# Appendix D

# Analytical Data

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# D1 Introduction

This appendix includes a series of tables of soil and water data for 100-BC. Unless otherwise noted, data were derived from the Hanford Environmental Information System (HEIS) database, which is designated as the central repository for Hanford Site environmental data. Users may access HEIS via the Hanford Site Environmental Dashboard Application http://environet.hanford.gov/EDA.

## D1.1 Field Name Definitions

This section includes an alphabetical list of selected field names (column headers) used in the accompanying data tables. *HEIS Sample, Result, and Sampling Site Data Dictionary* (HNF-38155, Rev. 1) contains a full listing of field names and their meanings.

EASTING – Geographic east-west coordinates of the sample site in meters (North American Datum of 1983).

LAB_QUALIFIER – A code that qualifies the associated result. These codes are reported by the analytical laboratory. The meaning of many codes depends on the METHOD_CATEGORY. Table D-1 describes laboratory qualifier codes.

NORTHING – Geographic north-south coordinates of the sample site in meters (North American Datum of 1983).

RESULT_COMMENT -- comments about the result record may be entered. Entries into this column are not reported by the laboratories but are added by data reviewers.

REVIEW_QUALIFIER -- A code indicating that the quality of the record has been questioned by the reviewer. Table D-2 defines the codes.

SAMP_DATE_TIME – Date the sample was collected.

SAMP_NUM -- A unique identifier for a physical sample.

SAMP_SITE_NAME – Well name, borehole number, or in the case of test pits, waste site name associated with the sample.

STD_ANAL_UNITS_RPTD – Analytical units for results.

STD_CON_LONG_NAME – Standardized name of the constituent or property reported.

STD_COUTING_ERROR -- Error value measured by counting disintegrations of radioactive analytes, reported in the same units as the STD_VALUE_REPORTED. This error serves as a lower bound for the uncertainty of the measurement.

STD_MDA – Minimum detectable activity, typically dependent on the measured instrument background and sample yield, reported in the same units as the STD_VALUE_REPORTED. Generally, it depends on the actual aliquot, count time, yield, efficiency, decay correction, and some measurement of the background. The background might be from associated instrument blanks, reagent blanks, baseline information for the sample, or some combination of these.

STD_SAMP_INTV_BOT -- Depth below land surface of bottom of sampling device, standardized to units of meters.

STD_SAMP_INTV_TOP – Depth below land surface of top of sampling device, standardized to units of meters.

STD_TOTAL_ANAL_ERROR -- A combination of counting error plus a laboratory-specific estimate dependent on the chosen analysis methods, representing sample-specific error (at 2 sigma) that could possibly be introduced into the analysis while at the laboratory, reported in the same units as the STD_VALUE_REPORTED. For radiological analyses, this is the total propagated uncertainty.

STD_VALUE_RPTD – The analytical result (e.g. concentration), converted if necessary to standard analytical units.

VALIDATION_QUALIFIER -- codes that are assigned by an individual who validates the result; this validation is performed only at the request of the project management for which the sample was collected. If no VALIDATION_QUALIFIER is recorded, then the validator either did not validate the record or agreed with the value reported and LAB_QUALIFIER code(s). Table D-3 defines the codes.

WELL_ID -- Unique well identification number.

WELL_NAME -- Name of the well or borehole from which the sample was collected. Names beginning with 199-B are located in 100-BC. Names beginning 699- are located outside the former operational error. Temporary boreholes and some aquifer tubes have names identical to the WELL_ID. Other well name formats (e.g., 05-M, AT-B-4-S) are aquifer tubes.

**Table D-1. Laboratory Qualifiers**

| Code | Translations |
|---|---|
| * | INORGANICS - Duplicate analysis not within control limits. |
| + | INORGANICS - Correlation coefficient for Method of Standard Additions (MSA) is < 0.995. |
| > | WETCHEM - Result greater than quantifiable range or greater than upper limit of the analysis range. |
| A | ORGANICS - Valid for TICs only: The TIC is a suspected aldolcondensation product. |
| B | INORGANICS and WETCHEM - The analyte was detected at a value less than the contract required detection limit (RDL), but greater than or equal to the IDL/MDL (as appropriate).<br>ORGANICS - The analyte was detected in both the associated.<br>QC blank and in the sample. RADIONUCLIDES - The associated QC sample blank has a result >= 2X the MDA and, after corrections, result is >= MDA for this sample. |
| C | INORGANICS/WETCHEM: The analyte was detected in both the sample and the associated QC blank, and the sample concentration was <= 5X the blank concentration.<br>ORGANICS (PESTICIDE only) – The identification of a pesticide confirmed by gas chromatograph/mass spectrometer (GC/MS). |
| D | All - Analyte was reported at a secondary dilution factor, typically DF>1 (i.e., the primary preparation required dilution to either bring the analyte within the calibration range or to minimize interference). Required for organics/wetchem if the sample was diluted. |
| E | INORGANICS - Reported value is estimated because of interference. See comment on cover page, hardcopy case narrative, or specific inorganic hardcopy data sheet.<br>ORGANICS - Concentration exceeds the calibration range of the GC/MS. |

