DOE/RL-2011-75
Revision 0

Transition Plan from the Interim 200-ZP-1 Pump-and-Treat System to the Commissioning of the 200 West Area Groundwater Treatment Facility

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

U.S. DEPARTMENT OF
ENERGY

Richland Operations
Office

P.O. Box 550
Richland, Washington 99352

Approved for Public Release;
Further Dissemination Unlimited

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Concurrence Page

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Terms

ATP	acceptance testing procedure
CAT	construction acceptance testing
COC	contaminant of concern
CTF	central treatment facility
DOE	U.S. Department of Energy
ETB	extraction transfer building
FY	fiscal year
IATP	integrated acceptance testing procedure
IRM	interim remedial measure
ITB	injection transfer building
MNA	monitored natural attenuation
OU	operable unit
P&T	pump-and-treat
ROD	Record of Decision
TCE	trichloroethylene
Tri-Party Agreement	*Hanford Federal Facility Agreement and Consent Order*

1 Introduction

This chapter describes the purpose of this transition plan and provides background information for transitioning from the interim 200-ZP-1 Operable Unit (OU) pump-and-treat (P&T) system to the commissioning of the 200 West Area groundwater treatment facility.

1.1 Purpose

The purpose of this transition plan is to document the general approach for terminating operations at the interim 200-ZP-1 OU P&T system, as well as startup and operations of the 200 West Area P&T facility. This plan includes the following:

- Background information, including the contaminants of concerns (COCs) and a brief summary of the project
- Brief description of construction acceptance testing (CAT), acceptance test procedures (ATPs), integrated acceptance test procedures (IATPs), and operational test procedures (OTPs)
- Discussion on *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) (Ecology et al., 1989) milestone-related dates and completion criteria
- General commissioning sequencing
- Well field configuration of the 200-ZP-1 OU during operations into fiscal year (FY) 2012
- Final configuration of the interim 200-ZP-1 P&T system after shutdown
- Repowering extraction well 299-W15-225
- Future use of interim 200-ZP-1 injection well field at injection transfer building 2

1.2 Background

The *Record of Decision Hanford 200 Area 200-ZP-1 Operable Unit Superfund Site, Benton County, Washington* (hereafter referred to as the Record of Decision [ROD]) (EPA et al., 2008) presented the selected remedial action for the 200-ZP-1 Groundwater OU, which was chosen in accordance with *the Comprehensive Environmental Response, Compensation, and Liability Act of 1980*, as amended by the *Superfund Amendments and Reauthorization Act of 1986*; the Tri-Party Agreement (Ecology et al., 1989); and, to the extent practicable, the "National Oil and Hazardous Substances Pollution Contingency Plan" (40 CFR 300*)*. This decision, based on information contained in the Administrative Record for the 200-ZP-l OU, is desired to protect the public health or welfare, and the environment, from actual or threatened releases of hazardous substances, pollutants, or contaminants into the environment.

The U.S. Department of Energy (DOE) is the lead agency for 200-ZP-1 OU remediation and the U.S. Environmental Protection Agency is the lead regulatory agency. Since 1994, the DOE has operated an interim remedial measure (IRM) P&T system to prevent carbon tetrachloride, the primary COC, from spreading in the 200-ZP-1 OU in order to (1) reduce contamination in the area of highest concentrations of carbon tetrachloride, and (2) provide information leading to the development of a final remedy protective of human health and the environment. The IRM P&T system was expanded by adding extraction wells from FY 2005 through FY 2008. During FY 2008, the P&T system included 14 extraction wells and 5 injection wells. Since 1994, more than 5.0 billion L (1.3 billion gal) of groundwater have been extracted, with more than 12,700 kg (28,000 lb) of carbon tetrachloride removed

from the groundwater. Additional information on the IRM is provided in the *Proposed Plan for Remediation of the 200-ZP-1 Groundwater Operable Unit* (DOE/RL-2007-33) and the *Feasibility Study Report for the 200-ZP-1 Groundwater Operable Unit* (DOE/RL-2007-28).

In accordance with the final ROD (EPA et al., 2008), the IRM may continue to operate until such time that the new 200 West Area P&T facility is operational. When the new facility is operational, the IRM extraction wells may be used to augment contaminant recovery performance (DOE/RL-2010-13, *200 West Area Groundwater Pump-and-Treat Remedial Design Report*) and the IRM injection well field to supplement the overall injection capacity.

The *200 West Area 200-ZP-1 Pump-and-Treat Remedial Design/Remedial Action Work Plan* (DOE/RL-2008-78) provided the plan and schedule for implementing the tasks to design, install, and operate the final remedy set forth in the 200-ZP-1 OU final ROD (EPA et al., 2008). The selected remedy combines P&T, monitored natural attenuation (MNA), flow-path control, and institutional controls to meet the objective of achieving established groundwater cleanup levels for all COCs in the 200-ZP- OU in 150 years. The COCs identified for the 200-ZP-l OU are carbon tetrachloride, total chromium (trivalent and hexavalent), nitrate, trichloroethylene (TCE), iodine-129, technetium-99, and tritium. A brief summary of each remedy component is presented below.

1.2.1 Pump-and-Treat Component

The P&T component was designed in combination with MNA to achieve cleanup levels for the COCs listed in Table 11 of the 200-ZP-1 OU final ROD (EPA et al., 2008). An initial pumping rate of 6,057 L/min (1,600 gpm) was evaluated through fate and transport analysis in the feasibility study report (DOE/RL-2007-28), resulting in an estimated duration of about 25 years to capture and remove 95 percent of the carbon tetrachloride mass. Carbon tetrachloride concentrations above 100 µg/L correspond to approximately 95 percent of the carbon tetrachloride mass currently residing in the aquifer. The treated groundwater will then be returned to the aquifer through injection wells.

No single technology is capable of meeting the cleanup levels for the 200-ZP-1 OU within 150 years. Therefore, a series of treatment technologies, known as a treatment train, will be used to remove contaminants from the groundwater once it has been extracted from the ground. Different treatment technologies (Table 1) will be used to achieve the COC cleanup levels, such as the following:

- Ion exchange is used to treat technetium-99 and iodine-129.
- Air stripping is used to treat the volatile compounds carbon tetrachloride and TCE, as well as their degradation products.
- Bioreactors are used to treat nitrate, metals, and volatile compounds.

The remedial design also includes future treatment of other constituents (e.g., uranium) that will be captured by the 200-ZP-1 and 200-UP-1 OU extraction wells. While not considered COCs for the 200-ZP-1 OU, such constituents will be encountered during restoration from sources related to adjacent groundwater OUs.

