RP Y12-F-0104 000 00

Water Usage Study for the Y-12 National Security Complex

consolidated nuclear security, llc
PANTEX PLANT | Y-12 NATIONAL SECURITY COMPLEX

Environmental Compliance
August 2023

Water Usage Study for the Y-12 National Security Complex

August 2023

Prepared by
Consolidated Nuclear Security, LLC
Management & Operating Contractor
for the
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REVISION LOG

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ABBREVIATIONS

CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
EFPC	East Fork Poplar Creek
NPDES	National Pollutant Discharge Elimination System
ORRL	Oak Ridge Reservation Landfill
Y-12	Y-12 National Security Complex

EXECUTIVE SUMMARY

The National Pollutant Discharge Elimination System (NPDES) Permit TN0002968 issued to the Y-12 National Security Complex (Y-12) on October 1, 2022, requires a water usage study be submitted within 15 months of the permit effective date. Annual updates are required to be submitted every 12 months from the initial submittal. The Y-12 NPDES permit describes the scope and requirements of the water usage study.

This is the initial submittal of the Water Usage Study for the Y-12 National Security Complex. This study meets the scope and requirements as set forth in the October 1, 2022, Y-12 NPDES permit.

1. INTRODUCTION

A National Pollutant Discharge Elimination System (NPDES) permit (TN0002968) was issued to the Y-12 National Security Complex (Y-12) with an effective date of October 1, 2022. The permit requires a water usage study be submitted within 15 months of the its effective date. Annual updates are required to be submitted every 12 months from the initial submittal.

The water usage study is required to include all outfalls that discharge to East Fork Poplar Creek (EFPC) between Outfall 200 and Outfall MTF. It should be noted that the location of Outfall MTF is not defined in the permit. Specific requirements for the study include the following:

- Identify the types of wastewater discharged from each outfall.
- Provide flow rates from each outfall for both winter and summer conditions.
- Describe any treatment for the outfall discharge (including chlorination and dechlorination).
- Provide the latitude and longitude for each outfall.
- Provide an updated map drawing showing the location of each outfall.
- Provide an updated water balance diagram for the facility.

This initial submittal of this report meets the requirements as set forth in the October 1, 2022, Y-12 NPDES permit.

2. OUTFALL DISCHARGE INFORMATION

Tables 1 and 2 include the following information for all outfalls that discharge to EFPC between Outfall 200 and Outfall MTF:

- The types of waste water discharged.
- The outfalls that discharge to EFPC between Outfall 200 and Outfall MTF.
- The flow rates from each outfall for both winter and summer conditions.
- A description of any treatment for the outfall discharge.
- The latitude and longitude for each outfall.

In addition to stormwater and groundwater, the types of wastewater discharged from outfalls at Y-12 includes those listed in the NPDES permit and permit application. This includes treatment system effluent, cooling tower blowdown, once-through noncontact water, steam condensate, process water, and boiler blowdown. Table 1 lists the types of stormwater, groundwater, and/or wastewater discharged.

For this study, flow rates were measured from each outfall that discharges to EFPC between Outfall 200 and Outfall MTF during both winter and summer conditions. Flow measurements were collected as dry weather instantaneous flows. A dry weather period is any period occurring greater than 72 hours since the last 0.1-in. rainfall event. Instantaneous flows are measured by standardized Y-12 procedures. An example of a procedural method includes the stopwatch and bucket method. Table 1 shows the collected flow rate data.

This study also evaluated and listed the forms of treatment for each outfall. The only form of treatment for some stormwater outfalls is dechlorination. There is also a treatment system effluent outfall from the Big Springs treatment system. This is the only outfall from a treatment system that discharges to EFPC between Outfall 200 and Outfall MTF. The Big Springs treatment system is a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) regulated treatment system and not regulated under the NPDES permit. Table 1 describes the treatment at the outfalls and any upstream treatment for discharges.

Table 1. Outfall Information

Outfall	Latitude			Longitude			Wastewater Type	Outfall Discharge Treatments
	Deg	Min	Sec	Deg	Min	Sec		
19	35	59	19	-84	14	39	Stormwater	None
20	35	59	18	-84	14	43	Cooling tower water, steam condensate, cooling water, and stormwater	None
21	35	59	19	-84	14	45	Steam condensate, cooling tower blowdown, and stormwater	Chlorine is treated by application of ammonium bisulfite
33	35	59	16	-84	14	49	Stormwater	None
34	35	59	15	-84	15	00	Once-through noncontact cooling water, steam condensate, groundwater from sump in basement, and stormwater	Chlorine is treated by application of ammonium bisulfite
41	35	59	16	-84	14	51	Stormwater	None
42	35	59	16	-84	14	52	Once-through noncontact cooling water and stormwater	Tablet dechlorinator
44	35	59	15	-84	14	52	Stormwater	None
45	35	59	15	-84	14	53	Stormwater	None
46	35	59	14	-84	14	54	Stormwater	None
47	35	59	15	-84	14	54	Once-through noncontact cooling water, steam condensate, cooling tower blowdown, reverse osmosis reject water, excess demineralized water, and stormwater	None
48	35	59	15	-84	14	54	Once-through noncontact cooling water, steam condensate, cooling tower blowdown, reverse osmosis reject water, excess demineralized water, and stormwater	None
Big Springs (CERCLA)	35.	59	14	-84	14	54	Big Springs Mercury Treatment Facility Effluent	Mercury treatment
51 (treatment facility)	35	59	13	-84	14	55	Big Springs Mercury Treatment Facility Effluent	Mercury treatment
54	35	59	14	-84	14	56	Stormwater	None
55	35	59	14	-84	14	57	Once-through cooling water and stormwater	None
57	35	59	13	-84	14	57	Stormwater	None
58	35	59	14	-84	14	58	Stormwater	None

