NYE County NWRPO -Technical Data Report

RID No.	Transmitter	Org.	Receiver	Org.	Key word1	Title/Description
7057.01	Kryder	NWRPO	QARC	NWRPO	22PC	NC-EWDP-22PC Alluvium Drill Cuttings Logging Forms

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Data Originator Preparer Contract Geologic Staff

Title of Data NC-EWDP-22PC Alluvium Drill Cuttings Logging Forms

Description of Data Drill cuttings logging reports exported from drilling database (NC Drilling v3.6.mdb) in .pdf format (Alluvium Drill Cuttings Logging Form from 10/14/04 to 10/20/04).

Data Collection Method Drill cuttings samples described on the geologic field logging forms during drilling and sampling of borehole.

Data Location(s) NC-EWDP-22PC

Data Collection Period(s) 10/14/04 to 10/20/04

Data Source(s) Geologic logging of drill cuttings.
Supporting Data: Field Scientific Notebook #163, Pages 1 to 30 (RID 6480) describing general drilling conditions; original field logging forms for drill cuttings (RID 7057); and archived drilling database (RID 7561).

Data Censoring Density data recorded on Alluvium Drill Cuttings Logging Forms.

Data Processing Data from field logging forms were entered into the drilling database, reviewed, and database reports were transmitted to the QARC.

Data Limitations

Data Limitations and Data Censoring have changed from the original field forms (RID 7057).

The interval from surface to 460 feet in borehole NC-EWDP-22PC was drilled using a casing advance method known as "dual-rotary" or "Barber drill" technique. The method employs two rotating assemblies including a table drive assembly that rotates and advances a drill casing, and a top head drive assembly that advances a drill string inside the drill casing. The drill bit is attached to drill pipe on the top-head drive and uses either conventional air circulation inside the drill casing or dual-wall circulation (reverse circulation) independent of the drill casing. From surface to a depth of 60.7 feet, 16-inch OD casing with a 16.75-inch OD casing shoe bit was advanced using a 14.75-inch mill-tooth tricone bit on 7-inch diameter dual-wall drill pipe. Conventional air circulation was used to lift the cuttings from the bit inside the drill casing. The return (air and cuttings) was discharged through a casing diverter and air cyclone separator and into sampling containers. Below 60.7 feet and to a depth of 460.0 feet, a smaller casing advance system was used. The system consisted of 10.75-inch OD drill casing with an 11.375-inch OD shoe bit and 9.875-inch bit on the 7-inch OD drill pipe.

Samples collected from alluvium by dual rotary techniques are not entirely representative of in situ conditions due to several drilling related factors. The near surface (0 to 60.7 ft) alluvial drill cuttings samples are impacted as a result of the larger drilling system being unable to effectively lift the drill cuttings, and especially the coarser fractions, during the advancement of the bit through a sample interval. Repeated clean out was required and as such, there was obvious bias in particle size distribution (PSD) and there is likely cross-contamination of adjacent sample intervals. Below 60.7 feet, using the smaller dual rotary drilling system, sample quality and representativeness was much improved. Samples still suffer from the impacts common to rotary drilling methods as has been described in previous EWDP drilling. Evidence from other boreholes in alluvial sediments indicates that the mechanical action of the rotary bit results in sample degradation and particle size distribution bias (See discussion in Report for the Early Warning Drilling Program Phase III Boreholes, Section 2.1.2, RID 5579). In general, the mechanical action of the bit reduces large-size particles to smaller-size particles effectively decreasing the gravel-size component and effectively increasing the sand and "fines"-size component. This is a relatively minor problem in unsaturated alluvium and in the upper part of saturated alluvium where water production is low. In underlying saturated alluvium this drilling impact renders particle size distribution data useless. Since this borehole penetrates unsaturated alluvium only, particle sizes in

drill cuttings are impacted to some extent but are considered to provide a reasonable approximation of in situ conditions.

The Alluvium Logging Form includes preliminary field estimates of grain size distribution for the 460 ft of alluvium penetrated. The estimates are made on every 2.5 foot sample interval and used for preliminary layering information and general planning of wells prior to receipt of laboratory data. These field estimates of grain size distribution as well as USCS group symbol data should be considered reasonably representative of geologic samples and have not been censored. Grain size distribution data determined by laboratory analysis on every second 2.5-foot sample interval are considered representative of the geologic samples (RID 6628).

Sample density data collected for samples is based on an ideal sample volume for an 11.375-inch borehole of 52.9 gallons or approximately 95 kilograms (assuming a specific gravity of 1.9). Sample yield varied substantially as a result of the drilling method and therefore the sample density data has also been censored.

In addition, some sample-handling disturbance may have been introduced into samples by the sample homogenization process and sample splitting. During the drilling, two sample processing methods (homogenization and splitting) were used. Samples collected in the interval from 17.5 to 215 feet were processed by collecting all of the sample material from an interval into a series of 20 gallon galvanized tubs, weighing the samples and then splitting the samples using a Gilson splitter. The volume of material and the weight of the tubs made this process very labor intensive. Beyond 215 feet, the samples were collected directly into wheelbarrows and dumped on to large tarps where the samples were homogenized using cone and quarter method. The later method precluded obtaining sample weights. Both methods appeared to work equally well. Some loss of fines content was noted for the samples in the interval from 435-460 feet as a result of wet processing equipment. This limitation would be negligible. Also noted during drilling were unusually moist samples from 275 to 350 ft (likely introduced from prior drilling operations at site 22). The moisture helped to reduce the loss of fines to air winnowing at the cyclone, but made the sample material stick to drill pipe, hoses and sampling equipment. All of the effects of these disturbances are difficult to quantify but are considered negligible, and therefore the samples and sample data have not been censored.

Evaluations of cementation of alluvium samples as recorded on the logging forms are difficult to accurately determine because intact pieces of in-situ material are not available in cuttings.

In summary, laboratory measurement of grain size distribution of alluvium drill cuttings in this borehole are considered to be modified to some extent from in situ conditions due to a number of drilling related factors. However, for the most part these factors were unavoidable. Disturbance from sample handling related factors is considered minimal. Except for censored data mentioned above, geologic drill cutting samples from NC-EWDP-22PC are considered approximately representative of in situ conditions.