Permit Fact Sheet

General Information

Permit Number	WI-0060968-10-0
Permittee Name and Address	DEVIL'S HEAD RESORT & CONVENTION CENTER S6330 Bluff Rd Merrimac WI 53561
Permitted Facility Name and Address	Devils Head Resort & Convention Center WWTF NEQ, SEQ, SEC 23, T11N, R7E, MERRIMAC TWP, MERRIMAC, WISCONSIN
Permit Term	April 01, 2025 to March 31, 2030
Discharge Location	NE ¼ of SE ¼, Section 23, T11N R7E
Receiving Water	Groundwater of the Lower Wisconsin River Basin (Lake Wisconsin Watershed, LW19) in Sauk county
Discharge Type	Existing, Continuous
Annual Average Design Flow	0.065 MGD
Industrial or Commercial Contributors	None
Plant Classification	A1 - Suspended Growth Processes; B - Solids Separation; C - Biological Solids/Sludges; N - Total Nitrogen; SS - Sanitary Sewage Collection System
Approved Pretreatment Program?	N/A

Facility Description

Devil's Head Resort and Convention Center operates a wastewater treatment facility to treat domestic wastewater produced at the resort. Treatment consists of an oxidation ditch followed by final clarification. Treated effluent is discharged to any of four seepage cells. Three groundwater monitoring wells are sampled quarterly to evaluate groundwater quality. The facility is designed to treat an average daily flow of 65,000 gallons per day and presently receives an average of 23,072 gallons per day for treatment. Sludge that is produced is stored on-site in a sludge holding tank and then transported by a permitted hauler for land application on Department approved fields or to a nearby municipal wastewater treatment facility for more treatment.

Substantial Compliance Determination

After a desk top review of all discharge monitoring reports, CMARs, land application reports, compliance schedule items, and a site visit on December 20, 2023, this facility has been found to be in substantial compliance with their current permit.

Sample Point Descriptions

Sample Point Designation		
Sample Point Number	**Discharge Flow, Units, and Averaging Period**	**Sample Point Location, Waste Type/Sample Contents and Treatment Description (as applicable)**
701	0.023 (Average 2023)	Influent: 24-hr flow proportional composite samples shall be collected after grinding/screening. Flow is monitored by a magnetic flow meter.
001	Not required to report during previous permit term	Effluent: 24-hr flow proportional composite samples and grab samples shall be collected after the final clarifier, prior to discharge to the land treatment system. Flow is monitored by a magnetic flow meter.
003	32,000 gallons (2023)	Aerobically digested, Liquid, Class B. Representative sludge grab samples shall be collected from the outer ring of the oxidation ditch, which is the sludge storage tank. Sludge samples shall be collected prior to hauling.

Permit Requirements

Sample Point Designation For Groundwater Monitoring Systems			
System	**Sample Pt Number**	**Well Name**	**Comments**
Seepage Cells	804	MW-4 (804) DOWNGRADIENT WELL	Point of Standards
	815	MW-5 (815) BACKGROUND WELL	Non-Point of Standards
	816	MW-6 (816) DOWNGRADIENT WELL	Non-Point of Standards

1 Influent – Monitoring Requirements

1.1 Sample Point Number: 701- INFLUENT

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Daily	Continuous	
BOD5, Total		mg/L	2/Week	24-Hr Flow Prop Comp	

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Suspended Solids, Total		mg/L	Weekly	24-Hr Flow Prop Comp	
Nitrogen, Total Kjeldahl		mg/L	Monthly	24-Hr Flow Prop Comp	
Nitrogen, Organic Total		mg/L	Monthly	Calculated	
Nitrogen, Ammonia (NH3-N) Total		mg/L	Monthly	24-Hr Flow Prop Comp	

1.1.1 Changes from Previous Permit:

Influent limitations and monitoring requirements were evaluated for this permit term and the following changes were made from the previous permit. See additional explanation of limits under "Explanation of Limits and Monitoring Requirements" below.

Flow: The sample frequency has changed to 'Daily' for eDMR reporting purposes.

BOD_5: The sample frequency has increase to align with effluent monitoring.

1.1.2 Explanation of Limits and Monitoring Requirements

Influent monitoring is needed to assess loading to the facility and treatment performance. The required parameters and sampling frequency are appropriate for a land treatment system as outlined in ch NR 206, Wis. Adm. Code.

