0098510

TRI-PARTY AGREEMENT

Change Notice Number TPA-CN- 460	TPA CHANGE NOTICE FORM	Date: May 9, 2011
Document Number, Title, and Revision: DOE/RL-2009-40, *Sampling and Analysis Plan for the 100-DR-1, 100-DR-2,100-HR-1, 100-HR-2, and 100-HR-3 Operable Units Remedial Investigation/Feasibility Study*, Rev. 0		Date Document Last Issued: March 25, 2010
Originator Jon McKibben/Fred Biebesheimer		Phone: 373.4677/373.1928

Description of Change:
Replaces pages 1-1/2, 3-27/28, 3-29/30, and 3-31/32 with the attached. These changes are in addition to those issued in TPA CN-368. The change allows drilling and sampling for Well R5 to a total depth of approximately 5 feet into the Ringold Fm Upper Mud (RUM) Unit and the well to be completed within the unconfined aquifer.

Briant Charboneau (DOE) and Nina Menard (Lead Regulatory Agency) agree that the proposed change modifies an approved workplan/document and will be processed in accordance with the Tri-Party Agreement Action Plan, Section 9.0, *Documentation and Records,* and not Chapter 12.0, *Changes to the Agreement.*

Note: Include affected page number(s)

Justification and Impacts of Change:

Well 199-D5-141 was installed approximately 300 feet west of the planned location for Well R5 and completed within the first water-bearing unit of the RUM Unit. Soil/aquifer sediment samples were collected during drilling to characterize deep vadose zone, unconfined aquifer, RUM Unit, and Ringold Fm Unit B. Water samples were collected during drilling to characterize groundwater in the unconfined aquifer, RUM Unit, and Ringold Fm Unit B. Samples were analyzed in accordance with Tables 2-18 and 2-19 of DOE/RL-2009-40, Rev 0. Data obtained is being used to partially fill Data Need numbers 7, 10, and 12 listed in the *Integrated 100 Area Remedial Investigation/Feasibility Study Work Plan Addendum 1: 100-DR-1, 100-DR-2,100-HR-1, 100-HR-2, and 100-HR-3 Operable Units* (DOE/RL-2009-46ADD5, Rev. 0).

Drilling and sampling for Well R5 will be to a total depth of approximately 5 feet into the RUM Unit and the well will be completed within the unconfined aquifer. Samples will be as listed in the revised Table 3-1 (attached). The results obtained will be used to partially fill Data Need numbers 2, 5, and 10 (DOE/RL-2009-46-ADD5). The associated changes listed in the following pages include:

- To Table 1-1, move Well R5 to "New wells to characterize deep vadose zone and unconfined aquifer" and update quantities. Change affects page 1-1.
- Table 3-1, Revise entry for Well R5 to allow for sampling to 5 feet into the RUM Unit. Add entry for Well 199-D5-141. Change affects pages 3-27 and 3-28.
- Table 3-1, update estimated sample totals. Change affects pages 3-29 and 3-30.
- Section 3.5.2.1 "New Groundwater Wells," "Well Depth and Screen Placement," update number of new groundwater wells in the unconfined aquifer from five to six. Change affects page 3-31.

Approvals:

DOE Project Manager	8-29-2011 Date	[X] Approved [ ] Disapproved
Ecology Project Manager	9-1-11 Date	[X] Approved [ ] Disapproved

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1 Introduction

This sampling and analysis plan (SAP) supports the remedial investigation (RI)/ feasibility study (FS) process for the 100-D/H Area. The 100-D/H Area is located on the Hanford Site in southeastern Washington State and is associated with four source operable units: 100-DR-1, 100-DR-2, 100-HR-1, and 100-HR-2. The 100-HR-3 Groundwater Operable Unit underlies the four source operable units. This SAP describes the sampling and analysis to be performed associated with environmental investigation wells for soil samples (boreholes), test pits, groundwater monitoring wells, and aquifer tubes within the area. Figure 1-1 shows the location of the planned and existing boreholes, test pits, groundwater monitoring wells, and aquifer tubes within the scope of this SAP. Chapter 2 of DOE/RL-2008-46-ADD1, *Integrated 100 Area Remedial Investigation/Feasibility Study Work Plan Addendum 1: 100-DR-1, 100-DR-2, 100-H-1, 100-H-2, and 100-H-3 Operable Units* (Addendum 1) describes the site background and environmental setting of the area. Table 1-1 presents the intersection of data needs discussed in Addendum 1 and sampling and analysis activities.