Outfall	Latitude			Longitude			Wastewater Type	Outfall Discharge Treatments
	Deg	Min	Sec	Deg	Min	Sec		
62	35	59	13	-84	15	10	Stormwater	None
63	35	59	12	-84	15	00	Once-through cooling water, groundwater from sump in basement, and stormwater	None
64	35	59	13	-84	15	01	Stormwater	None
67	35	59	12	-84	15	02	Once-through noncontact cooling water, steam condensate, and stormwater	None
71	35	59	11	-84	15	03	Once-through noncontact cooling water, groundwater from sump in basement, demineralized water, and stormwater	None
83	35	59	10	-84	15	05	Once-through noncontact cooling water, steam condensate, groundwater from sumps in basement, and stormwater	None
86	35	59	10	-84	15	08	Stormwater	None
87	35	59	10	-84	15	05	Cooling tower blowdown and stormwater	None
88	35	59	10	-84	15	07	Once-through noncontact cooling water and stormwater	None
99	35	59	09	-84	15	08	Once-through noncontact cooling water and stormwater	None
102	35	59	09	-84	15	09	Steam condensate, once-through noncontact cooling water, discharge through oil/water separator, and stormwater	None
109	35	59	09	-84	15	09	Steam condensate, once-through noncontact cooling water, cooling tower blowdown, and stormwater	None
110	35	59	08	-84	15	10	Stormwater	None
113	35	59	07	-84	15	13	Condensate and stormwater	None
114	35	59	06	-84	15	16	Once-through noncontact cooling water and stormwater	None
125	35	59	05	-84	15	18	Once-through noncontact cooling water and stormwater	None
126	35	59	05	-84	15	19	Stormwater	None
134	35	59	04	-84	15	21	Stormwater	None
135	35	59	04	-84	15	21	Once-through noncontact cooling water, steam condensate, cooling tower blowdown, and stormwater	Chlorine is treated by application of ammonium bisulfite
200	35	59	03	-84	15	21	Steam condensate, once-through noncontact cooling water, sump water, treated effluent from wastewater treatment plants, discharge from physical testing systems, cooling tower blowdown, and stormwater	Chlorine is treated by application of ammonium bisulfite

Table 2. Outfall Flow Data

Outfall	Winter Flow	Winter Date	Summer Flow	Summer Date
19	0 gpm	2/22/2023	0 gpm	6/29/2023
20	1 gpm	2/22/2023	0 gpm	6/29/2023
21	60 gpm	2/22/2023	30 gpm	6/29/2023
33	2.5 gpm	2/22/2023	5 gpm	6/29/2023
34	60 gpm	2/22/2023	200 gpm	6/29/2023
41	0 gpm	2/22/2023	0 gpm	6/29/2023
42	13 gpm	2/22/2023	20 gpm	6/29/2023
44	0 gpm	2/22/2023	0 gpm	6/29/2023
45	0 gpm	2/22/2023	0 gpm	6/29/2023
46	0 gpm	2/22/2023	0 gpm	6/29/2023
47	35 gpm	2/22/2023	75 gpm	6/29/2023
48	10 gpm	2/22/2023	15 gpm	6/29/2023
Big Springs (CERCLA)	156 gpm	2/22/2023	63 gpm	6/29/2023
51 (treatment facility)	2 gpm	2/22/2023	0 gpm	6/29/2023
54	0 gpm	2/22/2023	0 gpm	6/29/2023
55	< 0.5 gpm	2/22/2023	0.264 gpm	6/29/2023
57	0 gpm	2/22/2023	0 gpm	6/29/2023
58	0 gpm	2/22/2023	0 gpm	6/29/2023
62	0 gpm	2/22/2023	0 gpm	6/29/2023
63	0 gpm	2/22/2023	0 gpm	6/29/2023
64	0 gpm	2/22/2023	0 gpm	6/29/2023
67	7 gpm	2/22/2023	10 gpm	6/29/2023
71	1 gpm	2/22/2023	3 gpm	6/29/2023
83	0 gpm	2/22/2023	1 gpm	6/29/2023
86	0 gpm	2/22/2023	0 gpm	6/29/2023
87	0 gpm	2/22/2023	0 gpm	6/29/2023
88	9.5 gpm	2/22/2023	10 gpm	6/29/2023
99	25 gpm	2/22/2023	5 gpm	6/29/2023
102	< 0.5 gpm	2/22/2023	1 gpm	6/29/2023
109	75 gpm	2/22/2023	73 gpm	6/29/2023
110	0 gpm	2/22/2023	0 gpm	6/29/2023
113	113 gpm	2/22/2023	0 gpm	6/29/2023

