INTERIM CHANGE NOTICE
(ICN)

A. Document No.: PNNL-13024 **Revision No.:** 0 **Document Title:** *RCRA Groundwater Monitoring Plan for Single-Shell Tank Waste Management Area C at the Hanford Site* **Document's Original Author:** D. G. Horton and S. M. Narbutovskih	**Effective Date of ICN:** October 2004 **Change Requested By:** S. M. Narbutovskih

B. Action:
Make changes in the monitoring plan as described below in Section D. Attach this ICN to the front of the document.

C. Effect of Change:
This ICN documents the installation of three additional downgradient monitoring wells and one additional upgradient well. It updates the monitoring network and the stratigraphy of the aquifer. The project scientist will provide a schedule change request providing a list of additional wells to the sample scheduler.

D. Reason for Change/Description of Change:

(1) **Reason for Change**: Update groundwater quality monitoring plan at WMA C (PNNL-13024) to document the addition of three newly installed downgradient wells and one newly installed upgradient well. The monitoring network and the stratigraphy of the aquifer are also updated to reflect the information provided by these additional wells.

Description of Change:

(2) Mark through document Summary with a single line, initial, and date the change; then staple the attached Summary to the back of that page.

(3) Replace Figure 1.2 on page 1.3 with the attached Figure 1.2. Replace Table 4.1 on page 4.3, with the attached Table 4.1.

(4) Remove pages 2.23 and 2.24; replace with the attached pages (2.23 and 2.24) to document the additional geologic information based on data from the four newly installed wells.

(5) Add Plates 4 though 7 after Plate 3 at the end of the document.

E. Document Management Decisions:

For this ICN, S. P. Luttrell, T. G. Walker and S. M. Narbutovskih will sign approval.

See attached distribution list.

F. Approval Signatures
(Please Sign and Date)

Type of Change: (Check one):
___ Minor _X_ Major

Process Quality Department: T. G. Walker *Thomas G Walker* Date: 10-6-04

Approval Authority: S. P. Luttrell *[signature]* Date: 10/6/04

Other Approvals: S.M. Narbutovskih (Technical) *S M Narbutovskih* Date: Oct 6, 2004

SUMMARY

This document describes the groundwater monitoring plan for Waste Management Area (WMA) C located in the 200 East Area of the U.S. Department of Energy (DOE) Hanford Site. This plan is required under Resource Conservation and Recovery Act of 1976 (RCRA). The regulatory requirements can be found in WAC 173-303-400, and by reference, in 40 CFR 265.90 through 265.94. The plan objectives are to document the groundwater monitoring network designed to detect the facility's impact on the quality of groundwater beneath the site. As yet, groundwater monitoring results have not directly indicated that contamination associated with the single-shell tanks (SSTs) in WMA C has reached the aquifer, although groundwater contamination has increased since monitoring began in 1990.

The original groundwater monitoring network contained four RCRA-compliant wells used to monitor the uppermost 6 m (20 ft) of the unconfined aquifer with an assumed flow direction of due west. In addition, one pre-RCRA well was included as an upgradient well. The gradient of the water table is nearly flat, which caused ambiguities in the flow direction when based on water levels alone. Recent direct flow measurements with the colloidal borescope indicate a southwesterly flow direction at the WMA C. Three downgradient wells and one upgradient well were installed in FY2003 to provide more complete coverage. The addition of these wells completes the monitoring needs at this farm until the water level drops below the screen in the older RCRA wells. When this happens in 6 to 7 years, some of these older wells will either need replacement or require deepening.

Until the recent installation of upgradient well 299-E27-22, well 299-W27-7 was the only upgradient well. Currently, specific conductance is rising sharply at well 299-W27-7. A critical mean for specific conductance cannot be calculated using data from well 299-E27-7 because four quarters of stable data are needed for a critical mean calculation. Consequently, upgradient/downgradient comparisons were deferred until specific conductance stabilizes in well 299-E27-7, or four quarters of stable data are collected from the newly installed well 299-E27-22. Further information can be found on these new wells in Martinez (2003) and Williams and Narbutovskih (2004).

