SANBORN HEAD

Sanborn, Head & Associates, Inc.

Digitally signed by: Sanborn, Head & Associates, Inc.
DN: CN = Sanborn, Head & Associates, Inc. email = fmark@sanbornhead.com C = AD
Date: 2024.01.22 15:22:41 -05'00'

Bottom Ash Transport Water Best Management Practice Plan

MERRIMACK STATION
Bow, New Hampshire

Prepared for GSP Merrimack LLC
File No. 2025.14
October 2023

Administrative update
January 2024

TABLE OF CONTENTS

INITIAL CERTIFICATION

Management Certification

GSP Merrimack LLC (GSP) is committed to working towards reducing bottom ash transport water (BATW) discharges from the Merrimack Station facility and will provide the manpower, equipment, and materials necessary to implement this BATW Best Management Practices (BMP) Plan. The undersigned authorized facility representative attests that:

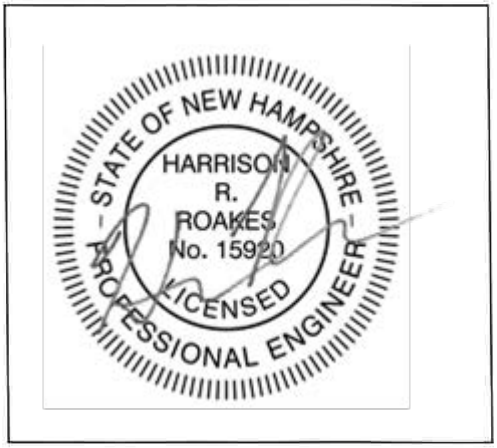
a) I have personally examined and am familiar with the included BATW BMP Plan;
b) I believe that the information in the BATW BMP Plan and any supporting documentation used in the development of this plan is true, accurate, and complete; and
c) The BATW BMP Plan, to the best of my knowledge and belief, meets the requirements of 40 CFR 423.

ELIZABETH H. TILLOTSON	Elizabeth H. Tillotson	October 31, 2023
Printed Name of Facility Representative	Signature	Date

Professional Engineer Certification

The BATW BMP Plan was prepared by Sanborn, Head & Associates, Inc. for the Merrimack Station facility located in Bow, New Hampshire. I, the undersigned Registered Professional Engineer, certify the following information in respect to the Merrimack Station BATW BMP Plan), subject to the assumptions and limitations contained within the BATW BMP Plan.

a) I am a licensed professional engineer in the State of New Hampshire.
b) I am familiar with the 40 CFR Part 423(k)(3) requirements for the BATW BMP Plan.
c) I am familiar with the Merrimack Station BATW system;
d) The BATW BMP Plan is included with this certification statement; and
e) The BATW BMP Plan, to the best of my knowledge and belief, will be implemented by GSP if the MK1 Boiler and MK2 Boiler units are designated low utilization electric generating units (LUEGUs).



Harrison R. Roakes

Printed Name of Licensed Professional Engineer

Signature

15920	New Hampshire	October 31, 2023
License Number	Licensing State	Date

INTRODUCTION

This Bottom Ash Transport Water (BATW) System Best Management Practices (BMP) Plan is prepared to meet the requirements of the Final Steam Electric Reconsideration Rule 40 CFR Part 423.13(k)(3). Sanborn, Head & Associates, Inc. (Sanborn Head) prepared this BATW BMP Plan for GSP Merrimack LLC (GSP). This BATW BMP and the services provided by Sanborn Head are subject to the Limitations provided in Appendix A.

This BATW BMP Plan is intended to be a working document. Therefore, certain aspects of the BATW BMP Plan require continued review, and action must be documented in support of the annual certification process. Key aspects of the BATW BMP Plan that GSP is responsible for implementing are highlighted below.

- Note and address any needed editorial updates to the BATW BMP Plan.
- Routinely (at least annually) review the feasibility of implementing new BMPs to include in this plan that have the potential to reduce BATW discharges at the facility.
- Investigate options to minimize slag sluice operations to reduce the volume of BATW discharges, such as optimizing intermittent operations to reduce sluice flows.
- Maintain records to document BATW flows.
- Maintain records to document the average amount of recycled BATW.
- Complete regular BATW maintenance and inspections, including preparation of inspection reports and summaries of preventative and corrective maintenance performed.

1.0 GENERATING UNIT IDENTIFICATION

The coal-fired generating units that contribute bottom ash (BA) to the BATW system are identified as MK1 Boiler and MK2 Boiler. The designation of these units as low utilization (as defined in 40 CFR 423.11) is currently under review by USEPA Region 1. This BMP Plan is prepared to meet the requirements for a BATW BMP Plan for the MK1 Boiler and MK2 Boiler units assuming EPA agrees to designate the units as low utilization electric generating units (LUEGUs).