The 200 West Area P&T facility will be constructed to provide capacity to treat up to 9,464 L/min (2,500 gpm) of extracted groundwater (at 7,571 L/min [2,000 gpm] nominal flow rate) using two parallel treatment trains. The groundwater treatment system will include the unit process components defined in Table 1. The initial extraction and injection well network is projected to include 20 extraction wells for the 200-ZP-1 OU, 3 extraction wells from the 200-UP-1 OU S/SX Tank Farm area, and 16 injection wells (Figure 1).

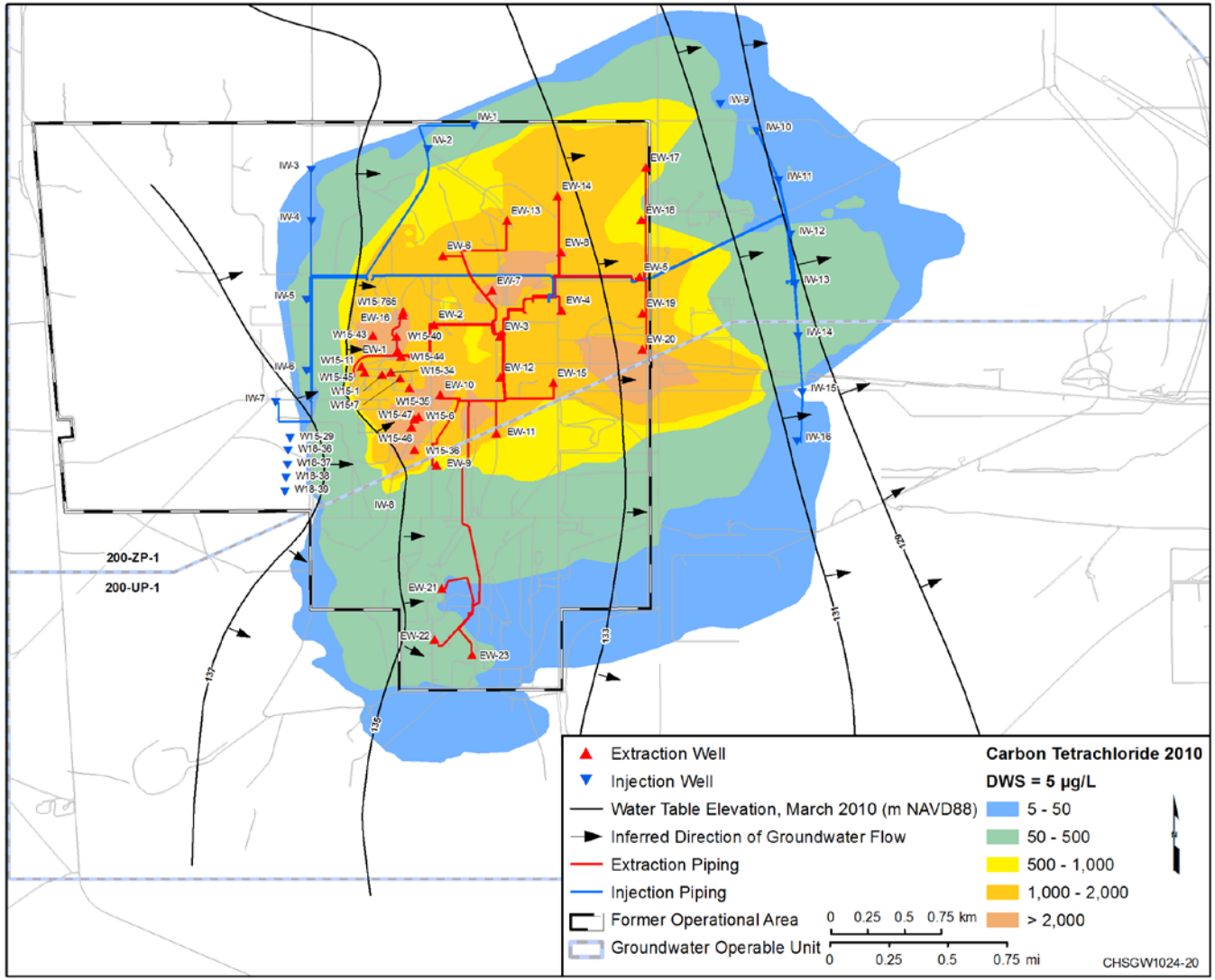
Table 1. 200 West Area Groundwater P&T System Unit Process Descriptions

Unit Process	Process Benefit	Targeted Parameter
Ion exchange	Removal of technetium-99, uranium, and iodine-129	Technetium-99 Iodine-129 Uranium*
Anoxic/anaerobic biodegradation	Removal of nitrate and carbon tetrachloride and conversion of hexavalent chromium to trivalent form	Nitrate Carbon tetrachloride Hexavalent chromium Trichloroethylene
Aerobic biodegradation	Degradation/removal of residual organic carbon substrate Removal of carbon tetrachloride, trichloroethylene, and chloroform	Biological oxygen demand Carbon tetrachloride Trichloroethylene Chloroform
Membrane filtration	Removal of particles, biomass, and precipitated trivalent chromium	Trivalent chromium Turbidity Biological oxygen demand
Air stripping	Removal of volatile organic compounds (carbon tetrachloride, chloroform, and trichloroethylene)	Carbon tetrachloride Trichloroethylene Chloroform
Sludge thickening	Thicken biological solids for dewatering process	Solids content
Sludge dewatering	Reduce water content to allow for landfill disposal	Water content
Lime treatment of dewatered sludge	Lyse micro-organism cells and kill biomass	Stabilized sludge for disposal
Treated water chemistry adjustment	Provide treated water stability	pH and alkalinity

* Uranium treatment is only required for groundwater from the 200-UP-1 OU.

1.2.2 Monitored Natural Attenuation Component

In addition to the P&T system, natural attenuation processes will be used to further reduce COC concentrations to below cleanup levels in 125 years. Natural attenuation processes include abiotic degradation, dispersion, and sorption, and natural radioactive decay for tritium. Monitoring will be performed in accordance with the approved remedial design/remedial action documents to evaluate the effectiveness of the P&T system and natural attenuation processes.



Note: "299-" well name prefix has been removed to conserve space in figure.