As of June 2004, nitrate concentrations were elevated, but below the drinking water standards, northeast (upgradient) and southwest of the 241-C Tank Farm boundary. In June 2004, a nitrate concentration of 42.5 mg/L was found southeast of the site. Along with nitrate, there were elevated levels of sulfate, calcium and technetium-99. The drinking water standard for technetium-99 (900 pCi/L) was exceeded northeast of the facility in 2002 but has dropped to 44.2 pCi/L (June 2004). Downgradient, the June 2004 technetium-99 levels were above the drinking water standard to the south (2,390 pCi/L) and southwest (8,370 pCi/L). Although source delineation has not been determined, this contamination may be part of a regional plume moving into the area from a source to the northeast. However, the periodic presence of cyanide in the groundwater suggests a tank-related source.

The waste management area was monitored either monthly or bimonthly prior to and during sluicing activities carried on to remove residual waste from a single-shell tank in 1998. These waste transfer activities have ceased, and beginning in FY2001 sampling frequency reverted to a quarterly schedule. Groundwater samples are analyzed for indicator parameters (pH, specific conductance, total organic carbon, total organic halides), anions, alkalinity, turbidity, ICP metals and site specific constituents such as technetium-99, cyanide, cesium-137, and cobalt-60. Water levels are measured quarterly.