2.0 SYSTEM DESCRIPTION

A water flow diagram that includes the BATW system is included as Appendix B.

The existing BA transfer system consists of a wet slag tank for collection of BA at the boiler with wet sluice of BA to the slag settling area. Water from the Merrimack MK1 cooling water tunnel and Merrimack MK2 cooling water tunnel are used for the BATW that transports BA from the MK1 Boiler and MK2 Boiler slag tanks, respectively. Bottom ash and water are drawn from the MK1 Boiler and MK2 Boiler slag tanks using jet pumps and travel by sluice to the slag settling area. Slag is collected and stored for beneficial reuse and water from the slag settling area travels to the service water pond. MK1 Boiler and MK2 Boiler slag tank seal water (aka overflow water), which is generated during normal operations to maintain the slag tanks at full level, is sent to the service water pond without passing through the slag sluice settling area. This seal water (overflow water) does not transport or sluice bottom ash (slag).

Some water from the service water pond is pumped at the service water pump house to be recycled for use in the flue gas desulfurization (FGD) absorber. Most of the water drawn for the FGD absorber is removed from the system via evaporation (steam) while much smaller amounts are removed as a component of the gypsum produced, and the remainder is handled as blowdown in the wastewater treatment facilities.

In addition to the flows mentioned above, the service water pond also receives storm drain and yard drain water, boiler blowdown, returned service water, and water from Waste Treatment Plant #1 (National Pollutant Discharge Elimination System [NPDES] Permit NH0001465).

The service water pond discharges via NPDES Permit NH0001465 Internal Outfall 003A to the cooling canal, (designated Waste Treatment Plant #2), for eventual discharge to the Merrimack River via Outfall 003.

3.0 WATER BALANCE

A diagram of the water balance is included as Appendix B, and tabulated values are provided below in Exhibit 1.

Exhibit 1 - Summary of BATW System Additions and Removals

Type	BATW System Component	Normal Station On-Line Operation Flow
Water removed from the BA transport system	Outfall: Outfall 003A to Waste Treatment Plant #2	5,330,000 GPD
	Service Water Pump House (primarily for FGD absorber use)	1,100,000 GPD
	Evaporation from the BATW system (e.g., from service water pond)	Not quantified
	Entrained with removed bottom ash	Not quantified
Water entering or recycled to the BA transport system. There is no BATW recycled back to the system in lieu of makeup water.	MK1 Cooling Water Tunnel	2,000,000 GPD (intermittent)
	MK2 Cooling Water Tunnel	4,230,000 GPD
	Service water pump house return	100,000 GPD
	Boiler Blowdown + Seal Water (Overflows) & Storm Drains	11,000 GPD (intermittent)
	Waste Treatment Plant (#1)	81,515 GPD
	Yard Drains	5,000 GPD (intermittent)

Note: As indicated above, some of the values represent typically intermittent flows. There is a non-zero balance of water removed and water added because of the intermittent flows.

4.0 MAINTENANCE AND INSPECTION

A regular maintenance and inspection preventative maintenance management system is used to identify, repair, and replace equipment prior to failures. Preventative maintenance work orders are issued for timely upkeep of critical equipment and components.

The Operations Department does a walk-through every shift (twice per day) to inspect the entire BATW system, including valves, pipe flanges and piping, to identify leaks, spills and other unintended bottom ash transport water escaping from the system. If needed, timely repairs are arranged.

Copies of inspection reports and documentation of preventative and corrective maintenance performed are maintained by GSP personnel and are required to be included as part of the annual certification of this BATW BMP Plan.

5.0 EVALUATION OF BATW ELIMINATION/MINIMIZATION

GSP completed an evaluation of costs and feasibility of full recycling of BATW to eliminate or minimize discharges. The evaluation recommendations were to install a remotely-located submerged flight conveyor (SPF) and associated infrastructure with an estimated cost of roughly $7,000,000 (2021 dollars). Given the significant changes to Merrimack Station's operational profile in recent years (substantially reduced operations and thus BATW discharges), the installation of SPF technology was no longer economically viable and GSP Merrimack is re-evaluating options with EPA Region 1 for complying with the no-discharge BATW permit limitation, including classification as LUEGUs.

6.0 RECYCLE SYSTEM AND DISCHARGE MINIMIZATION

The following elements are included in the current BATW system for recycling and minimizing BATW discharge.