Table 1-1. Plan Activities and Data Needs

Planned Activity	100-D Area		100-H Area		Data Needs No.[a]
	Quantity	Location	Quantity	Location	
New boreholes (vadose zone)[b]	5	116-D-1B Trench 116-D-7 Retention Basin 116-DR-1&2 Trench 116-DR-9 Retention Basin 118-D-6 Reactor Fuel Storage Basin	5	116-H-1 Trench 116-H-4 Pluto Crib 116-H-6 Solar Evaporation Basin 116-H-7 Retention Basin 118-H-6 Reactor Fuel Storage Basin	1, 2, 3, 12
Number of test pits	3	100-D-4 Trench 100-D-12 French Drain 116-D-4 Crib	2	116-H-2 Liquid Waste Trench 1607-H4-Septic Tank and Drain Field	2, 12
New wells to characterize deep vadose zone and unconfined aquifer[b]	6	Well #2 Well #3 Well #4 (116-D-1A) Well #5 Well #9 Well R5[c]	5	Well #6 Well #7 Well #10 Well #11 Well #12	5, 10
New wells to characterize deep vadose zone, unconfined aquifer, Ringold Upper Mud Unit, and Ringold Formation Unit B[b]	2	Well R4 199-D5-141	3	Well R1 Well R2 Well R3	7, 10, 12
New aquifer tubes	3 tubes at 1 location	Location #1	3 tubes at 1 location	Location #8	5

This revised Table 1-1 (pages 1-1 and 1-2) were approved under TPA-CN-368 and TPA CN-460

Table 1-1. Plan Activities and Data Needs

Planned Activity	100-D Area		100-H Area		Data Needs No.[a]
	Quantity	Location	Quantity	Location	
Sample spatial/temporal uncertainty groundwater monitoring wells[d]	53 existing locations				13

Notes:
This SAP is in addition to field activities described in DOE/RL-2009-09, *Sampling and Analysis Plan for Installation of 100-HR-3 Groundwater Operable Unit Remedial Process Optimization Wells*, and other planned activities.

a. Data needs are listed in Table 4-6 of DOE/RL-2008-46-ADD1, *Integrated 100 Area Remedial Investigation/Feasibility Study Work Plan Addendum 1: 100-DR-1, 100-DR-2,100-H-1, 100-H-2, and 100-H-3 Operable Units* (Addendum 1).

b. Boreholes and groundwater monitoring wells will be logged with a neutron moisture tool and the high-resolution, spectral gamma ray logging system. Geologic samples also will be logged.

c. A well completed within the first water-bearing interval of the RUM Unit, Well 199-D5-141, was installed approximately 300 feet west of the planned location for Well R5. Samples were collected during drilling to characterize deep vadose zone, unconfined aquifer, RUM Unit, and Ringold Fm Unit B; analyzed in accordance with Tables 2-18 and 2-19; and results obtained will be used to address Data Need numbers 7, 10, and 12 listed in Addendum 1. Because recent data from the vicinity of Well R5 exists to address these data needs, drilling for Well R5 will extend approximately 5 feet into the RUM Unit and the well will be completed in the unconfined aquifer to obtain data for use in filling other data needs.

d. Well 199-D5-41 converted to injection well and will not be included in network for all sampling rounds.

This revised Table 1-1 (pages 1-1 and 1-2) were approved under TPA-CN-368 and TPA CN-460