2 Land Treatment – Monitoring and Limitations

2.1 Sample Point Number: 001- EFFLUENT

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Daily	Total Daily	
BOD5, Total	Monthly Avg	50 mg/L	2/Week	24-Hr Flow Prop Comp	
Suspended Solids, Total		mg/L	Weekly	24-Hr Flow Prop Comp	
pH Field		su	Weekly	Grab	
Nitrogen, Total Kjeldahl		mg/L	Monthly	24-Hr Flow Prop Comp	
Nitrogen, Ammonia (NH3-N) Total		mg/L	Monthly	24-Hr Flow Prop Comp	
Nitrogen, Organic		mg/L	Monthly	Calculated	

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Total					
Nitrogen, Nitrite + Nitrate Total		mg/L	Monthly	24-Hr Flow Prop Comp	
Nitrogen, Total	Monthly Avg	10 mg/L	Monthly	Calculated	
Solids, Total Dissolved		mg/L	Monthly	24-Hr Flow Prop Comp	
Chloride	Daily Max	250 mg/L	Monthly	24-Hr Flow Prop Comp	
Fecal Coliform		#/100 ml	Monthly	Grab	Monthly monitoring April 2025 - March 2026.

2.1.1 Changes from Previous Permit:

Effluent limitations and monitoring requirements were evaluated for this permit term and the following changes were made from the previous permit. See additional explanation of limits under "Explanation of Limits and Monitoring Requirements" below.

Flow: Monitoring for effluent flow rate has been added to the permit.

BOD_5: The sample frequency has been updated.

Fecal Coliform: Monitoring for fecal coliform is included in the permit at a monthly frequency during the first year of the permit term.

2.1.2 Explanation of Limits and Monitoring Requirements

All requirements for land treatment of municipal wastewater are determined in accordance with ch. NR 206, Wis. Adm. Code. All categorical limits are based on s. NR 206.08(1), Wis. Adm. Code. More information on the limitations can be found in the Groundwater Evaluation for Devil's Head Resort and Convention Center, dated November 06, 2024, prepared by Zach Watson, Hydrogeologist.

The BOD, total nitrogen and chloride limits for the effluent have been continued. An exemption, per s. NR 206.06(2), Wis. Adm, Code, will continue for total dissolved solids because there no environmental or health concerns related to this parameter.

Fecal Coliform monitoring requirements are included, per s. NR 206.08(1)(b)5, Wis. Adm. Code, to determine the amount of fecal coliform discharged to groundwater and assess the potential for water supply contamination from the seepage cells.

Monitoring Frequencies: The Monitoring Frequencies for Individual Wastewater Permits guidance (April 12, 2021) recommends that standard monitoring frequencies be included in individual wastewater permits based on the size and type of the facility, in order to characterize effluent quality and variability, to detect events of noncompliance, and to ensure consistency in permits issued across the state. Guidance and requirements in administrative code were considered when determining the appropriate monitoring frequencies for pollutants that have final effluent limits in effect during this permit term.

3 Groundwater – Monitoring and Limitations

3.1 Groundwater Monitoring System for Seepage Cells

Location of Monitoring system: NEQ, SEQ & SEQ, NEQ, SEC 23, T11N, R7E, MERRIMAC TWN

Groundwater Monitoring Well(s) to be Sampled: MW-4 (804) DOWNGRADIENT WELL, MW-5 (815) BACKGROUND WELL, MW-6 (816) DOWNGRADIENT WELL

Groundwater Monitoring Well(s) Used to Evaluate Background Groundwater Quality: MW-5 (815) BACKGROUND WELL

Groundwater Monitoring Well(s) Used for Point of Standards Application: MW-4 (804)

Parameter	Units	Preventative Action Limit	Enforcement Standard	Frequency
Depth To Groundwater	feet	N/A	N/A	Quarterly
Groundwater Elevation	feet MSL	N/A	N/A	Quarterly
Chloride Dissolved	mg/L	125	250	Quarterly
Nitrogen, Nitrite + Nitrate (as N) Dissolved	mg/L	2.0	10	Quarterly
pH Field	su	8.4	N/A	Quarterly
Nitrogen, Ammonia Dissolved	mg/L	0.97	9.7	Quarterly
Nitrogen, Total Kjeldahl Dissolved	mg/L	N/A	N/A	Quarterly
Nitrogen, Organic Dissolved	mg/L	10.2	N/A	Quarterly
Solids, Total Dissolved	mg/L	775	N/A	Quarterly
Fecal Coliform	#/100 ml	N/A	N/A	Quarterly

3.1.1 Changes from Previous Permit:

Groundwater limitations and monitoring requirements were evaluated for this permit term and the following changes were made from the previous permit. See additional explanation of limits under "Explanation of Limits and Monitoring Requirements" below.

Chloride, Nitrite + Nitrate Nitrogen, pH, Organic Nitrogen, and Total Dissolved Solids: The PALs, ES, and/or ACL have been updated using data from the prior permit term.

Fecal Coliform: Monitoring for fecal coliform is included in the permit at a quarterly frequency during the first year of the permit term.