- BATW is recycled for use in the FDG scrubber.
- Investigate options to minimize slag sluice operations to reduce the volume of BATW discharges, such as optimizing intermittent operations to reduce sluice flows. The MK1 Boiler BATW sluice for emptying the slag tank is operated intermittently at a typically consistent flow, and minimizing the time that they are operating minimizes the BATW discharge.

Recycling BATW through the FDG scrubber reduces BATW discharges from the facility by over 1,000,000 GPD. Reductions in BATW discharges achieved by the other BMPs listed in this plan have not been quantified.

7.0 SCHEDULE FOR IMPLEMENTATION

No changes to the existing BATW system are planned. The BMPs outlined in this plan represent the BATW discharge control measures that GSP determined are technically available and economically achievable for the Merrimack Station facility at this time. The need to reevaluate options and feasibility for BATW elimination or minimization should be considered at least annually, and a new evaluation should be completed if operating conditions are changed or if additional information or technologies become available.

8.0 RECYCLE SYSTEM DOCUMENTATION

A regular maintenance and inspection preventative maintenance management system for the FGD system is used to identify, repair, and replace equipment prior to failures. Preventative maintenance work orders are issued for timely upkeep of critical equipment and components.

The Operations Department does a walk-through every shift (twice per day) to inspect the entire FGD system. If needed, timely repairs are arranged.

Copies of inspection reports and documentation of preventative and corrective maintenance performed are maintained by GSP personnel and will be included as part of the annual certification of this BATW BMP Plan.

9.0 FLOW MONITORING

Measurements associated with the flow monitoring are to be recorded on at least a weekly basis and kept in the BATW system maintenance and operation file.

Exhibit 1 - Summary of BATW System Additions and Removals

BATW System Component	Weekly Monitoring Method	During Normal Station On-line Operation	
		Flow Type	Typical Flow
MK1 water added to the BATW system, including the BATW slag sluice	Record start and stop times of water being added from the MK1 cooling water tunnel to the MK1 sluice system. Sum the total run time of the MK1 sluice water addition and multiple by the typical operational flow rate to obtain the weekly flow volume.	Intermittent	2,000,000 GPD
MK2 water added to the BATW system, including the BATW slag sluice	Record start and stop times of water being added from the MK2 cooling water tunnel to the MK2 sluice system. Sum the total run time of the MK2 sluice water addition and multiple by the typical operational flow rate to obtain the weekly flow volume.	Continuous	4,230,000 GPD
Total BATW discharged	Continuous flow monitoring data are collected at Internal Outfall 003A.	Continuous	5,330,000 GPD
BATW recycled to the FGD absorber	Operational or flow data will be collected to establish flows at the FGD absorber.	Continuous	1,100,000 GPD

Note: As indicated above, some of the values represent typically intermittent flows. There is a non-zero balance of water removed and water added because of the intermittent flows.

P:\2000s\2025.14\Source Files\202310 BATW BMP Plan\202310 BATW BMP.docx

Appendix A
Limitations

ATTACHMENT B
LIMITATIONS

1. The observations described in this report were made under the conditions stated herein. The conclusions presented in this report were based solely upon the services described herein, and not on scientific tasks or procedures beyond the scope of described services or the time and budgetary constraints imposed by the Client.
2. In preparing this report, Sanborn Head has relied on certain information provided by other parties referenced herein. Detailed evaluations of this information to verify its validity was not conducted.
3. Should additional information on relevant conditions at the site which is not contained in the report be obtained, such information should be brought to Sanborn Head's attention. We will evaluate such information and, on the basis of our evaluation, may modify the conclusions stated in this report.
4. This report was prepared for the exclusive use of GSP Merrimack LLC (GSP) for specific application for 40 CFR Part 423(k)(3) compliance for GSP's Merrimack Station bottom ash transport water system for MK1 Boiler and MK2 Boiler electric generating units in Bow, New Hampshire, and was prepared in accordance with generally-accepted environmental engineering practices. No warranty, express or implied, is made.