**Table D-1. Laboratory Qualifiers**

| Code | Translations |
|---|---|
| J | ORGANICS - Estimated value; (1) constituent detected at a level less than the RDL or PQL and greater than or equal to the MDL, (2) estimated concentration for tentatively identified compounds (TICs). Note - For HEIS data generated prior to December 1, 2002, laboratories may have applied a “J” qualifier to non-organic results. When applied, application was based primarily on criteria comparable to statement (1) above. Prior to January, 1998, validation qualifiers (including “J”) were recorded in the LAB_QUALIFIER field without identification as validation qualifiers. |
| L | MDL <= value < CRQL [RETIRED]. |
| M | INORGANICS - Duplicate precision criteria not met. |
| N | ALL (except GC/MS based analysis) - Spike and/or spike duplicate sample recovery is outside control limits. ORGANICS (GC/MS only) - Presumptive evidence of compound based on mass spectral library search. |
| P | ORGANICS (PCB only) - Aroclor target analyte with greater than 25% difference between column analyses. |
| Q | ORGANICS (Dioxins & PCB Congeners only) – Estimated maximum concentration. Used if one of the qualitative identification criteria is not met (e.g., Cl isotopic ratios outside theoretical range.) |
| S | INORGANICS - Reported value determined by the Method of Standard Additions (MSA). |
| T | Organics (GC/MS only) - Spike and/or spike duplicate sample recovery is outside control limits. |
| U | ALL - Analyzed for but not detected above limiting criteria. Limiting criteria may be any of the following: value reported < 0; value reported < counting error ; value reported < total analytical error; value_rptd <=contract MDL/IDL/MDA/PQL . Note – When another qualifier accompanies a "U" qualifier the result is always considered non-detected. The qualifier combinations "UJ" and "UL" indicate that the result was non-detected, but the detection limit (i.e., value reported in the VALUE_RPTD or MIN_DETECTABLE_ACTIVITY [rad analysis only] fields was estimated. |
| W | INORGANICS - Post-digestion spike recovery for GFAA out of control limit. Sample absorbency <50 percent of spike absorbency. |
| X | ALL – The result-specific translation of this qualifier code is provided in the hardcopy data report and/or case narrative. Additional result-specific translation information may also be found in the RESULT_COMMENT field for this record. |
| Y | Same as X if more than one flag is required. In the process of being retired. |
| Z | Same as X and Y if more than two flags are required. In the process of being retired. |

**Table D-2. Review Qualifiers**

| Code | Translations |
|---|---|
| F | This code is temporarily assigned while the result is undergoing further review. |
| G | Record has been reviewed and determined to be correct, or the record has been corrected with laboratory confirmation or other supporting information. |
| H | Laboratory holding time exceeded before the sample was analyzed. |
| P | Potential problem. Collection/analysis circumstances makes value questionable. |
| Q | Associated quality control sample is out of limits. |
| R | Do not use. Further review indicates the result is not valid. |
| Y | Result suspect. Review - insufficient evidence to show result valid or invalid. |
| Z | Miscellaneous circumstances exist. Additional information may be found in the RESULT_COMMENT field for this record and/or in the SAMP_COMMENT field of the parent sample record. |

**Table D-3. Validation Qualifiers**

| Code | Translations |
|---|---|
| J | Estimated value: The associated result value may not reflect quantitation/detection levels (if assigned with an associated "U" qualifier) or actual concentrations with the precision/accuracy typically associated with results by this methodology. Result<br>precision/accuracy may have been impacted due to minor quality control deficiency/s or sample matrix interferences identified during data validation. |
| R | Rejected value: The value may not reflect true concentrations. The ability to establish detection/ non-detection may be questionable. Validation activities identified major quality control deficiency/s or sample matrix interferences. The data should be considered unusable for most purposes. Any use of this data should be undertaken with great care. The data should not be used for certain regulatory decision-making purposes. |
| U | Functional non-detect: The constituent was analyzed for and reported as detected by the laboratory. The constituent has been assigned a non-detect qualifier due to associated low-level analytical batch contamination or other circumstances noted by the validator that indicates that use of the data as detected is inappropriate. Validation may result in a revised reported value. Revised results typically involve substituting the quantitation/reporting limit if greater than the initial laboratory reported value. This qualifier may be assigned along with either, but never both, of the other validation qualifiers. In that case, both definitions apply to the associated result. The data should be considered usable as a non-detect for most decision-making purposes. |

## D1.2 Soil Data

The file "WCH_CVPdata_05July2011.xlsx" lists Cleanup Verification Package (CVP) data from interim remediated waste sites, collected between 1995 and June 2011.