3.1.2 Explanation of Limits and Monitoring Requirements

Groundwater limits and requirements are determined in accordance with ch. NR 140, Wis. Adm. Code. Indicator parameter Preventive Action Limit (PAL) values are established per s. NR 140.20, Wis. Adm. Code. Alternative Concentration Limits as allowed under s. NR 140.28, Wis. Adm. Code, are established on a case-by-case basis.

Fecal Coliform monitoring requirements are included, per s. NR 206.10(5)(b), Wis. Adm. Code, to determine the amount of fecal coliform discharged to groundwater and assess the potential for water supply contamination from the seepage cells.

For more information, please refer to the Groundwater Evaluation for Devil's Head Resort and Convention Center, dated November 06, 2024, prepared by Zach Watson, Hydrogeologist.

4 Land Application - Monitoring and Limitations

Municipal Sludge Description						
Sample Point	**Sludge Class (A or B)**	**Sludge Type (Liquid or Cake)**	**Pathogen Reduction Method**	**Vector Attraction Method**	**Reuse Option**	**Amount Reused/Disposed (Gallons)**
003	B	Liquid	Hauled by permitted entity	Hauled by permitted entity	Hauled by permitted entity	32,000 gallons (2023)
Does sludge management demonstrate compliance? **Yes.**						
Is additional sludge storage required? **No.**						
Is Radium-226 present in the water supply at a level greater than 2 pCi/liter? **No.**						
Is a priority pollutant scan required? **No, design flow is less than 5 MGD.** Priority pollutant scans are required once every 10 years at facilities with design flows between 5 MGD and 40 MGD, and once every 5 years if design flow is greater than 40 MGD.						

4.1 Sample Point Number: 003- HAULED SLUDGE

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Solids, Total		Percent	Annual	Composite	
Arsenic Dry Wt	Ceiling	75 mg/kg	Annual	Composite	
Arsenic Dry Wt	High Quality	41 mg/kg	Annual	Composite	
Cadmium Dry Wt	Ceiling	85 mg/kg	Annual	Composite	
Cadmium Dry Wt	High Quality	39 mg/kg	Annual	Composite	
Copper Dry Wt	Ceiling	4,300 mg/kg	Annual	Composite	
Copper Dry Wt	High Quality	1,500 mg/kg	Annual	Composite	
Lead Dry Wt	Ceiling	840 mg/kg	Annual	Composite	
Lead Dry Wt	High Quality	300 mg/kg	Annual	Composite	
Mercury Dry Wt	Ceiling	57 mg/kg	Annual	Composite	
Mercury Dry Wt	High Quality	17 mg/kg	Annual	Composite	

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Molybdenum Dry Wt	Ceiling	75 mg/kg	Annual	Composite	
Nickel Dry Wt	Ceiling	420 mg/kg	Annual	Composite	
Nickel Dry Wt	High Quality	420 mg/kg	Annual	Composite	
Selenium Dry Wt	Ceiling	100 mg/kg	Annual	Composite	
Selenium Dry Wt	High Quality	100 mg/kg	Annual	Composite	
Zinc Dry Wt	Ceiling	7,500 mg/kg	Annual	Composite	
Zinc Dry Wt	High Quality	2,800 mg/kg	Annual	Composite	
Nitrogen, Total Kjeldahl		Percent	Annual	Composite	Monitoring only required when sludge is land applied.
Nitrogen, Ammonium (NH4-N) Total		Percent	Annual	Composite	Monitoring only required when sludge is land applied.
Phosphorus, Total		Percent	Annual	Composite	Monitoring only required when sludge is land applied.
Phosphorus, Water Extractable		% of Tot P	Annual	Composite	Monitoring only required when sludge is land applied.
Potassium, Total Recoverable		Percent	Annual	Composite	Monitoring only required when sludge is land applied.
PCB Total Dry Wt	Ceiling	50 mg/kg	Once	Composite	Once in 2026.
PCB Total Dry Wt	High Quality	10 mg/kg	Once	Composite	Once in 2026.
PFOA + PFOS		ug/kg	Annual	Calculated	Report the sum of PFOA and PFOS. See PFAS Permit Sections for more information.
PFAS Dry Wt			Annual	Grab	Perfluoroalkyl and Polyfluoroalkyl Substances based on updated DNR PFAS List. See PFAS Permit Sections for more information.

4.1.1 Changes from Previous Permit:

Sludge limitations and monitoring requirements were evaluated for this permit term and the following changes were made from the previous permit. See additional explanation of limits under "Explanation of Limits and Monitoring Requirements" below.

List 2 Nutrients: Monitoring has been added should land application occur and for planning purposes.

PCB: Monitoring and limits are included in the permit.

PFAS: Monitoring is required annually pursuant to s. NR 204.06(2)(b)9, Wis. Adm. Code.

