasts consist predominantly of rounded fragments of weakly indurated reactive sandstone, and lesser subrounded clasts derived from welded tuff lithologies. Sediment color is a uniform moderate yellowish brown (10YR 5/4), with local zones of dark yellowish orange (10YR 6/6) from 167.5 to 172.5 ft and from 175 to 180 ft. Sediments are noncemented, although some gravel clasts are coated with caliche. Sediments react strongly to 10% HCl. All samples were dry.
300		(180 to 202.5 ft) SANDY LEAN CLAY (CL): Unit is primarily a sandy lean clay (CL), becoming more clay-rich and gravel-poor with depth. A sandy fat clay (CH) is present below 197.5 ft. Fines are generally highly plastic, except in the uppermost interval from 180 to 182.5 ft where the fines have moderate plasticity. Gravel clasts consist predominantly of rounded fragments of weakly cemented and HCl reactive sandstone from 180 to 200 ft, and 100% subrounded volcanic clasts from 200 to 202.5 ft. Sediment color is primarily a moderate yellowish brown (10YR 5/4) with local zones of grayish orange (10YR 7/4) from 190 to 192.5 ft, and dark yellowish orange (10YR 6/6) from 192.5 to 195 ft and 200 to 202.5 ft. Sediments are noncemented and react strongly to 10% HCl. All samples were dry.
400		(202.5 to 260 ft) SILTY SAND WITH GRAVEL (SM): Interval consists of a thick sequence of silty sand with gravel (SM) with local thin layers of well-graded sand with silt and gravel (SW-SM) from 202.5 to 207.5 ft and poorly graded sand with silt and gravel (SP-SM) from 247.5 to 250 ft. Fines in the interval generally have low plasticity, except for intervals of moderate plasticity from 210 to 215 ft and 225 to 227.5 ft. Fines in the lowermost section from 245 to 260 ft are nonplastic. Gravel clasts are subangular to subrounded and consist predominantly of volcanic clasts except the interval from 250 to 260 ft where subrounded sandstone clasts predominate. Sediment color is predominantly moderate yellowish brown (10YR 5/4) with sections of grayish orange (10YR 7/4) from 205 to 207.5 ft, and pale yellowish brown (10YR 6/2) from 207.5 to 212.5 ft, 225 to 227.5 ft, and 250 to 260 ft. Sediments are non-cemented and react strongly to 10% HCl. All samples were dry.
500		(260 to 797 ft) REWORKED TUFFS AND RELATED VOLCANICLASTIC ROCKS (Tvy): Entire interval is a sequence of interbedded reworked tuffs and volcaniclastic sandstones and claystones. Sequence is generally weakly to strongly weathered and clayey (argillic). Sequence likely represents deposition of ash-fall tuffs into a shallow subaqueous (lacustrine or playa) environment, with breaks in volcanic activity represented by deposition of volcanic-source detritus forming sandstones and claystones. 260 to 297.5 ft (REWORKED TUFF): Tuff color is moderate yellowish brown (10YR 5/4) from 260 to 285 ft, changing to pale yellowish brown (10YR 6/2) from 285 to 297.5 ft. Tuff is nonwelded, devitrified and highly weathered, with an open/porous matrix. The tuff contains three different types of coarse (greater than 10 mm) caliche-coated lithic clasts. From 280 to 290 ft the tuff also contains faint laminated grayish orange (10YR 7/4) claystone, probably derived from ash. Samples react strongly to 10% HCl and all samples were dry. Unit may represent reworking of underlying ash-fall tuff. 297.5 to 422 ft (REWORKED ASH-FALL TUFF): Tuff unit color is dark yellowish orange (10YR 6/6) from 297.5 to 380 ft, light brown (5YR 6/4) from 380 to 395 ft, and pale grayish brown (5YR 4/2) from 395 to 422 ft. A distinct light brownish gray (5YR 6/1) reworked ash-fall tuff occurs from 365 to 375 ft. Tuff is nonwelded and devitrified, with an open/porous matrix. Tuff is highly weathered from 297.5 to 345 ft, moderately weathered from 345 to 350 ft, weakly weathered from 350 to 390 ft, and moderately weathered from 390 to 422 ft. Tuff contains 2 to 10% very pale orange (10YR 8/2) altered pumice clasts ranging in size from 3 to 20 mm from 340 to 400 ft, 2 to 5% grayish orange (10YR 7/4) pumice clasts 2 to 10 mm in size from 400 to 422 ft, and 1 to 2% dusky red (10R 2/2) lithic clasts that range from 1 to 4 mm in size from 297.5 to 380 ft. Samples react strongly to 10% HCl from 297.5 