The file "BC_RIFS_SoilData_05July2011.xlsx" lists analytical data from soil samples collected as part of the Remedial Investigation (RI) between October 2009 and June 2011. The samples were collected from vadose zone boreholes, test pits, and monitoring wells. Data include chemicals, radionuclides, and physical properties.

The file "118-B-1_ESD"lists analytical data from soil samples collected to further characterize the 118-B-1 Burial ground. This data was collected to support an explanation of significant difference to the *Interim Remedial Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-2, 100-HR-2, and 100-KR-2 Operable Units, Hanford Site (100 Area Burial Grounds), Benton County,* Washington (EPA/ROD/R10-00/121), to further characterize tritium contamination beneath the burial ground.

## D1.3 Groundwater Data

The groundwater file "BC_GW_Jan07toMar12.xlsx" was generated from the HEIS database. The file includes field and laboratory data from groundwater samples collected between January 1, 2006 and March 31, 2012 from wells, aquifer tubes, or boreholes in 100-BC. Review of the most recent data may not yet be complete; some analyses may be in the process of being flagged and/or re-reported. Consequently, groundwater data are subject to change in HEIS. Users of data in these files should keep in mind that current data can always be obtained from HEIS.

## D1.4 Water Levels

This section includes water-level data from manual or automated measurements in wells, and automated river stage data measured at 100-BC.

The data file "BC_Manual_WL.xlsx" includes manual water-level measurements in 100-BC wells and a few 600 Area wells near 100-BC for dates from 1949 to March 2012. The text below explains field codes that are specific to water-level data. Other field codes are explained in Section D.1.

HYD_DATE_TIME_PST -- Date of measurement

HYD_HEAD_METERS_NAVD88 -- Water level elevation in meters above North American Vertical Datum of 1988

DEPTH_TO_WATER_MP -- Measured depth below measuring point

DEPTH_TO_WATER_MP_UNITS -- Units in which original measurement made

RP_ELEV_METERS_NAVD88 -- Elevation of reference point in meters above North American Vertical Datum of 1988

MP_MINUS_RP -- Difference in elevation between measuring point and reference point

MP_MINUS_RP_UNITS -- Units of depth

DEPTH_TO_WATER_RP -- Depth below reference point

DEPTH_TO_WATER_RP_UNITS -- Depth units

REVIEW_QUALIFIER -- Indicator code that the quality of the data point is questioned, assigned by the data owners. Table D-3 explains the qualifier codes.

As part of the RI, selected 100-BC wells were equipped with pressure transducers and data loggers to collect hourly water-level measurements. The transducer stations became active at varying times between December 2010 and April 2011. The data files include data through September 21, 2011. Data files from the automated water level network begin with "AWLN_" followed by the well name and date. Data are included for the following wells.

- 199-B2-12 (monitors Ringold upper mud [RUM] unit)
- 199-B2-14 (monitors top of unconfined aquifer
- 199-B2-15 (monitors RUM)
- 199-B3-47 (monitors top of unconfined aquifer
- 199-B3-51 (monitors bottom of unconfined aquifer)
- 199-B4-14 (monitors top of unconfined aquifer
- 199-B5-6 (monitors bottom of unconfined aquifer)
- 199-B5-8 (monitors top of unconfined aquifer
- 199-B8-6 (monitors top of unconfined aquifer

The automated water-level network also includes a gauge in the Columbia River at 100-BC. The data file includes hourly river stage data for January 1, 2006 through September 21, 2011.

## D2 References

EPA/ROD/R10-00/121, 2000, *Interim Remedial Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-2, 100-HR-2, and 100-KR-2 Operable Units, Hanford Site (100 Area Burial Grounds), Benton County, Washington*, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington. Available at: http://www.epa.gov/superfund/sites/rods/fulltext/r1000121.pdf.

HNF-38155, ___, *HEIS Sample, Result, and Sampling Site Data Dictionary*, Rev. 1, Fluor Hanford, Inc., Richland, Washington.