4.1.2 Explanation of Limits and Monitoring Requirements

Requirements for disposal, including land application of municipal sludge, are determined in accordance with ch. NR 204, Wis. Adm. Code. Ceiling and high-quality limits for metals in sludge are specified in s. NR 204.07(5), Wis. Adm. Code. Requirements for pathogens are specified in s. NR 204.07(6) and in s. NR 204.07 (7), Wis. Adm. Code for vector attraction requirements. Limitations for PCBs are addressed in s. NR 204.07(3)(k), Wis Adm Code.

List 2 Nutrients: Monitoring for list 2 (nutrients) is highly recommended at the same time as the monitoring of List 1 (metals). Results will assist in the determination of the acres needed for land application of sludge should it be necessary. The number of acres needed is also required for the Land Application Management Plan Schedule (see schedules for more information). List 2 nutrient sampling is required when land application occurs.

Water Extractable Phosphorus: Water extractable phosphorus (WEP) is the coefficient for determining plant available phosphorus from measured total phosphorus. In Wisconsin, the Penn State Method is utilized and is expressed in percent. While a total P may be significant, the WEP may show that only a small percentage of the P is available to plants because of factors such as treatment processes and chemical addition that "tie-up" phosphorus limiting the amount of phosphorus that is plant available. As part of the Wisconsin's nutrient management plan (NMP) requirements, the accounting of all fertilizers must be included over the NMP cycle. The fertilizer value of the waste needs to be communicated to the farmer and accounted for in the NMP.

PFAS: The presence and fate of PFAS in municipal and industrial sludges is an emerging public health concern. EPA is currently developing a risk assessment to determine future land application rates and expects to release this risk assessment by the end of 2024. In the interim, the department has developed the "Interim Strategy for Land Application of Biosolids and Industrial Sludges Containing PFAS."

Collecting sludge data on PFAS concentrations from a wide range of wastewater treatment facilities will help protect public health from exposure to elevated levels of PFAS and determine the department's implementation of EPA's recommendations. To quantitate this risk, PFAS sampling has been included in this WPDES permit pursuant to ss. NR 214.18(5)(b) and NR 204.06(2)(b)9, Wis. Adm. Code.

Change in form submittal: Due to moving to electronic submittal of forms via Switchboard, forms 3400-049 ("Characteristics Report"), 3400-052 ("Other Methods of Disposal") and 3400-055 ("Annual Land Application") will now be generated by the department and the permittee will be required to submit all three reports each year of the permit term. Additionally, this is used to officially report that no land application of sludge has occurred, and annual submittal of the forms is required per the standard requirements section.

5 Schedules

5.1 Protective Measures for Public Health Exposure to Human Pathogens

Required Action	Due Date
Action Plan Submittal: The permittee shall evaluate options and submit to the department an action plan to restrict public access to the land treatment system to protect public health from exposure to human pathogens.	06/30/2025
Initiate Actions: Initiate actions as identified in the Action Plan. Notify the department upon action initiation, but at least by the due date.	12/31/2025
Complete Actions: Complete actions, as identified in the action plan, necessary to protect public health from exposure to human pathogens by restricting public access to the land treatment system.	03/31/2026

5.1.1 Explanation of Schedule

A schedule is included in the permit to provide time for the permittee to investigate options for reducing public exposure to human pathogens. Department policy recommends disinfection and fecal coliform limits be included in permits for wastewater discharges to groundwater and land treatment outfall when there is a recreational use or public access to the treatment area. The risk for public exposure to human pathogens is minimal, as recreation is not occurring on the land treatment site. However, recreation is occurring near the land treatment site which creates potential for accidental exposure. Exclusion of the public to the land treatment site would protect against accidental exposure to human pathogens without needing disinfection requirements at this time.

5.2 Chloride Source Reduction Measures (SRMs) for Groundwater Discharges

Required Action	Due Date
Chloride Reduction Plan: The permittee shall complete and submit for Department review and approval a chloride reduction plan (CRP). The CRP is an initial step toward controlling chloride and ensuring compliance with chloride limits based on applicable groundwater standards. The CRP shall evaluate all applicable source reduction measures (SRMs) and establish appropriate implementation activities for the SRMs. The CRP shall include a schedule for implementing the selected SRMs.	03/31/2026
Annual Progress Report: Once the chloride reduction plan (CRP) is approved by the Department, the permittee shall submit an annual progress report, under the authority of s. NR 205.07(1)(h), Wis. Adm. Code. If a SRM implementation date of an approved CRP is not met, this may constitute a violation of the permit. Submittal of the first annual progress report is required by the Date Due.	03/31/2027
Annual Progress Report: Submit progress report in implementing the chloride reduction plan (CRP).	03/31/2028
Annual Progress Report: Submit progress report in implementing the chloride reduction plan (CRP).	03/31/2029
Annual Progress Report: Submit progress report in implementing the chloride reduction plan (CRP).	03/31/2030

5.2.1 Explanation of Schedule

The permittee should develop a chloride reduction plan to determine options for bringing down chloride concentrations in the effluent. The chloride reduction plan should be submitted within the first year of the permit term and followed up annually to continue to assess options and review initiatives.