Outfall	Winter Flow	Winter Date	Summer Flow	Summer Date
114	0 gpm	2/22/2023	0 gpm	6/29/2023
125	0 gpm	2/22/2023	0 gpm	6/29/2023
126	0 gpm	2/22/2023	0 gpm	6/29/2023
134	0 gpm	2/22/2023	0 gpm	6/29/2023
135	104 gpm	2/22/2023	100 gpm	6/29/2023
200	1.75 mgd	2/22/2023	1.66 mgd	6/29/2023

3. OUTFALL LOCATIONS

An updated map showing the location of the outfalls at Y-12 is included in Appendix A.

4. WATER BALANCE INFORMATION

A water balance diagram has been developed for Y-12 covering a dry weather period. This diagram considers the water inflows and outflows that cross the Y-12 site boundaries. There are three inflow sources and five outflow sources. Potable water, groundwater, and Oak Ridge Reservation Landfill (ORRL) leachate are the inflow sources and outflows include EFPC, Bear Creek, the sanitary sewer, steam condensate to ground, and cooling tower evaporation.

Flow data include metered readings for the potable water, ORRL leachate, EFPC flow, sanitary sewer flow, and Bear Creek flow. Interviews with subject matter experts and system operators provided estimates for the flow data for the steam condensate to ground and cooling tower evaporation. The groundwater flow data were calculated using a mass balance approach.

As part of this water balance diagram development, the flows at Outfall 200 were evaluated. Flow data from Outfall 200 were compiled, and the high flow spikes from rainfall events were disregarded for a non-stormwater flow evaluation. Measured non-stormwater flows through Outfall 200 is approximately 1.7 million gpd. This flow is a combination of groundwater and discharges from processes using potable water.

Determining the portion of the potable water discharges flowing through Outfall 200 was based on interviews with subject matter experts and system operators. It was determined that approximately 0.83 million gpd of potable water discharges flow through Outfall 200. This is comprised of West End Treatment discharges, cooling tower discharges, once-through cooling discharges, and process water discharges. Therefore, the groundwater discharges from Outfall 200 are estimated at approximately 0.88 million gpd or 51% of the flow at Outfall 200. Given that there are fluctuations in the flows from the different discharges, it is reasonable to approximate that half of the non-stormwater flow from Outfall 200 is from groundwater.

The latest water balance diagram for the Y-12 site is included in Appendix B.

5. CONCLUSION

This report addresses the requirements of the current Y-12 NPDES permit. The discharges to EFPC from Outfall 200 to the effluent of the Mercury Treatment Facility are included. This study provides:

- The types of wastewater discharged from each outfall.
- The flow rates from each outfall for both winter and summer conditions.
- The outfall discharge treatments (including chlorination and dechlorination).
- The latitude and longitude for each outfall.
- An updated map drawing showing the location of each outfall.
- An updated water balance diagram for the facility.

APPENDIX A. UPDATED MAP

Y-12 COMPLEX STORM DRAIN OUTFALL MAP

LEGEND

- Outfalls in current NPDES Permit
- Outfalls not in current NPDES Permit
- Outfalls Eliminated
- 9422-01 SWHISS Real–time Monitoring Location On–line
- 9422-02 SWHISS Outfall Monitoring Not On–line
- 9422-18 Sanitary Sewer Monitoring Location On–line
- CB 160 Catch Basin
- 501 Discharge from Waste Treatment Facility

NORTH
TRUE
GRID

THE GRID AND COORDINATES AS SHOWN REPRESENT THE Y–12 COMPLEX GRID SYSTEM

SCALE 0 200 400 800 FEET

This document has been reviewed by a Y-12 DC/UCNI RO and has been determined to be UNCLASSIFIED and contains no UCNI. This review does not constitute clearance for Public Release.

Name: S. A. Shults

Date: 10/7/2014

Y-12 National Security Complex managed and operated by Consolidated Nuclear Security, LLC for the Department of Energy under U.S. Government contract DE-NA0001942 Oak Ridge, Tennessee

Map Created by Y–12 CIVIL ENGINEERING
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(PREPARED BY THE MAPPING SECTION OF Y-12 CIVIL ENGINEERING 574-8901)

APPENDIX B. WATER BALANCE DIAGRAM

Y-12 Water Balance Schematic
(Non-Stormwater)