Table 3-1. Sample/Measurement Locations and Depth

Sampling Location	Soil/Aquifer Sediment Sample/Measurement[a]		Water Sample/Measurement	
	Sample Interval Depth (ft bgs)[b]	Properties of Interest	Sample Interval Depth (ft bgs)	Analyte List
Well R5 to be drilled and installed in the unconfined aquifer at 100-D-12 in the 100-D area.Justification: Proposed to assess vadose zone contamination beneath the remediated waste site)100-D-12) and contamination in groundwater.	During drilling grab samples will be collected every 5 ft or where lithology changes occur in one pint jar and a chip tray from the drill cuttings.[d]	Geologic archive samples and field screening parameters in accordance with Table 2-18.	During drilling, samples to be collected at 4-ft intervals through the approximately 15-ft-thick unconfined aquifer (4 samples). During drilling 5 ft into the water table and near the bottom of unconfined aquifer (2 filtered groundwater samples).	Unfiltered groundwater samples will be analyzed for constituents and field screening parameters in accordance with Table 2-19. Filtered groundwater sample will be analyzed for metals and Cr(VI) in accordance with Table 2-19 to support K_d determination. Cr(VI) data will be used, as possible, to refine the nature and extent of chromium contamination.
	During drilling, samples to be collected at 5-ft intervals after initial samples at 23 ft, 26 ft, and 29 ft ft, continuous beginning at 10 ft above water table, at water table, 5 ft below water table, and near the bottom of the unconfined aquifer by split spoon. Two samples will be collected directly above and below the Hanford/Ringold contact (approximately 61 ft bgs) (21 samples).	Target analytes, field screening parameters, and batch leach test in accordance with Table 2-18. Samples collected at 26 ft, 29 ft, and at the Hanford/Ringold contact will only be analyzed for hexavalent chromium and total chromium. Aquifer sediment samples will be analyzed for metals, Cr(VI) and batch leach test in accordance with Table 2-18. Aquifer sediment sample analyses will include K_d determinations for metals and Cr(VI).		
	Major formation and lithology changes, and 10 and 5 ft above the Hanford Ringold contact, at the Hanford Ringold contact, and 5 ft below the Hanford Ringold contact by split spoon (4 samples).	Physical properties in accordance with Table 2-18.		

These revised pages 3-27 through 3-30 of Table 3-1 were approved under TPA-CN-368 and TPA CN-460

Table 3-1. Sample/Measurement Locations and Depth

Sampling Location	Soil/Aquifer Sediment Sample/Measurement[a]		Water Sample/Measurement	
	Sample Interval Depth (ft bgs)[b]	Properties of Interest	Sample Interval Depth (ft bgs)	Analyte List
Well 199-D5-141 - Drill and sample soil and groundwater from through the Ringold Upper Mud Unit and into Ringold Formation Unit B and completed in the Ringold Upper Mud Unit at 100-D-12 in the 100-D area. If well is at the same location as the test pit, the test it will be installed and backfilled before the well is installed. Justification: This data is needed to evaluate alternative CSM components regarding whether groundwater contamination is from vadose zone sources (in the periodically wetted zone), within the unconfined aquifer, above the Ringold Upper Mud Unit, or within the Ringold Upper Mud Unit and diffusing to the unconfined aquifer.	During drilling grab samples will be collected every 5 ft or where lithology changes occur in one pint jar and a chip tray from the drill cuttings.[d]	Geologic archive samples and field screening parameters in accordance with Table 2-18.	During drilling, samples to be collected at approximately 82.5, 87.5, 92.5, 97.5, 102.5, 107.5, 112.5, and 117.5[f], and from water-bearing intervals of the Ringold Upper Mud Unit and one water sample from Ringold Formation Unit B if sufficient water is available (11 samples). During drilling 87.5-90 and ~120.5[f] (2 filtered groundwater samples).	Unfiltered groundwater samples will be analyzed for constituents and field screening parameters in accordance with Table 2-19. Filtered groundwater sample will be analyzed for metals and Cr(VI) in accordance with Table 2-19 to support K_d determination. Cr(VI) data will be used, as possible, to refine the nature and extent of chromium contamination.
	25-27.5, 30-32.5, 35-37.5, 40-42.5, 45-47.5, 50-52.5, 55-57.5, 60-62.5, 65-67.5, 70-72.5, 72.5-75, 75-77.5, 77.5-80, 80-82.5, 82.5-85 (87.5-90[e] and 120 aquifer sediment samples) by split spoon (17 samples).	Target analytes, field screening parameters, and batch leach test in accordance with Table 2-18. Aquifer sediment samples will be analyzed for metals, Cr(VI) and batch leach test in accordance with Table 2-18. Aquifer sediment sample analyses will include K_d determinations for metals and Cr(VI).		
	During drilling, samples to be collected from the top, 25 and 50 into the Ringold Upper Mud Unit by split spoon (3 samples).	Target analytes, field screening parameters, and batch leach test in accordance with Table 2-18. Aquifer sediment sample analyses will include K_d determinations for metals and Cr(VI).		
	Major formation and lithology changes, and 10 and 5 ft above the Hanford Ringold contact, at the Hanford Ringold contact, and 5 ft below the Hanford Ringold contact by split spoon (4 samples).	Physical properties in accordance with Table 2-18.		
Sample 53 spatial and temporal uncertainty monitoring wells; three rounds.[j]	None	None	Three rounds of sampling will be occur that will	Constituents and field screening parameters in