5.3 Land Treatment Management Plan

A management plan is required for the land treatment system.

Required Action	Due Date

Land Treatment Management Plan Submittal: Submit a management plan to optimize the land treatment system performance and demonstrate compliance with ch. NR 206, Wis. Adm. Code. The land treatment system shall be operated in accordance with the approved management plan.	03/31/2026

5.3.1 Explanation of Schedule

An up-to-date Land Treatment Management plan is a standard requirement in reissued permits per ch. NR 206, Wis. Adm. Code.

5.4 Land Application Management Plan

A management plan is required for the land application system.

Required Action	Due Date
Land Application Management Plan Submittal: If the permittee proposes to land apply sludge, a management plan shall be submitted and approved by the department. The management plan shall be consistent with the requirements of this permit, and s. NR 204.07, Wis. Adm. Code. At minimum, the plan shall describe how the application rate has been calculated as well as how the sludge will be land applied and incorporated. Record keeping and tracking of site loadings shall also be described. Requests for land application site approvals shall also be included. The plan is due sixty (60) days prior to land applying.	

5.4.1 Explanation of Schedule

An up-to-date Land Application Management Plan is required that documents how the permittee will manage the land application of biosolids consistent with ch. NR 204, Wis. Adm. Code.

Attachments

NR 140 Groundwater Evaluation Report, dated November 06, 2024

Justification Of Any Waivers From Permit Application Requirements

No waivers requested or granted as part of this permit reissuance.

Prepared By: BetsyJo Howe, Wastewater Specialist **Date:** 02/12/2025

CORRESPONDENCE/MEMORANDUM

DATE: November 6, 2024 FILE REF: FIN 5458

TO: File

FROM: Zach Watson Hydrogeologist - SCR

SUBJECT: Groundwater Evaluation for Devil's Head Resort and Convention Center WI-0060968-09

General Information and Treatment System Description

Devil's Head Resort and Convention Center operates a wastewater treatment facility to treat wastewater produced at the resort. Treatment consists of an oxidation ditch followed by final clarification. Treated effluent is discharged to any of four seepage cells. Three groundwater monitoring wells are sampled quarterly to evaluate groundwater quality. The facility is designed to treat an average daily flow of 65,000 gallons per day and presently receives an average of 26,700 gallons per day for treatment. Sludge that is produced is stored on-site in a sludge holding tank and then transported by a permitted hauler for land application on Department approved fields or to a nearby municipal wastewater treatment facility for more treatment.

Table 1 – Monitoring Requirements and Limitations – Seepage Cells (Outfall 001)

Parameter	Current and Proposed Permit WI-0060968-09 and WI-0060968-10		
	Limit Type	Limits and Units	Sample Frequency
***Flow Rate**		**gpd**	**Daily**
BOD5, Total	Monthly Average	50 mg/l	Weekly
Suspended Solids, Total		mg/l	Weekly
pH Field		su	Weekly
Nitrogen, Total Kjeldahl		mg/l	Monthly
Nitrogen, Ammonia Total		mg/l	Monthly
Nitrogen, Organic Total		mg/l	Monthly
Nitrogen, Nitrite+Nitrate Total		mg/l	Monthly
Nitrogen, Total		10 mg/l	Monthly
Chloride	Daily Max	250 mg/l	Monthly
Solids, Total Dissolved		mg/l	Monthly
***Fecal Coliform**		**cfu/100 ml**	**Monthly[1]**

***Recommended changes to current permit**

1 – Monthly for the first year of the permit and then no sampling afterwards.

Table 2 – Seepage Cell Groundwater Monitoring System

Sample Point	Well Name	Current Permit and Proposed WI-0060968-09 and WI-0060968-10	
		Well Location	Well Designation
804	MW-4	Downgradient	Point of Standards
815	MW-5	Background	Non-Point of Standards
816	MW-6	Downgradient	Non-Point of Standards

Table 3 – Seepage Cell Monitoring Wells Groundwater Standards

Parameter	Current Permit WI-0060968-09		Proposed Permit WI-0060968-10	
	PAL	ES	PAL	ES
Depth to Groundwater	N/A	N/A	N/A	N/A
Groundwater Elevation	N/A	N/A	N/A	N/A
pH Field	6.0 – 8.0 su	N/A	***6.4 – 8.4 su**	N/A
Nitrite+Nitrate nitrogen	4.0 mg/l (ACL)	10 mg/l	***2.0 mg/l**	10 mg/l
Ammonia	0.97 mg/l	9.7 mg/l	0.97 mg/l	9.7 mg/l
Organic Nitrogen	3.0 mg/l	N/A	***10.2 mg/l**	N/A
Total Kjeldahl Nitrogen	N/A	N/A	N/A	N/A
Total Dissolved Solids	600 mg/l	N/A	***775 mg/l**	N/A
Chloride	150 mg/l (ACL)	250 mg/l	***125 mg/l**	250 mg/l
***Fecal Coliform[1]**	**N/A**	**N/A**	**N/A**	**N/A**

***Recommended changes for upcoming permit**

1 – Quarterly for the first year of the permit and then no sampling afterwards.