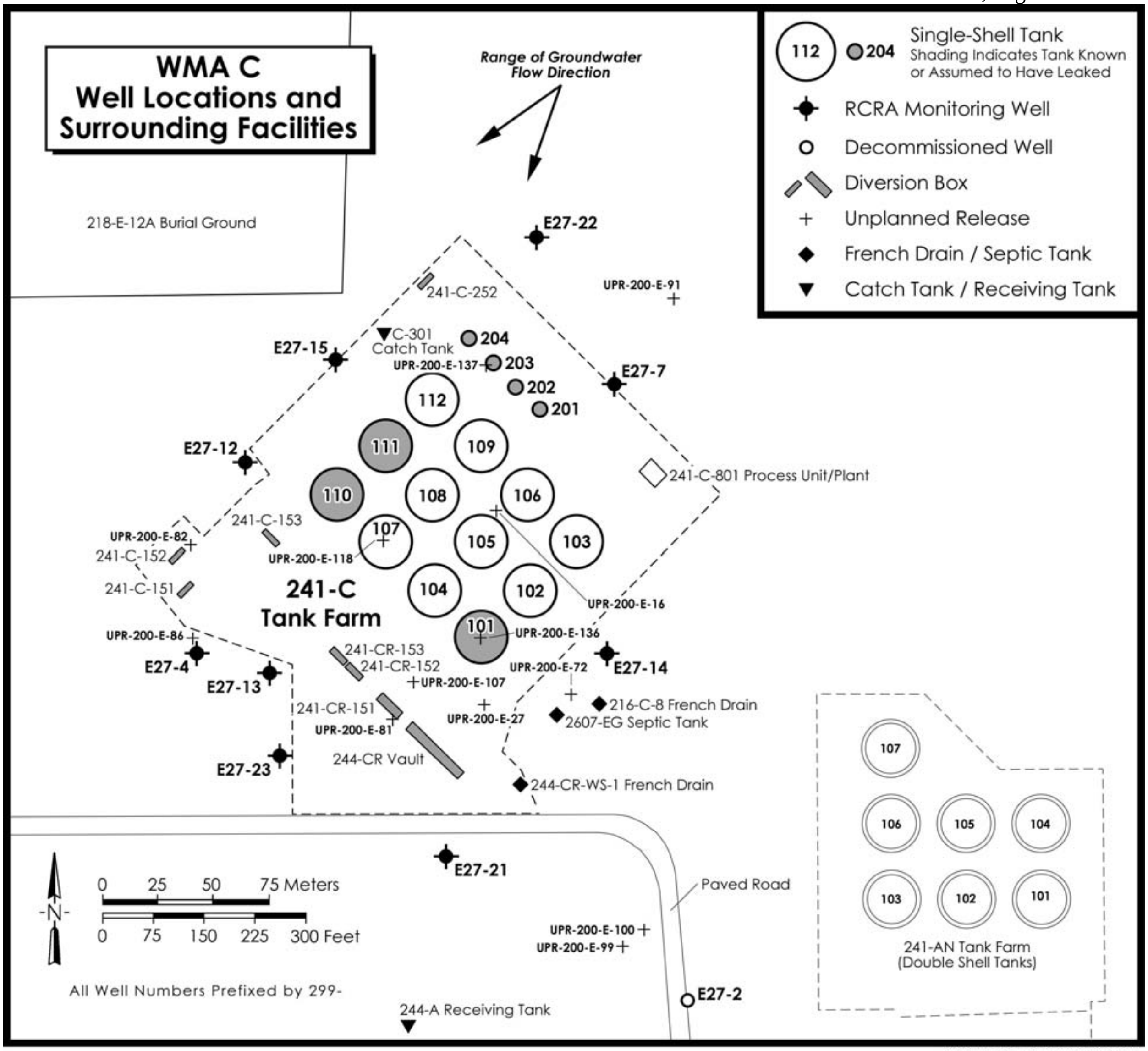

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Figure 1.2. Location Map of WMA C and Surrounding Facilities

Geologic interpretations were made from the well-site geologist's (or driller's) logs, comparing the logs to selected, archived samples at the Hanford Geotechnical Sample Library and from recovered samples taken in FY2003 during the drilling of the new wells shown in Figure 1.2. The geologic log interpretations of older wells were modified based on the archived samples. The most recent stratigraphic interpretations, based on the recently drilled wells, can be found in Martinez (2003). A further description can also be found in Williams and Narbutovskih (2004). Geophysical logs and laboratory moisture data were compared with the lithologic logs. In some cases, gross gamma-ray logs allowed a more accurate location of geologic contacts.

Plates 1 through 3 show cross sections adjacent to and through WMA C. The locations of cross sections were chosen to illustrate the geology beneath WMA C in both northeast-southwest and northwest-southeast directions. The information in Plates 1 through 3 is supplemented with the geologic logs presented in Plates 4 through 7 that show the stratigraphic horizons from the four new wells drilled in FY2003. The geology beneath WMA C consists of a basalt basement overlain by four sedimentary sequences distinguished by texture, particle size, mineralogy, and stratigraphic position. In ascending order, these sequences are:

- Hanford formation lower gravel sequence
- Hanford formation sand sequence
- Hanford formation upper gravel sequence
- Holocene eolian sediments and/or backfill material

The Elephant Mountain Member of the Saddle Mountains Basalt Formation is the base of the unconfined aquifer in the area. The Elephant Mountain Member was not encountered in any boreholes in the WMA C area except possibly well 299-E27-22, the new up gradient well, where basalt was encountered at the bottom of unconsolidated sediments. The elevation of the top of the Elephant Mountain Member in this well is 109.7 m (360 ft). The Elephant Mountain Member dips gently to the south into the Cold Creek syncline.

The Hanford formation lower gravel sequence overlies the Elephant Mountain Member beneath WMA C. The unconfined aquifer is contained in this unit. Based on observations of outcrop and intact core, these lower gravel sequence sediments are interpreted to be the high-energy, gravel-dominated facies of the Hanford formation. This facies is typically open framework or matrix supported, granule to boulder gravel with massive bedding, plane to low-angle bedding, and cross-bedding in outcrop. Lenticular and discontinuous units of sand-dominated facies are interbedded in the gravel-dominated facies. The Hanford formation lower gravel sequence was deposited by cataclysmic, Pleistocene floods.

This sequence is described on borehole logs of cuttings and samples from the WMA C Area as cobble to pebble gravels, sandy gravels with some gravelly sands, and silty sandy gravels. The gravels are subangular to well rounded and uncemented, although some local calcium carbonate consolidation is present. The composition of the gravels varies from borehole to borehole and ranges from 85% basaltic and 15% felsic to about 20% basaltic and 80% felsic. Sediments in the newly installed wells from FY2003 confirm that the unconfined aquifer lies in this lower gravel sequence of the Hanford formation. These lower sediments are gravel-dominated with basalt contents ranging from 40% to 85%. A 1.8-m (6-ft) section in new well 299-E27-22, on the northeast side, showed a silty, sandy gravel with 20% basalt.

The upper 0.6 to 1.5 m (2 to 5 ft) of the Hanford lower gravel sequence is described on borehole logs as silty to slightly silty, sandy gravel in the south and west portions of WMA C. This lithology is present in the east and north part of WMA C, seen in well 299-E27-22 (see Figure 1.3). The top of the Hanford formation lower gravel sequence was picked at the top of this silty, sandy gravel where it is present. Elsewhere, the top of the Hanford formation lower gravel sequence was picked at the base of a >9-m (30-ft) thick sand sequence overlying the lower gravel sequence.