to 345 ft, and weakly from 345 to 350 ft, 360 to 365 ft, 375 to 380 ft, and 410 to 422 ft. Other intervals exhibit no reaction. Samples were dry from 297.5 to 310 ft, moist from 310 to 325 ft, dry from 325 to 385 ft, and moist from 385 to 422 ft. 422 to 550 ft (REWORKED TUFF): Unit is light brown (5YR 5/6) from 422 to 445 ft, moderate yellowish brown (10YR 5/4) from 445 to 510 ft, pale yellowish brown (10YR 6/2) from 510 to 530 ft, and moderate yellowish brown (10YR 5/4) from 530 to 550 ft. Tuff is nonwelded and devitrified and has an open/porous matrix. Tuff contains 1 to 10% light gray (N 7) pumice clasts that range in size from 2 to 12 mm and 2 to 10% light gray (N 7) lithic clasts that range from 2 to 10 mm in diameter. From 510 to 530 ft the unit contains a less weathered gray (10YR 6/2) ash-fall tuff with a sucrosic texture. Unit reacts strongly to 10% HCl from 422 to 550 ft, reacts weakly at 445 and 460 ft, from 500 to 515 ft, and from 525 to 550 ft. Samples were moist from 422 to 430 ft and wet below 430 ft. The open-hole water level was 433 ft at the completion of drilling. 550 to 600 ft (CLAYSTONE): Unit is uniformly moderate yellowish brown (10YR 5/4) throughout. Due to drilling in this saturated soft rock, only a few flat chips of very finely bedded claystone were recovered. Most of the sample consisted of clay held in suspension and drill-induced "clay balls". The claystone reacts weakly to 10% HCl from 550 to 555 ft, and reacts strongly from 555 to 600 ft. 600 to 740 ft (WEAKLY ARGILLIZED REWORKED TUFF): Unit is pale reddish brown (10YR 5/4) from 600 to 695 ft, and light brown (10YR 5/6) from 695 to 725 ft. Tuff is nonwelded and variably argillized throughout. Unit is highly weathered (i.e., clayey) from 600 to 625 ft, and moderately weathered from 625 to 675 ft. Tuff contains 1% light gray (N 7) pumice clasts 1 to 4 mm in diameter from 625 to 700 ft. From 625 to 690 ft the tuff contains 1% lithics that vary in color from light gray (N 7) to dark brownish black (5YR 2/1). Samples react strongly to 10% HCl from 600 to 695 ft, and react weakly from 695 to 735 ft. Unit contains three basal members that form distinct subunits. The upper basal subunit from 725 to 730 ft is a weakly cemented weathered sandstone consisting of well-rounded and sorted grains of quartz and feldspar. The middle basal subunit from 730 to 735 ft is a moderate brown (5YR 4/4) weathered reworked tuff that contains 1% white (N 9) fragments of zeolitized pumice up to 4 mm in diameter and 1% dark gray (N 3) lithic clasts up to 2 mm in diameter. The lowermost basal subunit from 735 to 740 ft is a medium to dark gray (N 4) highly weathered reworked tuff that has the texture of coarse sandstone, consisting of 1 to 2 mm moderately to well-rounded grains of tuff containing 5% greenish black (5GY 2/1) biotite phenocrysts up to 0.5 mm in length. 740 to 770 ft (CLAYSTONE AND SANDSTONE): Sequence is interpreted as a series of thin (probably less than 2-ft thick in places) beds of tuffaceous sandstone and platy fissile claystone. Unit is moderate brown (5YR 4/4) in color, with a section from 750 to 765 ft that is light brown (5YR 5/6). Claystone from 740 to 745 ft has 1% white (N 9) quartz grains up to 7 mm in diameter, 1% white (N 9) pumiceous clasts up to 10 mm in diameter, and 1% medium dark gray (N 4) clasts up to 1.5 mm in diameter. The primary sandstone interval from 745 to 765 ft has 1% or less medium to dark gray (N 4) clasts up to 2 mm in diameter. Samples react weakly to 10% HCl from 740 to 765 ft and display no reaction from 765 to 770 ft. 770 to 797 ft (REWORKED TUFF): Unit is a uniform moderate brown (5YR 4/4) color, and moderately weathered throughout. Tuff contains trace amounts of golden, oxidized biotite up to 1.5 mm in length and 2% medium dark gray (N 4) lithic clasts up to 2 mm in diameter from 775 to 780 ft. From 780 to 797 ft the unit contains 1 to 2% white (N 9) pumice clasts up to 10 mm in diameter and 1 to 2% light gray (N 5) to white (N 9) lithic clasts ranging from 1 to 10 mm in diameter. Samples are non-reactive to 10% HCl. Argillization is strong from 775 to 795 ft. Contact with the underlying sand is sharp at 797 ft.
600		
700		