Geology

The bedrock underlying the treatment system is the undivided Cambrian-aged Trempealeau, Tunnel City and Elk Mound Groups. The Trempealeau Group includes the Jordan and St. Lawrence Formations, the Tunnel City Group includes the Lone Rock Formation and the Elk Mound Group includes the Wonewoc, Eau Claire and Mount Simon Formations (Bedrock Geologic Formations of Wisconsin 1982). These groups are comprised of sandstone with minor occurrences of dolomite. The overburden is mostly glacial meltwater stream sediments and till (Geology of Sauk County, Wisconsin 1990). Depth to bedrock is expected to be 100 – 150 feet below ground surface (Depth to Bedrock Map of Sauk County, Wisconsin 2002). Surface soils are the St. Charles silt loams and the Wyocena sandy loams (NRCS Soil Map).

Hydrogeology

Regional groundwater flow is to the south southeast towards the Wisconsin River (Water-Table Elevation Map of Sauk County, Wisconsin 2002). Groundwater elevation at the site is variable with groundwater elevations changing more than 20 feet during the past two decades of monitoring. Groundwater elevations at the site ranged from approximately 825 – 860 feet above mean sea level during the current permit term (**Figure 5**). Groundwater elevations exhibited a steady decline from the beginning of the permit term. Depth to water is approximately 50 – 90 feet below top of casing. The groundwater flow direction is variable between monitoring events (**Figure 1** and **2**). Generally, groundwater flow direction surrounding the treatment system is south to east.

Land Treatment Effluent Quality and Loading Rates

The hydraulic loading of the seepage cells was not monitored during the current permit term as there were no monitoring requirements for flow rate or hydraulic application rate. Therefore, the volume measured at the influent is used to approximate the volume sent to the absorption ponds. The approximated volume averaged 21,400 gallons per day during the current permit term. The concentration of total nitrogen averaged 4.7 mg/l during the current permit term (**Figure 3**). There were three monthly sampling events where the concentration of total nitrogen exceeded the 10 mg/l limit. Nitrogen discharged to the absorption ponds is primarily in the form of nitrite+nitrate. The concentration of chloride averaged 101 mg/l for the permit term. There were no monthly sample results that exceeded the 250 mg/l limit for chloride. The results for chloride began to increase in 2017 and have hovered between 40 – 180 mg/l except for a few outliers (**Figure 4**). This variability and overall average concentration is elevated relative to the results for chloride seen from 2008 – 2016. The results for BOD are generally low, averaging 4.1 mg/l for the permit term with no exceedances of the 50 mg/l limit.

Background Groundwater Quality

Background groundwater quality is defined by the results from samples collected at MW-5. The results for chloride are low, hovering around 10 mg/l with periodic fluctuations up to 80 mg/l. From 2009 – 2020, the results for nitrite+nitrate most often fell between 1-2 mg/l. The concentration of nitrite+nitrate began to vary widely beginning in 2021 with concentrations reaching as high as 13 mg/l in December 2022. The results for ammonia are non-detect.

Downgradient Groundwater Quality

The results for chloride at MW-4 are stable and averaged approximately 50 mg/l (**Figure 7**). The results for chloride at MW-6 decreased over the past five years. No results from MW-6 have exceeded the NR 140 PAL for chloride since 2018. The average result for chloride at MW-6 was 66 mg/l during the past five years. The results for nitrite+nitrate at MW-4 and MW-6 averaged approximately 4.1 mg/l and 4.7 mg/l, respectively. The concentration of nitrite+nitrate has generally increased since the prior groundwater evaluation (**Figure 6**). The results for ammonia are generally non-detect.

Exceedance Review - July 1, 2019 – November 9, 2023.