P:\2000s\2025.14\Source Files\202310 BATW BMP Plan\App A - Limitations\Limitations.docx

Appendix B
Schematic of Water Flow

MK1

COMMON

MK2

CONDENSATE FROM STORAGE TANK FOR WATER SIDE METAL CLEANING (DONE ONCE EVERY 7 YEARS) (WSMC) 60 GPD (150,000 GAL PER)

LOSS TO ATMOSPHERE 16,902 GPD

MERRIMACK RIVER INLET FOR GAS SIDE ASH WASH (GSAW) (DONE 5 TIMES PER YEAR) 6,850 GPD

MERRIMACK RIVER INLET FOR GAS SIDE ASH WASH (GSAW) (DONE 1 TIME PER YEAR) 2900 GPD

LOSS TO ATMOSPHERE 26,827 GPD

CONDENSATE FROM STORAGE TANK FOR WATER SIDE METAL CLEANING (DONE ONCE EVERY 7 YEARS) 150,000 GAL PER (WSMC) 60 GPD

SCREENHOUSE STEAM 50 GPD

SCREENHOUSE STEAM 50 GPD

MK1 GENERATOR 113,600 KW

MK1 TURBINE

2.35 MGD (815,000 PPH @ F.L.)

6.7 MGD (2,320,000 PPH @ F.L.)

MK2 TURBINE

MK2 GENERATOR 314,000 KW

PUMP

(816,000 PPH @ F.L.) 2.35 MGD

(2,330,000 PPH @ F.L.) 6.7 MGD

PUMP

CONDENSER

MERRIMACK RIVER INLET

57.5 MGD (3.54 MG / hr @ F.L.)

CONDENSER

131.2 MGD (8.4 MG / hr @ F.L.)

MERRIMACK RIVER INLET

UNIT 1 BOILER DRAINS 4 TIMES PER YEAR (30,000 GALS PER) 330 GPD

720 GPD LOSS

BLOW DOWN TANK

1440 GPD BLOWDOWN

MK1 BOILER

UNIT 2 BOILER DRAINS DONE 4 TIMES PER YEAR (50,000 GAL PER) 550 GPD

MK2 BOILER

60 GPD (WSMC)

60 GPD (WSMC)

6,850 GPD (GSAW)

1,600 GPD

2900 GPD (GSAW)

POLISHING DEMINERALIZER

7150 GPD REGENERATION WATER

55,000 GPD MAKE UP WATER

WWT #3 SLAG SLUICE SETTLING AREA

2.0 MGD SLAG SLUICE & FREEZE PROTECTION

4.23 MGD SLAG SLUICE & FREEZE PROTECTION

6.23 MGD

48,000 GPD MAKEUP WATER

8 GPD

PUMP

TO CLOSED COOLING WATER SYSTEM

SLAG TANK

SLAG TANK

2.0 MGD

OVERFLOW & STORM DRAINS 6,400 GPD

8,000 GPD

WASTE TREATMENT #4 SERVICE WATER POND

OVERFLOW & STORM DRAINS 3,000 GPD

4.23 MGD

RENTAL FRAC TANKS

6.7 MGD

56 GPD

TO CLOSED COOLING WATER SYSTEM

PUMP

CONDENSATE STORAGE TANK

60 GPD

TO BOILER NO. 2 WATER SIDE METAL CLEANING

FROM MERRIMACK MK1 COOLING WATER TUNNEL

EVAPORATION 908,000 GPD

SERVICE WATER PUMP HOUSE

1.10 MGD

RECIRC. BACKWASH 100,000 GPD

5000 GPD

YARD DRAINS

FROM MERRIMACK MK2 COOLING WATER TUNNEL

2960 GPD

REGENERATION WASTE (25/YR) (SEE NOTE 2) 7150 GPD

REGENERATION WASTE (SEE NOTE 2) 6,940 GPD

DEMINERALIZER

6,940 GPD

REGENERATION WATER

60 GPD TO BOILER NO. 1 WATER SIDE METAL CLEANING

CONDENSATE STORAGE TANK

RENTAL FRAC TANKS

6910 GPD

1.0 MGD

FGD ABSORBER

212,500 GPD

NON-CONTACT COOLING WATER 144,000 GPD

GYPSUM 20,000 GPD

SWWTS (SEE NOTE 4)

68,500 GPD DISTILLATE

3,500 GPD

72,000 GPD

OFF-SITE DISPOSAL

72,000 GPD BLOWDOWN

PWWTS (SEE NOTE 4)

FGD WASTEWATER TREATMENT SYSTEM #5

81,515 GPD

OUTFALL 003B

MCW 9,870 GPD

UNIT 2 ROOF DRAINS 625 GPD

MISC TANK MAINTENANCE DRAINS 100 GPD

STORM WATER (PIPE TRENCH) 809 GPD

62,000 GPD

WELL WATER

100,000 GPD SERVICE WATER

REGENERATION WATER 6,000 GPD

WASTE TREATMENT PLANT #1 (BASINS, NEUTRALIZER, OIL SEPARATOR)

40,675 GPD

37,090 GPD

EQUIPMENT AND FLOOR DRAINS

BOILER WATER SAMPLE DRAINS AND CHEMICAL AREA DRAINS (SEE NOTE 2)