These revised pages 3-27 through 3-30 of Table 3-1 were approved under TPA-CN-368 and TPA CN-460

Table 3-1. Sample/Measurement Locations and Depth

Sampling Location	Soil/Aquifer Sediment Sample/Measurement[a]		Water Sample/Measurement	
	Sample Interval Depth (ft bgs)[b]	Properties of Interest	Sample Interval Depth (ft bgs)	Analyte List
			represent low (October 2009), high (May 2010), and transition (February 2010) river stages (157 samples).	accordance with Table 2-19.
Sample 6 new aquifer tubes (Table 3-2); three rounds.	None	None	Three rounds of sampling will be occur that will represent low (October 2009), high (May 2010), and transition (February 2010) river stages (6 aquifer tubes x 3 rounds = 18 samples).	Constituents and field screening parameters in accordance with Table 2-19 (see Table 3-3 for additional information).
Estimated total number of samples.[i]	Soil/Aquifer sediment chemical: 319 Physical property: 68 Geologic archive samples: variable		Water samples collected during drilling: 113 Spatial and temporal uncertainty samples: 157 (3 rounds total) Aquifer tube samples: 18 samples (3 rounds total)	
Estimated minimum number of field quality control samples.[i]	Soil/Aquifer sediment chemical: 52 (17 equipment blank, 17 field blank, 17 duplicate, 1 split) Physical property: 0 Geologic archive samples: 0		Water samples collected during drilling: 19 (6 equipment blank, 6 field blank, 6 duplicate, 1 split) Spatial and temporal uncertainty samples: 30 (3 equipment blank, 3 field blank, 3 duplicate, 1 split each round, 3 total rounds) Aquifer tube samples: 9 (1 equipment blank,1 field blank, 1 duplicate for each round, 3 total rounds)	

These revised pages 3-27 through 3-30 of Table 3-1 were approved under TPA-CN-368 and TPA CN-460

Table 3-1. Sample/Measurement Locations and Depth

Sampling Location	Soil/Aquifer Sediment Sample/Measurement[a]		Water Sample/Measurement	
	Sample Interval Depth (ft bgs)[b]	Properties of Interest	Sample Interval Depth (ft bgs)	Analyte List
Estimated total number of samples.[i]	Soil/aquifer sediment chemical: 351 Physical property: 64 Geologic archive samples: variable		Water samples collected during drilling: 129 Spatial and temporal uncertainty samples: 187 Aquifer tube samples: 27	

Notes:

a. Geologic samples will be logged. Boreholes and groundwater monitoring wells will be logged with a neutron moisture tool and the high-resolution, spectral gamma ray logging system. Information regarding the downhole geophysical logging analytical performance requirements is presented in Table 2-2.

b. Upon visual observation of contamination, a depth discrete sample will be collected for applicable analysis. For example, if Cr(VI) contamination is observed at any interval other than those stated for sampling, a depth discrete sample would be collected for Cr(VI) analysis.

c. This sample will be collected 5 ft into the water table.

d. Archive samples may be omitted at the discretion of the field geologist due to radiological field data.

e. Sample depths are approximate and based on historic information from the surrounding wells. Actual depths may vary from those listed. Samples are intended to be collected at 15, 10, 5, and 2 ft above water table, at the water table, 5 ft below the water table, and at the bottom of the unconfined aquifer.

f. Depths are approximate and based on the average groundwater levels measured at wells in the area in 2008. Unfiltered groundwater samples are to be collected at 5-foot intervals through the unconfined aquifer. The filtered groundwater sample is to be collected at 5-feet into the water table. If a second filtered groundwater sample is to be collected, sample is to be collected at the bottom of the unconfined aquifer.