Sample Point	Well Name	Parameter	ES Exceedances	PAL/ACL Exceedances
804	MW-4	pH	N/A	1/16
		Nitrite+nitrate, nitrogen	1/16	2/16
		Total dissolved solids	N/A	1/16
815	MW-5	Nitrite+nitrate, nitrogen	2/16	4/16
		Organic nitrogen	N/A	2/16
		Total dissolved solids	N/A	1/16
816	MW-6	Nitrite+nitrate, nitrogen	1/16	6/16
		Total dissolved solids	N/A	1/16

Treatment System Impact to Groundwater Quality

Much of the land upgradient of seepage cells is forested and should be free of the typical impacts seen from agriculture (nitrogen) or road salting (chloride). However, the parking lot for the resort could act as a source of some background chlorides if the facility salts the parking lot and fertilizing of the golf course could also act as a potential source of background nitrite+nitrate. It is possible that some of nitrogen or chloride observed at the monitoring wells (both background and downgradient) could be related to these activities. The varying

groundwater elevation results bring into question the overall groundwater flow regime and reduce the confidence in the interpretation of the impact of the seepage cell treatment system on local groundwater.

While those points should be considered, MW-6 is still most often downgradient of MW-5 and therefore the seepage cells. The impact from loading of the seepage cells is most clearly seen by comparing the results for chloride at Outfall 001 and MW-6 during the period of 2016 – 2019. Monitoring well MW-6 is the nearest and most reliably downgradient monitoring well and the elevated concentrations of chloride during 2017 at Outfall 001 are clearly observed at MW-6 (**Figure 8**). The results for chloride at MW-5 have been low (i.e., < 10 mg/l) during most of the sampling events. Recent results have shown elevated concentrations of up to 80 mg/l. Given the proximity of MW-5 to the seepage cells, it is possible that the loading of the seepage cells could be impacting the results at MW-5.

Indicator Parameter PALs

Indicator Parameter PALs are developed following the procedures described in s. NR 140.20(2), Wis. Adm. Code and "Calculating Preventive Action Limits and Evaluating Groundwater Quality Exemptions for Groundwater Dischargers". Indicator parameters do not have Enforcement Standards. The PAL for an indicator parameter is a benchmark for evaluating site specific trends. When significant increases in the trends are observed, the facility and the department's response action under s. NR 140.24 Wis. Adm. Code should be to investigate the source of the compound. The indicator PALs for this facility were calculated using whichever of the two following methods provides a greater PAL.

- ∑ [Background groundwater quality + (Standard Deviation of results x 3)]
- ∑ [Background groundwater quality + Minimum Increase (NR 140.20 Table 3)]

Indicator parameter PALs for the current permit term were calculated using monitoring data from MW-5 during the prior permit term. The indicator parameter PALs for use in the upcoming permit WI-0060968-10 are presented in **Tables 3** and were calculated using results from MW-5 (January 1, 2019 – November 10, 2023).

Alternative Concentration Limits

Alternative concentration Limits (ACLs) can be developed and provided for a groundwater monitoring system to replace the PAL or ES (s. NR 140.28, Wis. Adm. Code). ACLs are provided if the conditions at the background monitoring well(s) indicate that it is appropriate. The methodology and considerations for developing and providing ACLs are outlined in the guidance document "Calculating Preventive Action Limits and Evaluating Groundwater Quality Exemptions for Groundwater Dischargers". The concentrations at a background well should not necessarily act as a minimum expectation of groundwater quality at downgradient wells, especially if those established concentrations at a background well are in exceedance of an NR 140 ES. ACLs for chloride and nitrite+nitrate are not provided in the upcoming permit term as the background concentrations for these parameters are low. The recent results for nitrite+nitrate at MW-5 that are elevated are assumed to be anomalous. If the concentration of nitrite+nitrate continues to increase throughout this upcoming permit term (0060968-10) then reestablishing an ACL for nitrite+nitrate may be appropriate for the 0060968-11 permit term.

Conclusions, Recommendations and Schedule Requirements

- The average concentration of total nitrogen and chloride at Outfall 001 is low enough that the results at the groundwater monitoring wells should most often remain below the enforcement standard and often below the preventive action limit for nitrite+nitrate and chloride. While the results for chloride most often fall below the limit of 250 mg/l, a chloride reduction plan should be developed by Devil's

Head Resort to determine options for bringing down chloride concentrations to the lower values observed prior to 2017. The chloride reduction plan should be submitted within the first year of the reissued permit and followed up with annually to continue to assess options and review prior initiatives.

- The results for groundwater elevation are at times sporadic and may be indicative of sample collection error. Devil's Head groundwater sampling personnel should ensure that they are collecting accurate depth to water and groundwater elevation data.
- While it appears that the water supply wells surrounding the seepage cells are cased to at least 100 feet below ground surface, there may be the potential for this wastewater to be drawn into these water supply wells given their proximity to the seepage cells. Therefore, Fecal Coliform has been added to the monitoring requirements for both Outfall 001 and the groundwater monitoring wells for one year to determine the amount of fecal coliform discharged to groundwater and assess the potential for water supply contamination from the seepage cells.
- Per s. NR 206.06(2), Wis. Adm. Code, the department will continue to provide an exemption for the 500 mg/l limitation on total dissolved solids at Outfall 001 as there continue to be no environmental or health concerns related to this parameter.

