ECF-200W-19-0104
Revision 0

200 West Pump and Treat New Source Review for Process Changes

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

CH2MHILL
Plateau Remediation Company

P.O. Box 1600
Richland, Washington 99352

Approved for Public Release;
Further Dissemination Unlimited

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APPROVED
By Julia Raymer at 11:12 am, Oct 30, 2019

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ENVIRONMENTAL CALCULATION COVER PAGE

SECTION 1 - Completed by the Responsible Manager

Project: Soil & Groundwater Remediation Project

Date: 8/22/2019

Calculation Title and Description: 200 West Pump and Treat New Source Review for Process Changes. Review the impact of cessation of biological nitrate treatment on air emissions at the 200 West Pump and Treat Facility, and perform a new source review of the air emissions as required by WAC 173-460.

RELEASE / ISSUE

DATE: Oct 30, 2019 HANFORD RELEASE

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ENVIRONMENTAL CALCULATION COVER PAGE (Continued)

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SECTION 5 - Applicable if Calculation is a Risk Assessment or Uses an Environmental Model

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Table

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Terms

2WPT	200 West Pump-and-Treat
AMP	Air Monitoring Plan
ARAR	applicable or relevant and appropriate requirement
ASIL	acceptable source impact level
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
COC	contaminant of concern
GAC	granular activated carbon
gpm	gallons per minute
NSR	new source review
O&M	operations and maintenance
OU	operable unit
ROD	record of decision
SQER	small quantity emission rate
TAP	toxic air pollutant
tBACT	toxics best available control technology

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1 Purpose

The purpose of this calculation is to show compliance with the requirements found in WAC 173-460, "Controls for New Sources of Toxic Air Pollutants." Planned modifications to the 200 West Pump and Treat (2WPT) are currently scheduled for early Fiscal Year 2020. The changes to the 2WPT include bypass or shut down of the biological treatment system within the plant, and utilizing the air stripper towers at the plant to perform treatment of Contaminants of Concern (COCs) as proposed in DOE/RL-2019-38, *200-ZP-1 Operable Unit Optimization Study Plan*. Specifically, this calculation is in support of WAC 173-460-040, "New Source Review," to determine if the changes proposed in operations of the 2WPT will result in an increase in toxic air pollutant (TAP) emissions at the current maximum plant flow of 2,500 gallons per minute (gpm).

2 Background

The 2WPT treats extracted groundwater through several treatment processes including ion exchange, biological treatment and air stripping. At diffuse locations within the treatment process, air emissions are captured and directed to granular activated carbon (GAC) beds that remove TAPs from the air prior to discharge to the atmosphere. The 2WPT is regulated under *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) authority, and therefore does not require a permit for air emissions. However, the management of the facility strives to comply with the substantive requirements found in WAC 173-400, "General Regulations for Air Pollution Sources" and WAC 173-460, which have been determined to be applicable or relevant and appropriate requirements (ARAR). The ARARs are provided in Appendix A of EPA et al., 2008, *Record of Decision, Hanford 200 Area, 200-ZP-1 Superfund Site, Benton County Washington* (hereinafter called the 200-ZP-1 Record of Decision [ROD]). Substantive compliance with the ARARs is described in the Air Monitoring Plan (AMP) for the 2WPT (Appendix C of DOE/RL-2009-124, *200 West Pump and Treat Operations and Maintenance Plan*; hereinafter called the Operations and Maintenance [O&M] Plan).

The 2WPT currently operates in accordance with DOE/RL-2009-124, Rev. 5. The O&M Plan provides direction for the activities necessary to operate, maintain and monitor the performance of the 2WPT. The 2WPT is a major component of the selected remedy in the 200-ZP-1 and 200-UP-1 Groundwater Operable Units (OUs), the 200-DV-1 OU perched water, extracted groundwater from the 200-BP-5 OU, leachate collected from the Environmental Restoration Disposal Facility, and treatment of excess purgewater from the Modular Storage Units.

A portion of the current remediation process at the 2WPT is a biological remediation system for treatment of nitrate, carbon tetrachloride, trichloroethene, and hexavalent chromium. Additional information acquired after the issuance of the 200-ZP-1 ROD in 2008 has suggested a change to the process will be required to meet the remedy performance for carbon tetrachloride within the time frame of the ROD (125 years). A study performed on abiotic degradation of carbon tetrachloride in the aquifer (PNNL-22062, *Abiotic Degradation Rates for Carbon Tetrachloride and Chloroform: Final Report*) suggested that without modifications to 2WPT operations to specifically target the carbon tetrachloride, the remedy timeline would not be achievable. To target the carbon tetrachloride, an optimization plan (DOE/RL-2019-38) has been drafted to propose increasing the flow through the 2WPT as well as targeting carbon tetrachloride. This would include the cessation of the biological system for treatment, the installation of new wells to target carbon tetrachloride removal, adding a third air stripper tower and increasing the maximum water flow in the plant from 2500 gpm to 3750 gpm. Since the biological system will be shut down, the main treatment system will consist of beneficial blending and the air stripper towers. This also means the plant will no longer perform biological treatment for nitrate or hexavalent chromium.