Figure 1. 200 West Area Well and Piping Locations in Relation to Carbon Tetrachloride Plume

1.2.3 Flow-Path Control Component

Flow-path control will be achieved by creating a large capture zone by pumping from the extraction wells and injecting treated groundwater into the aquifer to the east (downgradient) of the groundwater contamination. As a result, the natural eastward flow of the groundwater slows and the COCs are retained within the capture zone. Flow-path control has the added benefit of increasing the time available for natural attenuation processes to reduce contaminant concentrations not captured by the extraction wells. Treated groundwater will also be injected upgradient, along the western border of the groundwater contamination, to feed the aquifer and direct contamination eastward toward the extraction wells.

Flow-path control will also be used to minimize the potential for groundwater in the northern portion of the aquifer to flow northward through Gable Gap and toward the Columbia River. Injection wells have been located to redirect the groundwater flow to the east, which is the longest groundwater flow path to the river (approximately 26 km [16 mi]).

1.2.4 Institutional Controls Component

The use of 200-ZP-1 OU groundwater will be restricted through institutional and land-use controls for the foreseeable future until cleanup levels are achieved. A description of these controls and their implementation is provided in the final ROD (EPA et al. 2008) and detailed in the *Sitewide Institutional Control Plans for Hanford CERCLA Response Actions* (DOE/RL-2001-41).

2 Interim 200-ZP-1 Pump-and-Treat System

The IRM P&T system may remain operational until such time that the 200 West Area P&T facility is operational. Fourteen extraction wells and five injection wells are currently installed (Table 2). As extraction wells experience problems (e.g., equipment failure, low-flow shutdown, etc.), the wells are taken offline and disconnected from the system at the wellhead tees. Five extraction wells are currently offline (Table 2). Wells that are currently online but operating at low flow will be taken offline as they run dry and will then be disconnected from the system at the wellhead tee. As allowed, offline wells will be isolated from the process while the system continues to operate. High-density polyethylene pipelines will then be triple rinsed with clean water, blown out with air, and/or drained, and the ends secured with caps, plugs, or flanges. A locked cover will be placed over the wellhead piping. The rinse water will be treated in the process building and then pumped to the injection wells and/or taken to the ModuTanks[1] in the 200 East Area. Pipelines will remain in place until retrieved for disposal.

Table 2. Current Status of Interim 200-ZP-1 P&T System Well Field

Well Type	Well Name*	FY 2011 Flow Rate	Current Status	Notes
Extraction	299-W15-45	20	Offline	Pump failure
Extraction	299-W15-34	11	Online	Low flow; likely to run dry
Extraction	299-W15-35	18	Online	Low flow; likely to run dry
Extraction	299-W15-47	22	Offline	Pump failure
Extraction	299-W15-36	5	Offline	Low flow

[1] ModuTank™ is a trademark of ModuTank Inc., Long Island City, New York.

Table 2. Current Status of Interim 200-ZP-1 P&T System Well Field

Well Type	Well Name*	FY 2011 Flow Rate	Current Status	Notes
Extraction	299-W15-6	5	Offline	Low flow
Extraction	299-W15-40	3	Offline	Low flow
Extraction	299-W15-43	15	Online	Low flow; likely to run dry
Extraction	299-W15-225	253	Online	New extraction well to be connected to 200 West Area P&T facility
Extraction	299-W15-765	10	Offline	Pump failure due to low flow
Extraction	299-W15-11	12	Online	Low flow; likely to run dry
Extraction	299-W15-1	9	Online	Low flow; likely to run dry
Extraction	299-W15-7	7	Online	Low flow; likely to run dry
Extraction	299-W15-46	51	Online	--
Injection	299-W15-29	146	Online	Injection well field to be used by 200 West Area P&T facility in FY 2012 or early FY 2013
Injection	299-W18-36	90	Online	Injection well field to be used by 200 West Area P&T facility in FY 2012 or early FY 2013
Injection	299-W18-37	73	Online	Injection well field to be used by 200 West Area P&T facility in FY 2012 or early FY 2013
Injection	299-W18-38	73	Online	Injection well field to be used by 200 West Area P&T facility in FY 2012 or early FY 2013
Injection	299-W18-39	73	Online	Injection well field to be used by 200 West Area P&T facility in FY 2012 or early FY 2013

Extraction well 299-W15-225, one of the new extraction wells drilled for the 200 West Area P&T facility, has been connected to the IRM P&T system and online since June 2010. This well and other current extraction wells with higher production flow rates are expected to remain connected and operational for the IRM P&T system until the 200 West Area P&T facility is operational (approximately early in the third quarter of FY 2012). When the 200 West Area P&T facility is treating contaminated groundwater, the IRM P&T system will be shut down, and the wells connected at that time will be disconnected and flushed as described above.

Extraction well 299-W15-225 will then be connected to the 200 West Area P&T facility. The well's electrical and mechanical racks are configured the same as the other 200 West Area P&T racks, except the wireless communication system will be added to the well's electrical rack. Repowering of this well may be completed using the transformer that currently provides electrical service to the IRM P&T system.

In the future, additional injection well capacity may be added to the west injection well field by connecting the existing five IRM P&T system injection wells through the IRM injection manifold building rather than drilling two new injection wells. Treated water will be piped from the 200 West Area

P&T facility injection transfer building 2 to the IRM injection manifold building to provide an additional 1,893 L/min (500 gpm) of injection capacity.

The strategy and basis for shutdown of the IRM P&T system is described in the *ZP-1 Pump-and-Treat Facility Layup Plan* (SGW-49761) (included as Appendix A of this plan). The IRM P&T system and equipment will be placed in layup condition while further decisions are made regarding long-term shutdown or possible future uses. Operations personnel will continue to use the open space in the southeast corner of the building for materials storage or other activities in the interim.

3 200 West Area Pump-and-Treat Facility Startup

Startup of the 200 West Area P&T facility involves three basic stages, culminating with final testing and resulting in limited approval for operations of the facility. The three stages for system commissioning include (1) CAT of each functional area, (2) individual ATPs for each function or grouping of functional areas, and (3) IATP where the facility is run as an integrated operation. When complete, including a graded readiness evaluation, the facility will be turned over to Soil and Groundwater Remediation Project to perform OTP (SGW-49168, *200 West Area Pump-and-Treat System Startup Plan*), after which time the facility will be released for unrestricted operations.