g. Sample depths are approximate and based on historic information for surrounding wells and boreholes. Actual depths may vary by several meters from those listed. Samples are to be collected at 10 and 5 ft above Hanford-Ringold contact, at the Hanford-Ringold contact, and 5 ft below the Hanford-Ringold contact.

h. Sample depths are approximate and based on historic information for surrounding wells and boreholes. Actual depths may vary by several meters from those listed. Samples are to be collected at the top, 25 ft into, and 50 ft into the Ringold Upper Mud Unit.

i. Number of samples is estimated. Actual number of samples collected may vary based on conditions encountered in the field (e.g., additional samples may be collected based on field observations).

j. Fifty two wells in network after well 199-D5-41 is converted to injection well.

BHI-00127, *100-H Area Technical Baseline Report.*

DOE/RL-93-29, *Limited Field Investigation Report for the 100-DR-1 Operable Unit.*

EPA/ROD/R10-95/126, *Declaration of the Record of Decision for the 100-BC-1, 100-DR-1, and 100-HR-1 Operable Units Hanford Site, Benton County, Washington.*

UNI-946, UNI-946, *Radiological Characterization of the Retired 100 Areas.*

WAC 173-340, "Model Toxics Control Act—Cleanup," 2007

WHC-EN-TI-181, 1983, *100-D Area Technical Baseline Report.*

CSM = conceptual site model
Cr(VI) = hexavalent chromium
K_d = distribution coefficient
MTCA = model toxics control act
PAH = polynuclear aromatic hydrocarbon

These revised pages 3-27 through 3-30 of Table 3-1 were approved under TPA-CN-368 and TPA CN-460

3.5.2 Groundwater Characterization

Groundwater characterization, including well activities, identification of wells to be sampled, well depth and screen placement, and well drilling and completion procedures, is discussed in this section. Figure 3-1 depicts the general well schematic.

3.5.2.1 New Groundwater Wells

Table 3-1 summarizes groundwater well activities. For each new well installed, slug tests will be performed after development. Larger scale pumping tests will be planned for groups of wells based on the results of the slug tests and proximity to key waste sites.

Well Depth and Screen Placement

For the six new groundwater wells in the unconfined aquifer in 100-D and five new groundwater wells in the unconfined aquifer in 100-H, a 6.1-m (20-ft) screen will be installed and centered so the middle of the screen is at the water table. For the two new groundwater wells in 100-D and the three new groundwater wells in 100-H to be drilled to Ringold Formation Unit B, up to a 6.1-m (20-ft) screen will be installed based on ability to produce water in the water-bearing Ringold Upper Mud Unit.

Well Drilling and Completion Procedures

Well drilling will be performed in accordance with WAC 173-160. The wells will be drilled using 25.4-cm (10-in.) diameter (or larger) casing to total depth. The drilling method will be determined based on discussions between the drilling lead and drilling contractor. Well decommissioning, when performed, will be in accordance with WAC 173-160.

The wells will be constructed as 15-cm (6-in.) wells with Schedule 10, Type 304 or 316 stainless steel, V-slot continuous wire wrap screen, atop a 1.5-m (5-ft)-long stainless steel sump with end cap. A Schedule 10 stainless steel riser will be used to extend the permanent well into the vadose zone, with Schedule 10 carbon steel casing through the vadose zone to ground surface. Colorado silica sand will be used for the sand pack; sodium bentonite pellets and/or natural sodium bentonite chunks, crumbles, or powdered bentonite will be used for bentonite sealing material; and Type I/II Portland cement will be used for cement grout.

Surface construction consisting of protective casing, protective guard posts, and cement pad must be in place before job completion. The protective casing will be a minimum of 5 cm (2 in.) larger in diameter than the permanent casing. Protective casing will rise approximately 0.9 m (3 ft) above the ground surface. Permanent casing will rise to approximately 0.3 m (1 ft) below the top of the protective casing. Protective casing will have a lockable well cap extending approximately 38 cm (15 in.) above the top of the protective casing.

Final well design, including screen placement and length, will be determined by concurrence of the field geologist, drilling lead, and operable unit lead based upon field conditions. If the completion is different from WAC 173-160 requirements, then variances will be obtained from Ecology.