20,000 GPD

3,000 GPD

DEMINERALIZER

REGENERATION WASTES (SEE NOTE 2) 6,000 GPD

35,910 GPD

54,060 GPD

100,000 GPD SERVICE WATER

WELL WATER

EQUIPMENT AND FLOOR DRAINS CHEMICAL LAB SINKS (SEE NOTE 2)

BOILER WATER SAMPLE DRAINS CHEMICAL AREA DRAINS (SEE NOTE 2)

3,000 GPD

20,000 GPD

5.33 MGD

HYDROSTATIC RELIEF LINE

OUTFALL 003A

LOSS TO ATMOSPHERE

ASH LANDFILL LEACHATE COLLECTION TANKS 4,000 GPD

YARD SERVICE BLDG FLOOR DRAIN SUMP 6 GPD (DONE 2 TIMES PER YEAR 1000 GAL PER)

CHEMICAL TANK SYSTEM CLEANING WASTES 15 GPD (SEE NOTE 2)

2.16 MGD

57.5 MGD

WASTE TREATMENT PLANT #2 (SPRAY MODULES)

131.2 MGD

CONDENSER COOLING WATER DISCHARGE

191.9 MGD

OUTFALL 003

EQUIPMENT DEICING STEAM 100 GPD (90DAYS/YEAR)

WELL WATER

WELL WATER 4000 GPD

METAL PICKLING RINSE WATERS (SEE NOTE 2)

SANITARY WASTES

4000 GPD

OFF-SITE DISPOSAL

ON-SITE SEPTIC SYSTEM

004 MK1 SCREEN WASHWATER 0.81 MGD MAX.

MK2 SCREEN WASHWATER 0.91 MGD MAX.

SCREENHOUSE MK2

11 GPD ROOF DRAIN

SCREENHOUSE MK1

004 ROOF DRAIN (260 FT²) 16 GPD

004 ACTIVE SUMP 10 GPD (EST)

004 ACTIVE SUMP 100 GPD (EST)

004 FIRE PUMP RECIRC. 0.72 MGD

005 MAINTENANCE SUMPS 40 DAYS/YEAR 300,000 GPD EACH

ICE DAM REMOVAL SPRAY 300,000 GPD 10 TIMES/YEAR

DEICING HEADERS MK1 = 8 MGD MK2 = 13MGD 90 DAYS/YEAR

MERRIMACK RIVER

FLOW

LEGENDS:

MGD = MILLION GALLONS PER DAY
GPD = GALLONS PER DAY
PPH = POUNDS PER HOUR
– – – – – – INTERMITTENT FLOW

———— CONTINUOUS FLOW DURING DURING NORMAL STATION ON LINE OPERATION

NOTES:

1. STORM WATER FLOWS BASED ON ANNUAL RAINFALL OF 36.53", WITH A RUNOFF COEFFICIENT OF 80% (EXCEPT ROOF DRAINS, AND SLAG POND WHICH HAVE 100% RUNOFF COEFFICIENT).
2. LIMITED PERMIT STREAMS.
3. CONTINUOUS FLOWS GENERALLY BASED ON FULL LOAD OPERATION
4. SEE GZA DRAWING, FIGURE 1.

CONTRACT SERVICES

REV	DESCRIPTION	ENG/PE#	DATE	DRN	CHKD	APPR
6	WWT & MISC. FLOW UPDATES RWO100843		1/17/24	DJP	AGP	AGP
5	LOCATED REV.4 ON SERVER & ADD GSP TITLE BLOCK WO#25385		2/3/22	DJP	CB	CB
4	REVISED NOTED REFERENCES		5/4/17	MR		
3	REVISED FGD WATER VOLUMES		6/2/11	ZLF	AGP	AGP
2	REVISED WATER VOLUMES		2/10	ZLF	AGP	AAA
1	REVISED WATER VOLUMES		5/09	ZLF	AAA	AAA
0	REMOVED WET LANDS & UPDATED YARD DRAINS	.	12/05	JMR	AAA	AAA
DWG REV	EPN/DESCRIPTION	CONT/PE#	DATE	DRN	CHKD	APPR

GRANITE SHORE POWER

SCHEMATIC OF WATER FLOW

MERRIMACK STATION

G	6
DRAWN	JMR
ENGINEER	JMR
CHECKED	DAF
APPROVED	DAF
DATE	02/20/03
SCALE	NONE
FILE:	MK-M-1235.DWG
IMAGE:	
DRAWING NO.	MK-M-1235