Table 4.1. Network Monitoring Wells

Well Name	Completion Date	Upgradient Downgradient	Sampling Objective	Sampling Frequency
299-E27-7	1982	Up	C, WL	SA
299-E27-12	1989	Crossgradient	C, WL	SA
299-E27-13	1989	Down	C, WL	SA
299-E27-14	1989	Down	C, WL	SA
299-E27-15	1989	Crossgradient	C, WL	SA
299-E27-4	2003	Down	C	SA
299-E27-21	2003	Down	C	SA
299-E27-22	2003	Up	C	SA
299-E27-23	2003	Down	C	SA

WL = Water-level measurement.
C = Chemistry monitoring.
SA = Semi-annual.

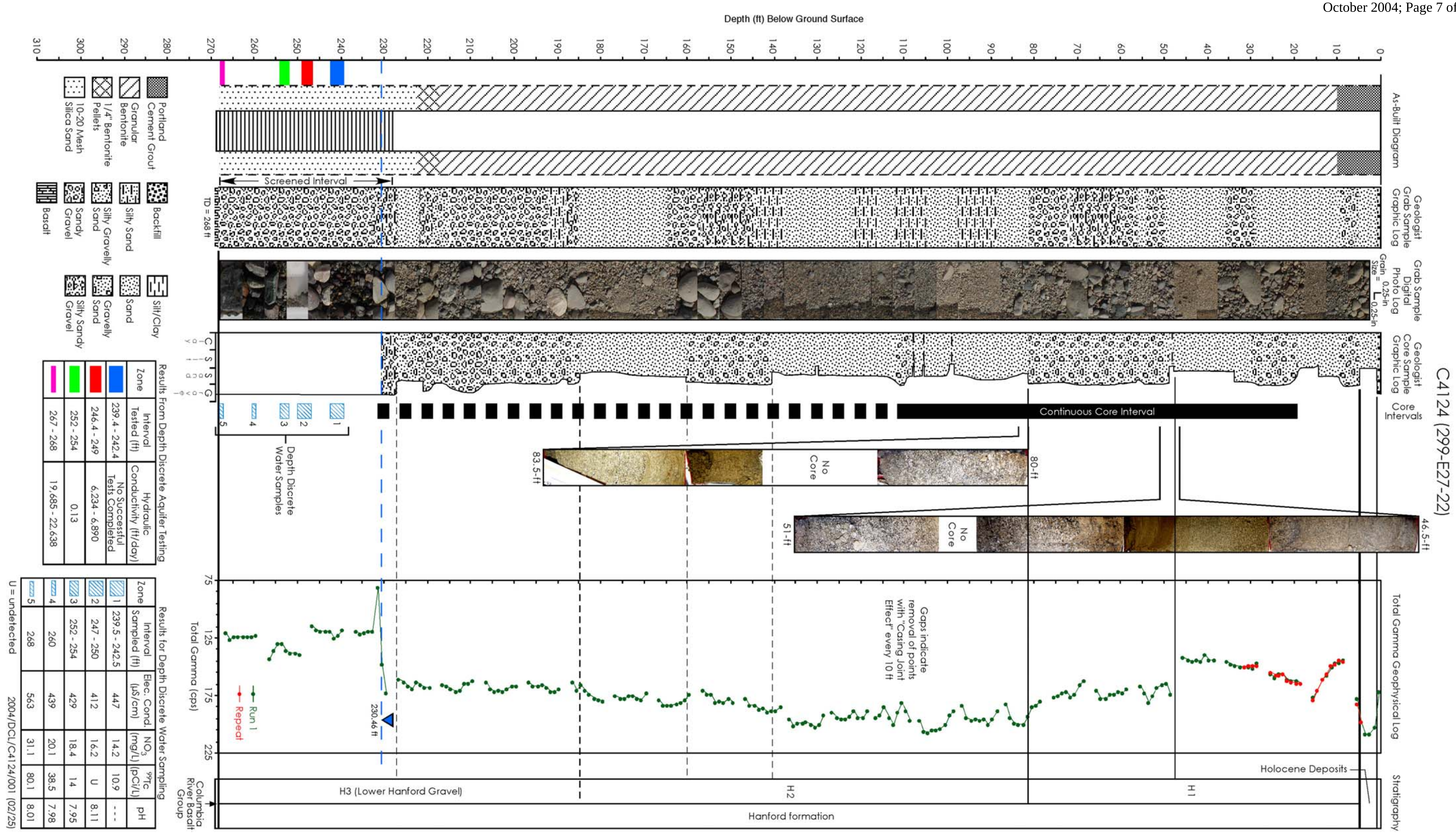

PLATE 4. Geologic Section for Well 299-E27-22 near Single-Shell Tank Farm WMA C (after PNNL-14656)

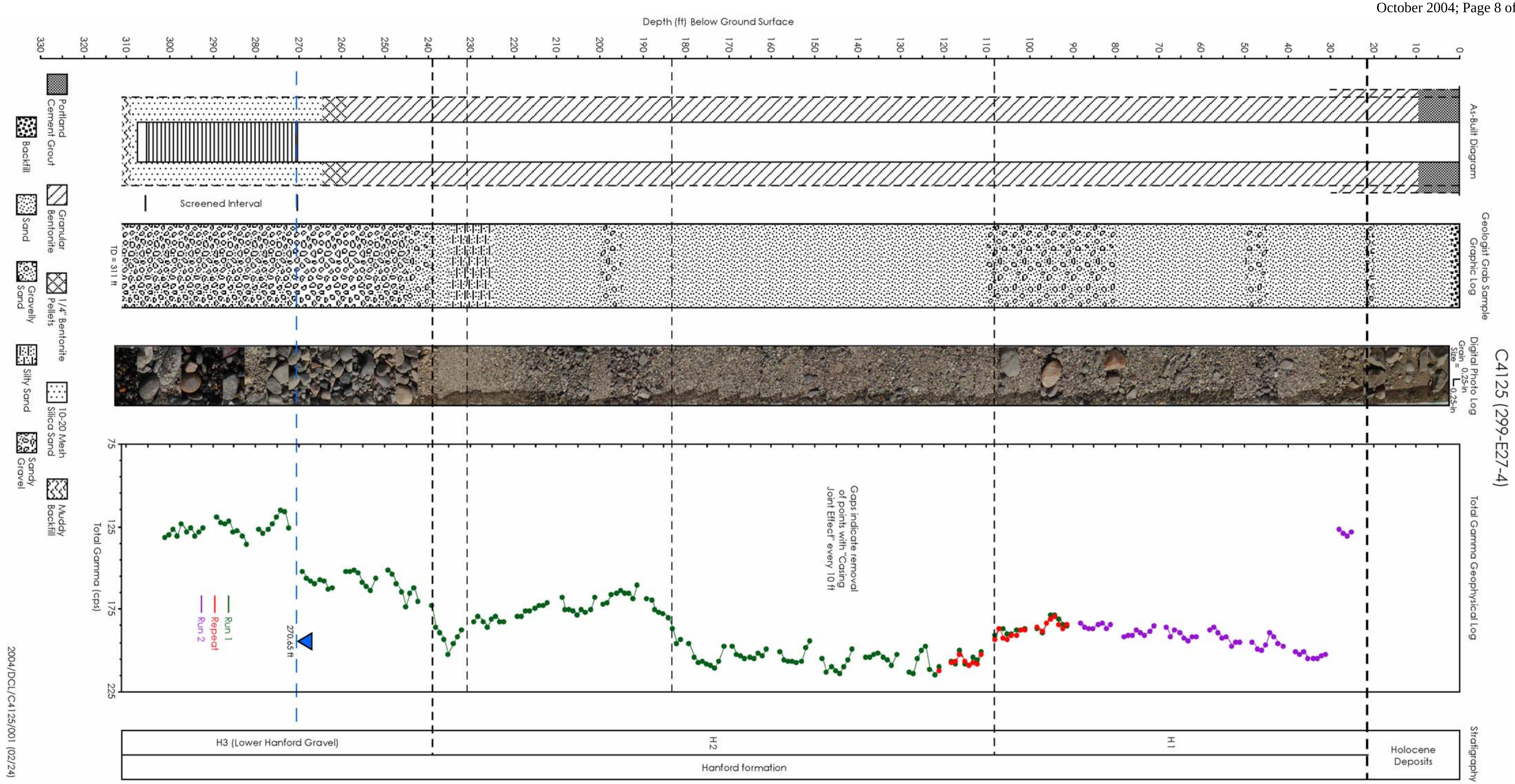

PLATE 5. Geologic Section for Well 299-E27-4 near Single-Shell Tank Farm WMA C (after PNNL-14656)