3.1 Construction Acceptance Testing

Construction acceptance testing (CAT) is a prerequisite to performing ATPs. The objective of the CAT is to ensure that all vendor equipment is complete and has been installed as designed and in accordance with vendor instructions, which will support full system operation with minimal issues during execution of the ATP. Individual CATs are required to be performed for functional areas which may include the following:

- Extraction wells
- Extraction transfer building 3
- Membrane bioreactor
- Injection wells
- Biological building process support
- Bio-solids handling
- Supervisory control and data acquisition
- Extraction transfer building 1
- Ion-exchange processing
- Air-stripper system
- Injection transfer building 1
- Radiological building process support
- Lime stabilization
- Ammonia scrubber
- Extraction transfer building 2
- Fluidized bed bioreactor
- Process volatile organic compound control
- Injection transfer building 2
- Ion-exchange solids handling

The CAT will ensure properly anchored equipment, verify electrical equipment control wiring and electric motor verification/testing, verify correct installation of fluid processing equipment (piping and pumps), and ensure testing of equipment. The startup plan contains an explanation of each of the CAT procedures (Appendix G of SGW-49168).

The end state of the CAT process will be a systematic demonstration that the equipment and systems have been installed in accordance with the design. The system will then be ready for ATP testing.

3.2 Acceptance Testing Procedure

The objective of the ATP is to demonstrate system compliance with the *200 West Area Pump-and-Treat System Functional Design Criteria* (SGW-40043) and that the final constructed/installed systems can operate successfully as designed. The ATP will be conducted in two parts: (1) individual ATPs by functional area or grouping of functional areas (see above listing), and (2) an IATP where the process is operated as an integrated operation.

Performing an ATP on each functional area and then performing IATP allows the startup team to test each functional area separately; the IATP will then be used to test the entire treatment system. The individual ATPs and IATP will be conducted using non-contaminated water. By testing the functional areas first, issues can be identified (e.g., failed control panel) and the corrective process initiated before starting IATP. In this manner, the majority of issues will be corrected in the functional areas before IATP is started. Therefore, the only potential issues during IATP may be those requiring the system to be integrated (e.g., software issues). If issues remain unresolved when IATP begins, these issues will be addressed first in the checklist of items to be corrected before OTP begins. Following correction of issues and completion of the IATP, the OTP will begin.

The IATP will be performed with non-contaminated water to demonstrate that the full system is capable of functioning as designed. Biomass development is a critical element in the treatment process. Phase 1 operations for the 200 West Area P&T facility will be defined by the initiation of the inoculation process which meets Tri-Party Agreement Milestone M-016-122 (Table 3). The inoculation process begins with the loading of water into the first bioreactor followed by loading of the carbon media and ultimately the inoculation of microorganisms into the system. Completion of CAT and ATP testing of the S/SX Tank Farm technetium-99 treatment system (capacity of 189 L/min [50 gpm] or more) is ready to begin operation by August 31, 2012, constitutes meeting Tri-Party Agreement Milestone M-016-120 (Table 3).

Table 3. Tri-Party Agreement Milestones for the 200 West Area Groundwater P&T Facility

Milestone	Description	Date
M-016-122	Begin Phase 1 operation of the new 200 West Area P&T facility per the remedial design report/remedial action work plan (DOE/RL-2008-78) and the 200-ZP-1 final ROD (EPA et al., 2008). This action will provide the initial portion of the overall P&T capacity expected to be required by the 200-ZP-1 and 200-UP-1 RODs. This initial operation can provide treatment of the technetium-99 plume at the S/SX Tank Farm within the 200-UP-1 OU.	December 31, 2011
M-016-120 Lead Agency: EPA	The DOE will have a groundwater treatment system for the Tc-99 plume at the S/SX Tank Farm within the 200-UP-1 Operable Unit. This milestone will be met by using treatment capacity at the new 200 West Area Pump and Treat Facility.	August 31, 2012

3.3 Operational Testing Procedure

The primary objective of OTP is to validate the operation and maintenance procedures and to complete operator training. The secondary objective of OTP is to monitor process and system performance during extended run-time and to demonstrate that the facility meets the design requirements. The OTP will begin following IATP and will use contaminated groundwater. The OTP will be performed under Soil and Groundwater Remediation Project operations management control. Required calibrations and preventative/routine maintenance for full facility operation will be identified as prerequisites and will be completed prior to OTP initiation. Essential drawings will be as-built and will be issued prior to the start of OTP. A checklist will be used to track any outstanding items. The OTP will be complete prior to any request for approval authority to release the facility for unrestricted operations.

The 200 West Area P&T facility is designed for a capacity of 9,463 L/min (2,500 gpm), 4,732 L/min per train (1,250 gpm per train), with an expected average nominal operating flow of 7,571 L/min (2,000 gpm). The minimum operational flow rate is 2,271 L/min (600 gpm) for each train. Following completion of the IATP, the first treatment train will begin operations using contaminated groundwater at low flow rates and will enter OTP. Once operational, the ion-exchange process in the radiological control building will be brought online using technetium-99-contaminated groundwater. The second treatment train will then be seeded with micro-organisms and brought online, splitting the flow between the two trains. The wells anticipated to be used to support operations of treatment trains A and B during conduct of the OTPs and the estimated flow rates are provided in Table 4 for extraction wells and Table 5 for injection wells. The general sequence of events following the completion of the IATP is provided in the startup plan (SGW-49168).

Table 4. 200 West Area Extraction Wells – Connection Point, Estimated Flow Rate, and Estimated Start Date

Train	System Flow (gpm)	Extraction Well	System Connection Point	Flow Rate (gpm)	Start Date
A	600	Recycle potable water	Directly to CTF	600	December 2011
A	600[a]	299-W14-74 (YE-4)	Directly to CTF	80 to 130	April 2012
		299-W11-96 (YE-8)	Directly to CTF	80 to 130	April 2012
A	650	299-W12-2 (YE-5)	ETB 1 to CTF	80 to 130	Third quarter FY 2012
		299-W12-3 (YE-18)	ETB 1 to CTF	80 to 130	Third quarter FY 2012
		299-W12-4 (YE-19)	ETB 1 to CTF	80 to 130	Third quarter FY 2012
A & B	650 to 1,430	299-W15-225 (YE-1)	ETB 2 to CTF	80 to 130	Third quarter FY 2012
		299-W14-73 (YE-3)	ETB 2 to CTF	80 to 130	Third quarter FY 2012
		299-W17-3 (YE-9)	ETB 2 to CTF	80 to 130	Third quarter FY 2012
		299-W17-2 (YE-10)	ETB 2 to CTF	80 to 130	Third quarter FY 2012
		299-W11-49 (YE-12)	ETB 2 to CTF	80 to 130	Third quarter FY 2012
		299-W14-21 (YE-15)	ETB 2 to CTF	80 to 130	Third quarter FY 2012