A mass balance calculation is maintained by the 2WPT engineering staff to show constituent concentrations in the water influent streams, how those concentrations change through multiple treatment systems in the 2WPT, the fractions of constituents that enter the air stream at the air stripper, and other fugitive sources. As required by the O&M plan, the mass balance calculation for the plant has been re-calculated to address the proposed changes at the current flow rate of 2500 gpm. The mass balance calculation is performed by updating all of the concentrations for COCs sampled at the extraction wells in the calculation, then re-calculating concentrations throughout the plant without biological treatment. Because the previous mass balance calculation was performed under the assumption of treatment through the biological system, air emissions need to be addressed in accordance with the requirements for a new source review (NSR) as found in WAC 173-460-040.

Table C-1 of the AMP shows the original list of constituents that were identified as having a potential to be present in the air stream after air stripper treatment of the water stream. These constituents were analyzed through the mass balance calculation and compared to their respective de minimis emissions values. Constituents that were not eliminated through treatment (e.g. ion exchange, biological) in the plant to less than the de minimis value are found in Table C-2 of the AMP. These remaining constituents were compared to their small quantity emission rate (SQER) values to determine if comparison to the acceptable source impact level (ASIL) would be necessary. The constituents that required comparison to the ASILs are in Table C-3 of the AMP.

For this calculation, the mass balance was updated using current extraction well sampling data, including the constituents from Table C-1 of the AMP. The air emissions results from the mass balance calculation were compared to de minimis and SQER values.

3 Methodology

1. Review the air emissions results of the mass balance calculation provided by 2WPT engineering.
2. Convert engineering data from kg/day to the averaging period in WAC 173-460-150, “Table of ASIL, SQER and De Minimis Emission Values.”
3. If air emissions values are below the de minimis values, then no additional actions are necessary.
4. If the air emissions values exceed the de minimis then apply toxics best available control technology (tBACT) and compare to SQER.
5. If the air emission values with tBACT applied exceed the SQER but are bounded by (i.e., less than) the previous modeled emissions, then no additional actions are necessary.
6. If the air emissions values with tBACT applied exceed the SQER and not bounded by (i.e., greater than) the previous modeled emissions, then perform the next review action as required in WAC 173-460.

4 Assumptions and Inputs

- 1 year = 365 days
- 1 pound = 0.4536 kg
- Equation for conversion: (kg/day * pounds/kg * day/year) = pounds/year
- GAC is considered a tBACT for all compared constituents. Assumed a conservative efficiency of 70% removal

- Some of the original constituents thought to be present during before operations of the plant had begun have not been detected. If a constituent was not sampled or detected in the extraction well network in the past two years, it was eliminated from the constituents to be compared to the *Washington Administrative Code* values as it was assumed that the constituent was not present.

5 Calculation

The calculation is presented in Table 1.

Table 1. Calculation

		Step 1	Step 2		Step 3	Step 4		Step 5	Step 6
Constituent	**CAS Number**	**Mass Release (kg/day)**	**Mass Release (lbs/averaging period)**	**Averaging Period**	**De minimis (lbs/averaging period)**	**SQER (lbs/ averaging period)**	**Emissions after tBACT (lbs/yr)**	**Previous Model Emissions (lbs/yr)**	**Exceeds SQER and previous model**
Carbon tetrachloride	56-23-5	6.74	5423.5	1 year	0.228	4.57	1627.1	2299.89	No
Hexavalent chromium [a]	N/A	0.0	0.0	1 year	6.40E-05	0.00128	0.0	N/A	N/A
Trichloroethylene	79-01-6	0.039	31.4	1 year	4.8	95.9	9.4	1.10	No
Chloroform	67-66-3	0.062	49.9	1 year	0.417	8.35	15.0	37.8	No
Vinyl chloride	75-01-4	0.002	1.6	1 year	0.123	2.46	0.48	N/A	N/A
Methylene chloride	75-09-2	0.015	12.07	1 year	9.59	192	3.6	1.19	No
Benzene	71-43-2	Not detected	N/A	1 year	0.331	6.62	N/A	2.55	N/A
1,1,1-Trichloroethane	71-55-6	Not detected	N/A	24 hours	6.57	131	N/A	N/A	N/A
1,2-Dichloroethane	107-06-2	Not detected	N/A	1 year	0.369	7.39	N/A	N/A	N/A
DBCM	124-48-1	Not sampled	N/A	1 year	0.355	7.10	N/A	N/A	N/A
1,1-Dichloroethylene	75-35-4	Not detected	N/A	24 hours	1.31	26.3	N/A	1.49E-03	N/A
1,1-Dichloroethane	75-34-3	Not detected	N/A	1 year	6.0	131.0	N/A	N/A	N/A
1,2-Dichloropropane	78-87-5	Not sampled	N/A	1 year	0.959	19.2	N/A	N/A	N/A
1,4-Dichlorobenzene	106-46-7	Not sampled	N/A	1 year	0.872	17.4	N/A	N/A	N/A
2-Napthylamine	91-59-8	Not sampled	N/A	1 year	0.0188	0.376	N/A	N/A	N/A
Ammonia	7664-41-7	Not sampled	N/A	24 hours	0.465	9.31	N/A	N/A	N/A
Beryllium	1304-56-9	Not detected	N/A	1 year	0.004	0.08	N/A	N/A	N/A
Bromoform	75-25-2	Not sampled	N/A	1 year	8.72	174.0	N/A	N/A	N/A