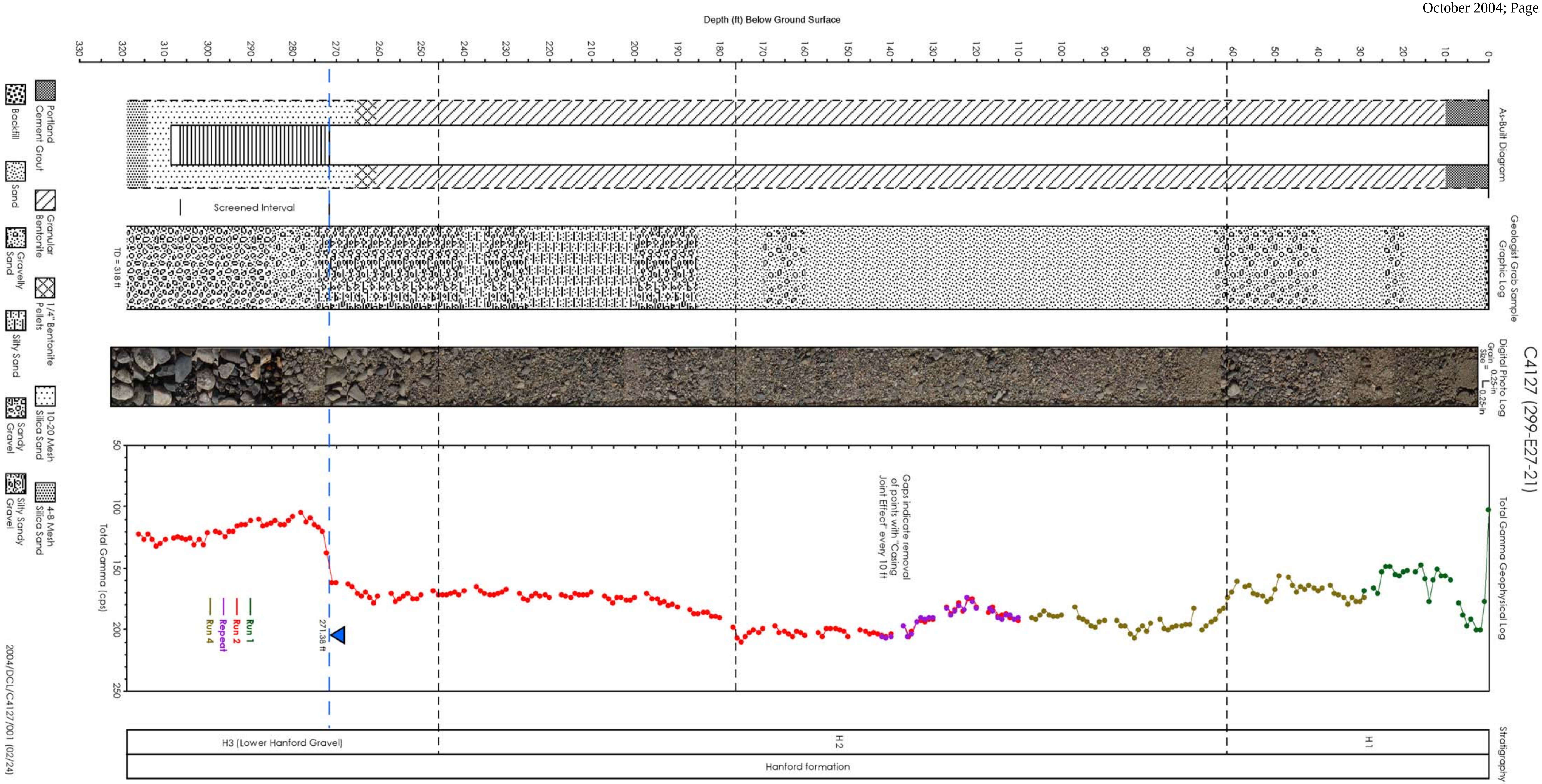

PLATE 6. Geologic Section for Well 299-E27-21 near Single-Shell Tank Farm WMA C (after PNNL-14656)