Table 4. 200 West Area Extraction Wells – Connection Point, Estimated Flow Rate, and Estimated Start Date

Train	System Flow (gpm)	Extraction Well	System Connection Point	Flow Rate (gpm)	Start Date
A & B	1,430 to 1,950	299-W14-20 (YE-2)	ETB 2 to Tc-99 treatment	80 to 130	Third quarter FY 2012
		299-W11-50 (YE-6)	ETB 2 to Tc-99 treatment	80 to 130	Third quarter FY 2012
		299-W11-90 (YE-7)	ETB 2 to Tc-99 treatment	80 to 130	Third quarter FY 2012
		299-W11-92 (YE-16)	ETB 2 to Tc-99 treatment	80 to 130	Third quarter FY 2012
A & B	1,950 to 2,030	299-W22-90 (YE-21)	ETB 3 to Tc-99 treatment	20	Fourth quarter FY 2012
		299-W22-91 (YE-22)	ETB 3 to Tc-99 treatment	30	Fourth quarter FY 2012
		299-W22-92 (YE-23)	ETB 3 to Tc-99 treatment	30	Fourth quarter FY 2012
A & B	2030-2500 (future)[b]	299-W14-22 (YE-20)	ETB 1 to CTF	80 to 130	--
		(YE-17)	ETB 1 to CTF	80 to 130	--
		(YE-11)	ETB 2 to CTF	80 to 130	--
		(YE-13)	ETB 2 to CTF	80 to 130	--
		(YE-14)	Directly to CTF	80 to 130	--

Notes: Third quarter of FY 2012 refers to the timeframe of April, May, and June 2012.

a. Groundwater from the two extraction wells is blended with the potable water to attain the 2,272 L/min (600 gpm) minimum flow.

b. Future wells will be drilled in FY 2012 or later.

CTF = central treatment facility

ETB = extraction transfer building

Table 5. 200 West Area Injection Wells – Connection Point, Estimated Flow Rate, and Estimated Start Date

Train	System Flow (gpm)	Injection Well	System Connection Point	Flow Rate (gpm)	Start Date
A	600	299-W6-13 (YJ-1)	CTF to ITB 2	100 to 200	February-April 2012
		299-W6-14 (YJ-2)	CTF to ITB 2	100 to 200	February-April 2012
		299-W10-36 (YJ-3)	CTF to ITB 2	100 to 200	February-April 2012
		299-W10-35 (YJ-4)	CTF to ITB 2	100 to 200	February-April 2012
		299-W15-226 (YJ-5)	CTF to ITB 2	100 to 200	February-April 2012
		299-W15-227 (YJ-6)	CTF to ITB 2	100 to 200	February-April 2012

Table 5. 200 West Area Injection Wells – Connection Point, Estimated Flow Rate, and Estimated Start Date

Train	System Flow (gpm)	Injection Well	System Connection Point	Flow Rate (gpm)	Start Date
A & B	880 to 1,800	699-46-68 (YJ-10)	CTF to ITB 1	100 to 150	Third quarter FY 2012
		699-44-67 (YJ-12)	CTF to ITB 1	100 to 150	Third quarter FY 2012
		699-42-67 (YJ-14)	CTF to ITB 1	100 to 150	Third quarter FY 2012
		699-43-67B (YJ-17)	CTF to ITB 1	100 to 150	Third quarter FY 2012
A & B	1,800 to 2,300	200-ZP-1 injection wells (five)	CTF to ITB 2	500	FY 2012-FY 2013
A & B	2,300 to 2,500 (future)*	699-40-67 (YJ-15)	CTF to ITB 1	100 to 150	--
		(YJ-18)	CTF to ITB 1	100 to 150	--
		(YJ-16)	CTF to ITB 1	100 to 150	--
		(YJ-9)	CTF to ITB 1	100 to 150	--

Notes: Third quarter of FY 2012 refers to the timeframe of April, May, and June 2012.

* Future wells will be drilled in FY 2012 or later.

CTF = central treatment facility

ITB = injection transfer building

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Appendix A

SGW-49761, ZP-1 Pump-and-Treat Facility Layup Plan

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SGW-49761
Revision 0

ZP-1 Pump and Treat Facility Layup Plan

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

Contractor for the U.S. Department of Energy
under Contract DE-AC06-08RL14788

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SGW-49761
Revision 0

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ZP-1 Pump and Treat Facility Layup Plan

Document Type: RPT Program/Project: S&GRP

Date Published
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ZP-1 Pump and Treat Facility Layup Plan

1.0 Introduction

This plan describes the strategy and basis for the interim shutdown of the ZP-1 Pump & Treat (P&T) facility, in accordance with the requirements of GRP-POL-0002, *S&GRP Policy for Removing Facilities from Active Service.* The initial release of this plan provides only the actions necessary to place the facility in an "interim layup" condition.

Groundwater treatment operations at the ZP-1 P&T facility are scheduled to end in December 2011, when groundwater treatment in the 200 west area will be transferred to the new 200-W P&T facility. The ZP-1 plant and equipment will be placed into a layup condition, while further decisions are made regarding long-term shutdown or possible future uses. Operations personnel will continue to use the open space at the southeast corner building for materials storage or other activities in the interim.

2.0 Background

The CHPRC Soil & Groundwater Remediation Project operates several "Pump & Treat" facilities on the Hanford Site. The ZP-1 Pump & Treat facility was constructed in the 1990s to remove legacy carbon tetrachloride contamination from groundwater in the 200-W area. The facility is currently connected to fourteen extraction wells, via a combination of above ground and underground HDPE piping. Treated water is returned to the aquifer via five injection wells. (See Table 1).

Although the facility operates on a 7 day, 24 hour schedule, operators are normally on station only during regular day shifts. An automated alarm dialer alerts personnel to alarm conditions at other times. Maintenance, administrative, and technical support are provided from the S&GRP organization as needed.