Table 1. Calculation

		Step 1	Step 2		Step 3	Step 4		Step 5	Step 6
Constituent	**CAS Number**	**Mass Release (kg/day)**	**Mass Release (lbs/averaging period)**	**Averaging Period**	**De minimis (lbs/averaging period)**	**SQER (lbs/ averaging period)**	**Emissions after tBACT (lbs/yr)**	**Previous Model Emissions (lbs/yr)**	**Exceeds SQER and previous model**
Carbon disulfide	75-15-0	Not detected	N/A	24 hours	5.26	105.0	N/A	N/A	N/A
Chlorobenzene	108-90-7	Not sampled	N/A	24 hours	6.57	131.0	N/A	N/A	N/A
Ethylbenzene	100-41-4	Not sampled	N/A	1 year	3.84	76.8	N/A	N/A	N/A
Methyl tertiary butyl ether	1634-04-4	Not sampled	N/A	1 year	36.9	739	N/A	N/A	N/A
o-Xylene	95-47-6	Not sampled	N/A	24 hours	1.45	29.0	N/A	N/A	N/A
Phenol	108-95-2	Not sampled	N/A	24 hours	1.31	26.3	N/A	N/A	N/A
Styrene	100-42-5	Not sampled	N/A	24 hours	5.91	118	N/A	N/A	N/A
Toluene	108-88-3	Not sampled	N/A	24 hours	32.9	657.0	N/A	N/A	N/A
Lead [b]	N/A	Not sampled	N/A	1 year	10	16	N/A	N/A	N/A
Mercury (Elemental)	7439-97-6	Not sampled	N/A	24 hours	0.000591	0.0118	N/A	N/A	N/A
Vanadium	7440-62-2	Not sampled	N/A	24 hours	0.00131	0.0263	N/A	N/A	N/A
Manganese [b]	N/A	0.0	0.0	24 hours	0.000263	0.00526	N/A	N/A	N/A
Cobalt	7440-48-4	0.0	0.0	24 hours	0.000657	0.013	N/A	N/A	N/A
Copper [b]	N/A	0.0	0.0	1 hour	0.011	0.219	N/A	N/A	N/A
Cadmium [b]	7440-43-9	0.0	0.0	1 year	0.00228	0.0457	N/A	N/A	N/A
Fluoride [b]	N/A	0.0	0.0	24 hours	0.0854	1.71	N/A	N/A	N/A
Selenium [b]	N/A	0.0	0.0	24 hours	0.131	2.63	N/A	N/A	N/A

Table 1. Calculation

		Step 1	Step 2		Step 3	Step 4		Step 5	Step 6
Constituent	**CAS Number**	**Mass Release (kg/day)**	**Mass Release (lbs/averaging period)**	**Averaging Period**	**De minimis (lbs/averaging period)**	**SQER (lbs/ averaging period)**	**Emissions after tBACT (lbs/yr)**	**Previous Model Emissions (lbs/yr)**	**Exceeds SQER and previous model**

a. Hexavalent chromium result is from samples collected in 2014. The value is suspected to be erroneous, and a full explanation of the potential for hexavalent chromium in the air stream can be found in SGW-62363, *Hexavalent Chromium Treatment at the 200 West Pump and Treat*.

b. As the constituent with other compounds (e.g. selenium & selenium compounds).

CAS = Chemical Abstracts Service

N/A = not application

SQER = small quantity emission rate

tBACT = toxics best available control technology

6 Results and Recommendations

The results of the mass balance calculation show that only two constituents may exceed the parameters of the current air model. Both constituents, however, were still below the SQER value from WAC 173-460-150. Following the ARAR within WAC 173-460-080, "First Tier Review," a constituent that is shown to be below the SQER can either be modeled or calculated. Though the results for methylene chloride and trichloroethylene are above the previously modeled results, this NSR confirms that the values are still well under each of the associated SQERs. The remainder of the constituents are well below the previously modeled results. Based on this evaluation the emissions are expected to be in compliance with all requirements of WAC 173-460. No further action is needed.

In order to confirm the calculations in this NSR, monthly air samples are recommended for the first two quarters of operation under DOE/RL-2019-38. A review of the data collected monthly will be used to determine if monthly sampling is still recommended after the first two quarters. Constituents analyzed will be the same as the current requirements as defined in the O&M Plan (DOE/RL-2009-124).

An additional NSR will be performed for the increase of flow through the plant up to 3750 gpm prior to initialization of that change.

7 References

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