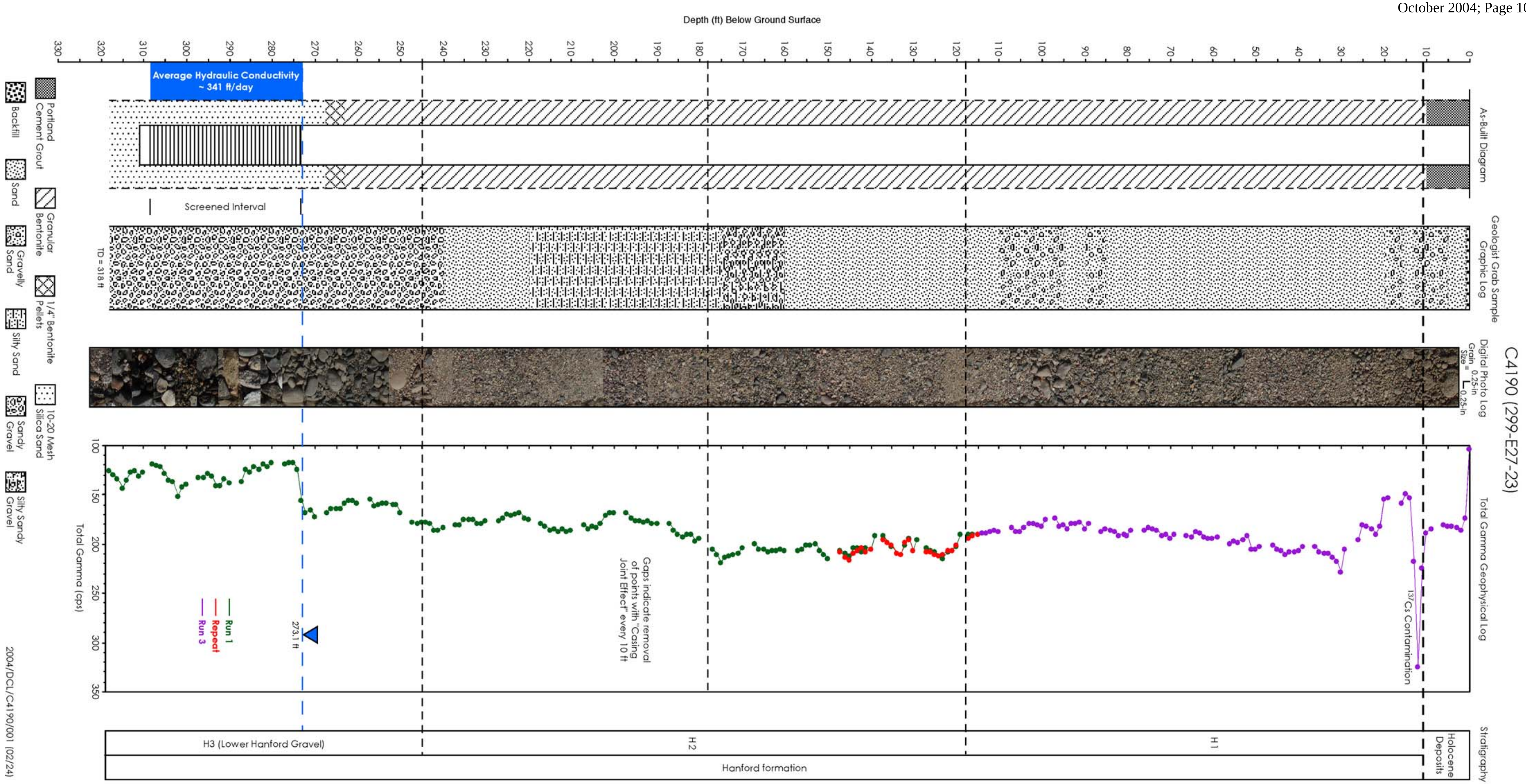

PLATE 7. Geologic Section for Well 299-E27-23 near Single-Shell Tank Farm WMA C (after PNNL-14656)

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