Table 1: Current ZP-1 Wells

Well Type	Well ID	
Extraction	299-W15-45	(WE01)
Extraction	299-W15-34	(WE02)
Extraction	299-W15-35	(WE03)
Extraction	299-W15-47	(WE04)
Extraction	299-W15-36	(WE05)
Extraction	299-W15-6	(WE06)
Extraction	299-W15-40	(WE07)
Extraction	299-W15-43	(WE08)
Extraction	299-W15-225	(ZE09)
Extraction	299-W15-765	(WE10)
Extraction	299-W15-11	(ZE11)

Extraction	299-W15-1	(ZE12)
Extraction	299-W15-7	(ZE13)
Extraction	299-W15-46	(ZE14)
Injection	299-W15-29	(INJ01)
Injection	299-W18-36	(INJ02)
Injection	299-W18-37	(INJ03)
Injection	299-W18-38	(INJ04)
Injection	299-W18-39	(INJ05)

2.1 Facility Description

The ZP-1 P&T site is located northwest of the Plutonium Finishing Plant on the west side of the 200-W Area of the Hanford site.

The main process building, 216-ZP-1, is a 60-ft by 40-ft by 25-ft metal frame building with a sloped cement floor. An electrical room (20-ft by 20-ft) is located in the southwest corner of the building. An operator work station with the HMI is also located in the northeast corner of the electrical room. The southeast corner of the building is used for storage. The remainder of the space in the building is the process area. The floor slopes to the north wall of the building where influent tank T-01 is located in the northeast corner, and effluent tank T-02 is located in the northwest corner. The floor slope starts at the north end of the electrical room. The volume of space created by the sloping floor creates a secondary containment system. The volume available has been designed to contain a full tank of water from either tank T-01 or T-02 (in case one of the tanks develops a leak).

The buildings are served by electrical power only; no potable water or sanitary sewer lines serve the site.

The two extraction manifold buildings are used to manifold four of the ten extraction lines into two lines before entering the process building. The extraction lines from wells WE01, WE02, WE07, WE08, ZE09, WE10, ZE11, and ZE12 run directly to the process building. Lines from wells WE05, WE06 and ZE14 run into extraction manifold building #2 where they are combined into one line which runs to manifold building #1. In manifold building #1, water from wells WE03 and ZE13 is combined with the water from well WE04 and the water from manifold building #2. The combined flow is then split into two lines, one above ground and one underground, for transfer to the process building.

The injection well system consists of five injection wells (INJ01, INJ02, INJ03, INJ04, and INJ05), one injection manifold building (216-ZP-1C), and an injection leak detection system. The injection manifold building is used to distribute the injection flow to the five injection wells.

After the latest upgrade, the ZP-1 facility can treat up to 450 gallons per minute (gpm) of contaminated groundwater, for discharge back into the aquifer.

The ZP-1 treatment process was designed to minimize further migration of and remove contaminants of concern (COCs): carbon tetrachloride, chloroform and trichloroethylene from groundwater in the 200-ZP-1 Operable Unit. The basic process flow is shown in Figure 2. A summary of facility structures, process tank data and information on other major pieces of equipment is included in the system design description, 0200W-DB-G0002, Rev. 5.

Groundwater is collected from extraction wells throughout the 200 west area east of the Plutonium Finishing Plant. Over the years, extraction wells have been realigned several times to optimize contaminant capture or increase extraction flow.

The primary process function of the ZP-1 P&T is to extract COCs from the groundwater via an air stripping column. Incoming groundwater from each extraction well is filtered upon entry to the facility, then combined in tank T01. The contaminated water is routed through the stripping column where the COCs is transferred from the groundwater into a stream of air. The air passes though two GAC (granulated activated carbon) canisters in series where the COCs is adsorbed. The treated water then passes through a particulate filter before being routed to tank T02. The treated water is pumped from tank T-02 back into the aquifer via the injection wells. The remaining process equipment in the facility supports the carbon tetrachloride removal process.