This revised Section 3.5.2.1 (pages 3-31 and 3-32) were approved under TPA-CN-460

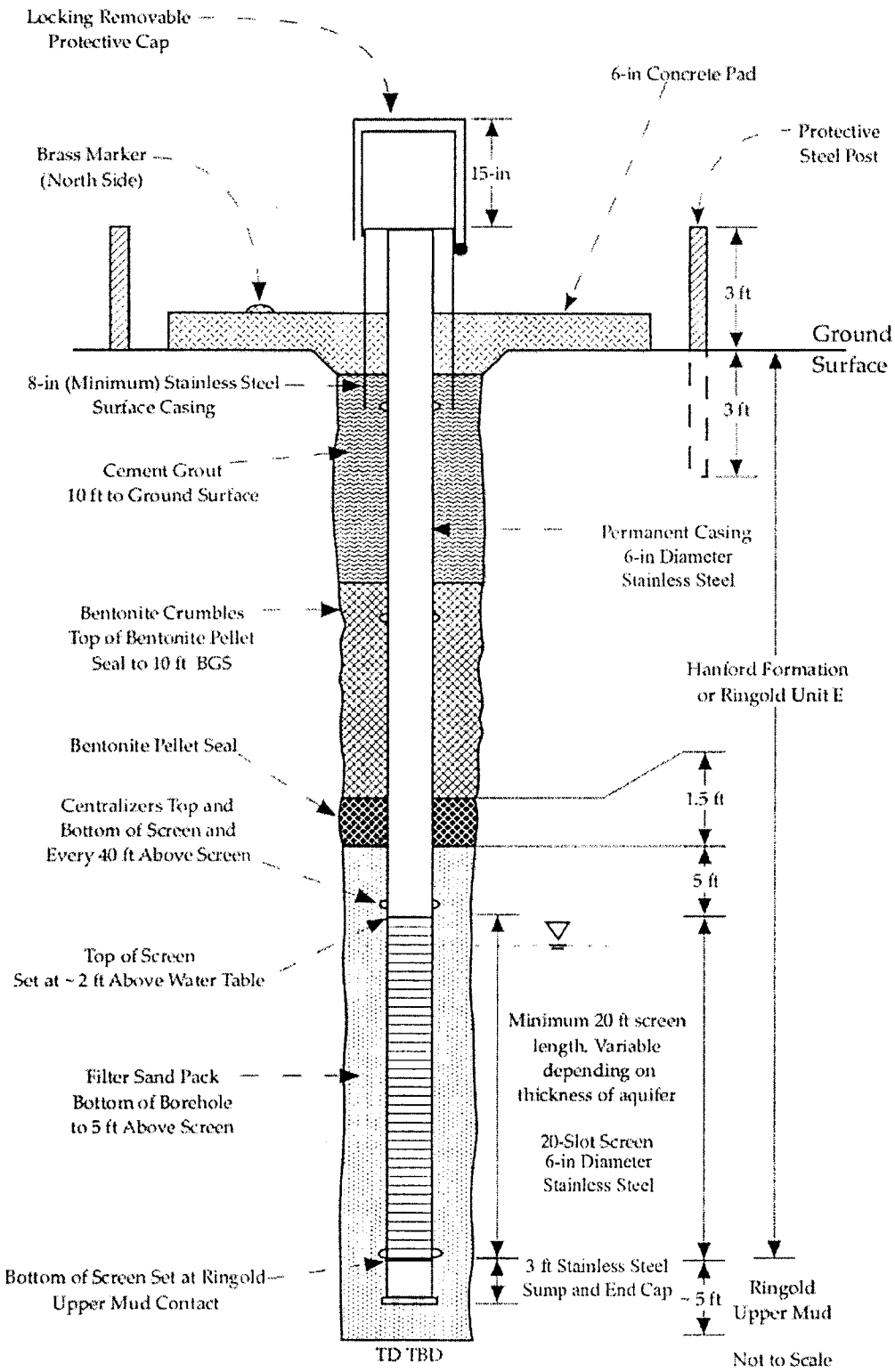

Figure 3-1. General Well Schematic

This revised Section 3.5.2.1 (pages 3-31 and 3-32) were approved under TPA-CN-460