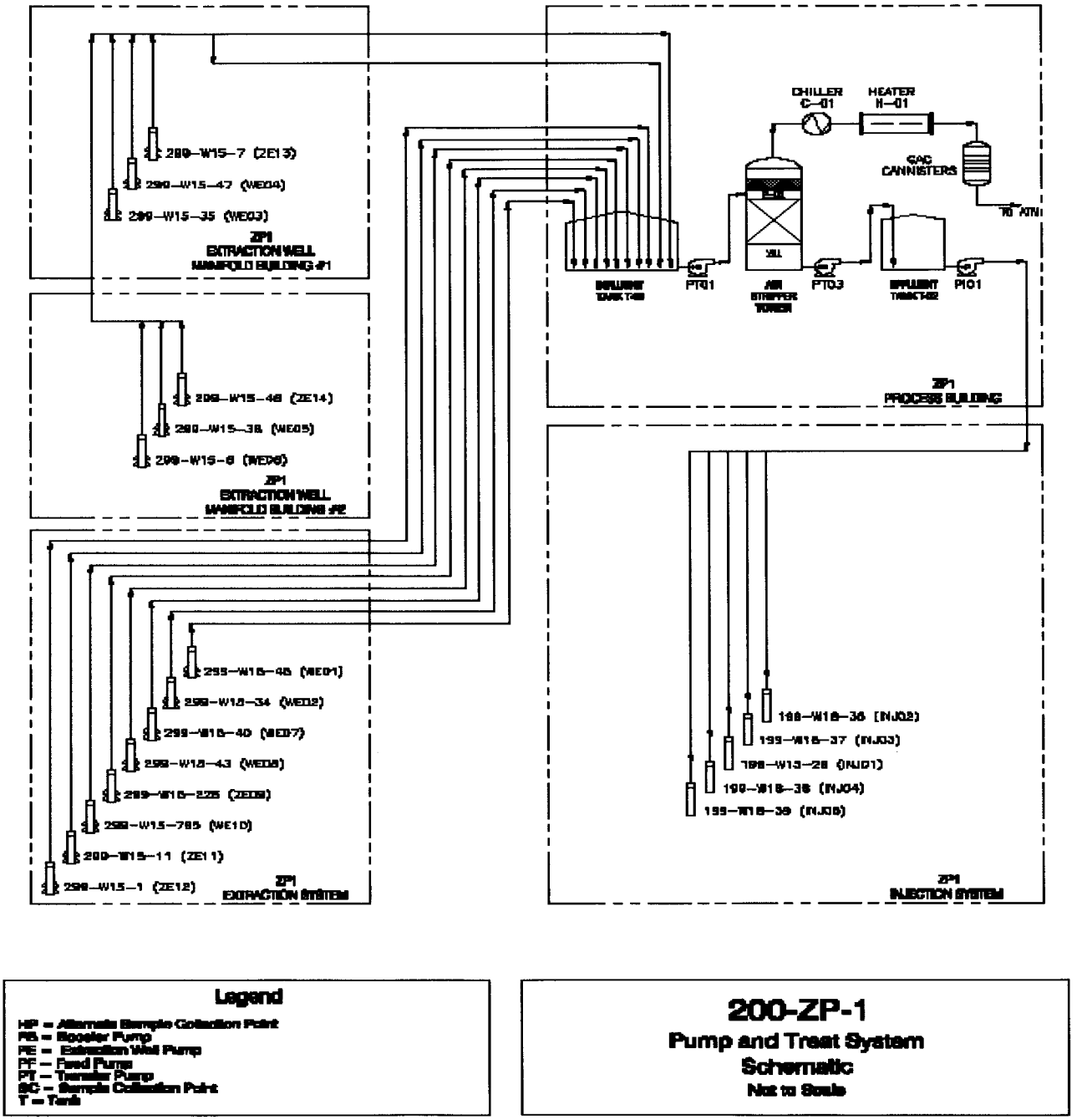

Figure 1: ZP-1 Schematic

3.0 Shutdown Plan

The 200-ZP-1 Pump and Treat Facility is scheduled to be permanently shut down not long after the 200 West Pump and Treat Facility takes over groundwater remediation in the 200 West Area. This work should be completed in FY2012.

Extraction Piping and Manifold Buildings

The extraction piping and manifold buildings contact untreated groundwater containing COCs. These lines and associated equipment will be triple flushed with clean water. Well 299-W15-225 (ZP-1 well ZE09) will be connected to the 200 West Pump and Treat Facility. The remaining wells will be taken out of service.

The above ground extraction well piping will be disconnected at the well head tees. The well head piping will be plugged or capped and a locked cover placed over the well head piping. The HDPE piping will be triple flushed with water from the well head to the process building and then a cap/plug or blind flange will be installed on the ends of the piping.

The underground extraction well piping will be disconnected where it attaches to the well head. The well head will be blanked and secured to meet Washington state regulations. The underground piping will be triple flushed with water from the well head to influent tank T-01 and then blown out with air and/or drained. Flush water will be supplied by a portable tank or purge water truck. Some of the underground extraction well piping passes through one or more manifold buildings in route to the process building. The extraction piping in the manifold buildings will be flushed as the water passes through it. The flush water will be treated in the process building and then pumped into the injection wells.

Process Building Equipment

The equipment in the process building from where the extraction water lines enter the building to the outlet of the stripping tower handle untreated water containing COCs. This equipment will be triple rinsed as part of the facility shutdown.

The liquid process equipment in the process building downstream from the stripping tower has only been contacted by water that has been treated by the ZP-1 stripping tower to remove carbon tetrachloride. Therefore, this equipment does not need to be flushed. The lines will be drained or blown out with air and then isolated by closing valves in the injection manifold building and the process building.

Injection Piping and Injection Manifold Building

The injection piping and manifold building have not handled untreated groundwater. They have contacted only water that has been treated by the ZP-1 stripping tower to remove carbon tetrachloride.

The following bullets represent the approximate sequence of steps needed to accomplish the layup process. Detailed steps and technical decisions will be documented in the associated work control documents.

- Prepare Facility Modification Package (FMP) to show interim layup configuration for wells WE04, WE05, WE06, WE07, and WE10.
- Notify Facilities & Property Management of shutdown plans, and complete other administrative requirements of PRC-PRO-PMT-475.
- Plan layup work package (incorporate or cancel any pending maintenance items).
- Isolate wells WE04, WE05, WE06, WE07, and WE10 from the process while the plant continues to operate using the remaining wells.
- Triple rinse well lines from WE04, WE05, WE06, WE07, and WE10 as allowed while plant is operating.
- Blow down lines with air to remove residual water.
- Secure the ends of the well lines and well head piping with caps, plugs, or flanges.
- Prepare Facility Modification Package (FMP) to show interim layup configuration for the rest of the facility.
- Shut down remaining extraction wells (WE01, WE02, WE03, WE08, ZE09, ZE11, ZE12, ZE13, and ZE14) when the 200 West Facility begins operation.
- Disconnect PNNL Tc-99 test equipment and return to PNNL.
- Recirculate treated water to rinse out all process vessels, pipes, storage tanks, sumps, and other equipment (stripping tower, etc.) to the extent possible (use other water source if needed).
- Normal operating procedure will be followed; the procedure will be revised as needed to support steps or processes needed to accomplish the layup.
- Inject all rinsate to ZP-1 injection wells, with sufficient volume to dilute as required (potential to route final rinsate to ETF).
- Drain and/or blow down lines, vessels, pumps, etc. as needed.
- Dispose of any remaining supplies.
- Perform appropriate "storage" PMs (e.g., lubricate pumps, motors, and compressor).
- Shut down computer control system.
- Remove & dispose of filter cartridges.
- Open breakers for pumps and other powered process equipment (leave lights, heat, and convenience receptacles available for Operations use of building as storage area).
- Open breakers for the heater/chiller unit. Pump out chiller refrigerant.
- Electrical utilities will disconnect and remove the Field Data Acquisition System (FDAS) located in the northwest corner of the control room that is used to log power usage.
- Shutdown control room HVAC unit (or set to unoccupied status)
- Disconnect and remove the uninterruptable power supply (UPS) units.
- Clean, dry, and properly store sample/test equipment. Portable instruments that support operations processes (B&K analyzers) will be removed from the building.
- Clean-up, dispose of test materials, any remaining trash; sweep floors.
- Perform rad surveys. Install mousetraps.
- Cancel process-related PMs; continue GFCI, emergency lights, fire extinguisher for Operations occupancy.

- Inactivate Routines and Operating procedures.
- Well 299-W15-225 (ZP-1 well 9) will be connected to the 200 West pump and treat facility by construction forces.
- Establish final disposition decision and actions in the FY12 baseline schedule and budget.

4.0 Basis Discussion

Consideration has been given to each of the items listed in GRP-POL-0002, section 3.1. The following paragraphs explain the strategy for each of these areas.

4.1 Radiological Control

Sample and dispose of any remaining water filters present in the building. Remove GAC canisters and send them off site for regeneration. This will remove the majority of the potential sources.

4.2 Waste Management

Waste will be dispositioned in accordance with the Waste Management Plan for the Expedited Response Action for 200 West Area Carbon Tetrachloride Plume and the 200-ZP-1 and 200-PW-1 Operable Units (DOE/RL-2000-40). Any remaining chemicals in the chemical storage cabinet will be disposed of according to applicable CHPRC procedures. The chemicals will be transferred to other P&T facilities if there is a use for them there.

4.3 Environmental Protection

The assigned Environmental Compliance Officer will approve this plan. Injection of process rinsate after it has passed through the stripping tower to remove COCs is acceptable. Facility sump leak detection will be inactivated with the computer control system shut down; this is acceptable, as the process fluid will be removed from the facility.

4.4 Fire Protection

Fire Protection Engineering was contacted, and will evaluate requirements for the change in facility occupancy status. The GAC canisters could theoretically pose a fire hazard if heated to a high temperature. The GAC canisters will be removed from the facility as part of the layup.

4.5 Industrial Safety

Existing ISMS practices will suffice for the continued occupancy of the building as a material storage area.

4.6 Surveillance

No specific surveillance requirements are identified. Surveillance could be conducted in conjunction with entries for material storage or other purposes.

4.7 Configuration Baseline

An FMP will be prepared to document the actions taken to place the plant in layup status. The assigned Design Authority will retain responsibility for actively maintaining configuration control of the facility.

4.8 Training

No new training is required for associated plant personnel. Operations staff will be reassigned to other work.

4.9 Regulatory Documents

Interim Record of Decision for the 200-ZP-1 Operable Unit (DOE letter #016085, June 5, 1995). The groundwater treatment remedial action that has been performed by the ZP-1 P&T will continue to be performed using the new 200-West Pump and Treat Facility. The remedial Action Work Plan will be reviewed and modified as necessary to address the shutdown of ZP-1.

4.10 Outstanding Work Packages

Existing work packages have been reviewed; some items are being deferred/cancelled, while others will be incorporated into the layup work package. As part of the layup work package, outstanding work packages will be appropriately dispositioned.

4.11 Outstanding Procurements

No outstanding procurements have been identified.

4.12 Spares

Any decision regarding spares will be deferred until final disposition of the facility is determined. No further spares will be ordered at this time.

4.13 Sampling Schedules

The sampling function associated with the water treatment operation carbon tetrachloride removal with GAC ceases at shutdown. No other sampling applies.

4.14 Preventive Maintenance

Near-term scheduled maintenance work will be evaluated for completion or deferral. PMs associated with plant processes will be inactivated. Special PM items relevant to the layup will be identified in the associated work package.

4.15 Calibrations

No instrument calibrations are due prior to the planned shutdown. Closeout calibrations are not required since the calibrated equipment being shut down were used for process control and not data reporting purposes.

4.16 Equipment Degradation

Major plant components are considered durable for one-year layup duration without degradation. Resilient materials such as pump seals, valve seats, and flexible tubing tend to harden with drying and disuse; and small electrical parts such as switches, sensors, and relays are subject to corrosion and sticking over time. No additional precautions will be taken to prevent degradation therefore, any future plans for the facility will need to consider those items prone to failure at restart, and include replacement or thorough testing prior to placing such items back in service.

4.17 Power Source Control

The FMP will include electrical lineups as part of the layup configuration.

4.18 Freeze Protection

In general, all wetted equipment will be drained. As the facility will remain at least occasionally occupied as a storage space, internal temperature should be maintained well above freezing.

4.19 Winterization

The winterization instructions for the facility will be updated.

4.20 Corrective Actions

All corrective actions assigned to the ZP-1 P&T in the corrective action management process will be reviewed for applicability as part of the shutdown planning, and any outstanding corrective actions will be dispositioned. Any corrective action arising during the shutdown period will be evaluated in a timely manner and tracked during the interim layup period.

4.21 Records

No record storage is maintained at the facility. Data residing on the control system computer will be backed up and dispositioned according to normal P&T operating practices.

5.0 References

GRP-POL-0002, *S&GRP Policy for Removing Facilities from Active Service*

0200W-DB-G0002, *200-ZP-1 System Design Description*

Interim Record of Decision for the 200-ZP-1 Operable Unit (DOE letter #016085, June 5, 1995)

PRC-PRO-MN-472, *Cold Weather Protection*

PRC-PRO-PMT-475, *Real Property Asset Management*

Waste Management Plan for the Expedited Response Action for 200 West Area Carbon Tetrachloride Plume and the 200-ZP-1 and 200-PW-1 Operable Units (DOE/RL-2000-40).

6.0 Facility Information

Table 1: ZP-1 Major Equipment Summary

Tanks

Service	Number	Size	Information
Influent Storage Tank	T-01	12,700 gal	
GAC Canisters	V02A/B/C V03A/B/C	4-ft diameter x 7-ft tall	
Effluent Storage Tank	T-02	12,700 gal	

Process Equipment

Item	Number	Size	Information
Stripping Tower	V-01		
Water Filters	F1A, F2A F2A, F2B		
Heater/Chiller	H-01/C-01		
Transfer Pump	PT-01	50 HP	
Injection Pump	PI-01	40 HP	
Air Blower	B-01		

Extraction well Pumps

Well Identification	Pump Manufacturer/ Model No.	Pump Operating Range, gpm	No. of Pump Stages	Power of Motor, hp
299-W15-45 (ext. well #1)	40S50-15	15-40	15	5
299-W15-34 (ext. well #2)	60S100-18	25-60	16	10
299-W15-35 (ext. well #3)	85S150-11	60-118	11	15
299-W15-47 (ext. well #4)	85S150-11	60-118	11	15

299-W15-36 (ext. well #5)	25S30-15	16-32	15	3
299-W15-6 (ext. well #6)	40S75-21	25-55	19	7.5
299-W15-40 (ext. well #7)	10S10-15	5-14	15	1
299-W15-43 (ext. well #8)	75S100-16	45-95	16	10
299-W15-225 (ext. well #9)	385S400-6B	260-550	6	40
299-W15-765 (ext. well #10)	75S100-16	45-95	16	10
299-W15-11 (ext. well #11)	75S100-16	45-95	16	10
299-W15-1 (ext. well#12)	60S75-13	55-75	13	7.5
199-W15-7 (ext well #13)	75S100-16	45-95	16	10
299-W15-46 (ext well #14)	75S100-16	45-95	16	10

Table 2: Procedures Specific to ZP-1 P&T

GRP-FS-04- Z-200-002, *ZP-1 Pump-and-Treat Facility Operation and Alarm Response*

GRP-FS-04- Z-200-006, *ZP-1 Pump-and-Treat Rounds*

GRP-FS-04-Z-200-004, *ZP-1 Pump-and-Treat Line-up*

GW-PM-601, *ZP-1Annual System Calibration*

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