Figure 1 – Seepage Cell Groundwater Flow Map – March 28, 2022

Water Table Flow Map
Devil's Head Resort and Convention Center
March 28, 2022

Site Location

Devil's Head Resort and Convention Center
S6330 Bluff Rd
Merrimac, WI 53561

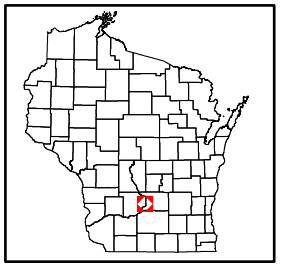
Legend

- Monitoring Wells
- DMZ
- Water Table Contour (0.5 FAMSL 3/28/22)

Notes

Water table contours generated using elevation data collected on March 28, 2022. Water table elevations and contours are presented in feet above mean sea level.

Created By: watsoz
Date: 12/4/2023



0 40 80 120 160 200 240 Feet

1:1,500

Figure 2 – Seepage Cell Groundwater Flow Map – September 13, 2023

Water Table Flow Map
Devil's Head Resort and Convention Center
September 13, 2023

Site Location

Devil's Head Resort and Convention Center
S6330 Bluff Rd
Merrimac, WI 53561

Legend

- Monitoring Wells
- Water Table Contour (0.5' FAMSL 9/13/23)
- DMZ

Notes

Water table contours generated using elevation data collected on September 13, 2023. Water table elevations and contours are presented in feet above mean sea level.

Created By: watsoz
Date: 12/4/2023

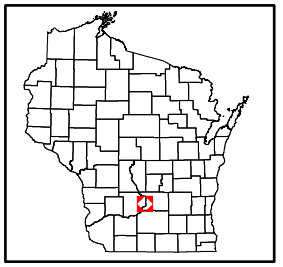


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Figure 3 – Total Nitrogen at Outfall 001

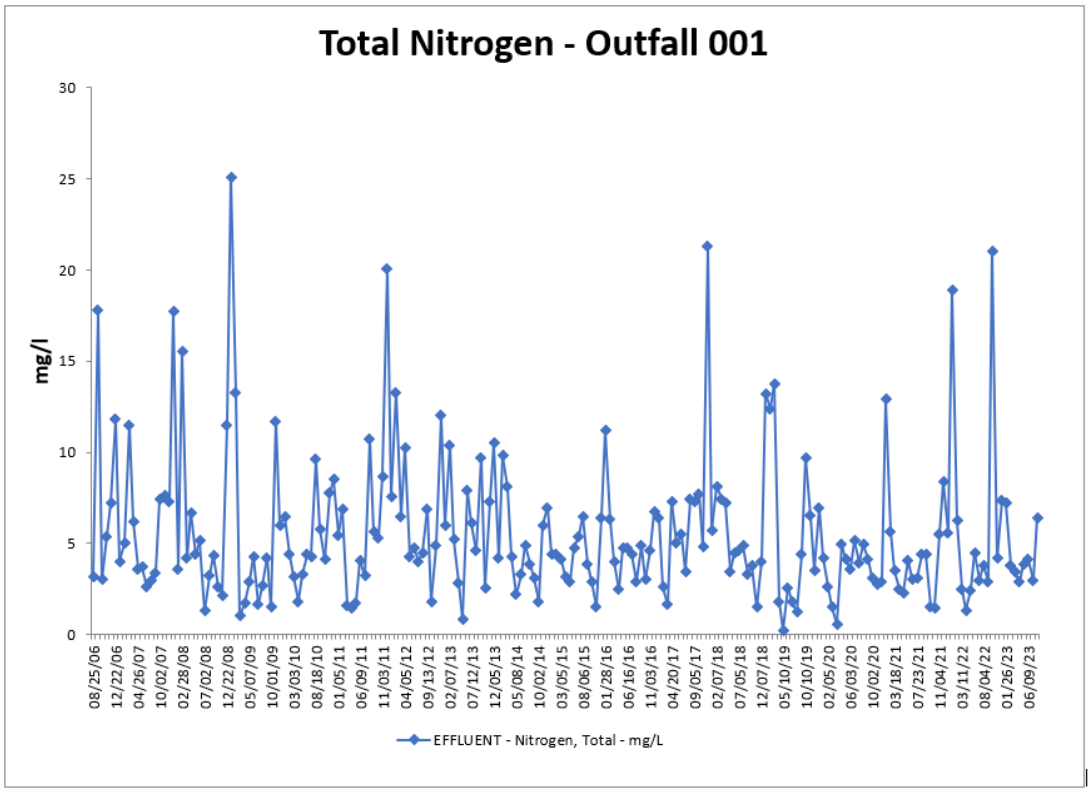

Figure 4 – Chloride at Outfall 001

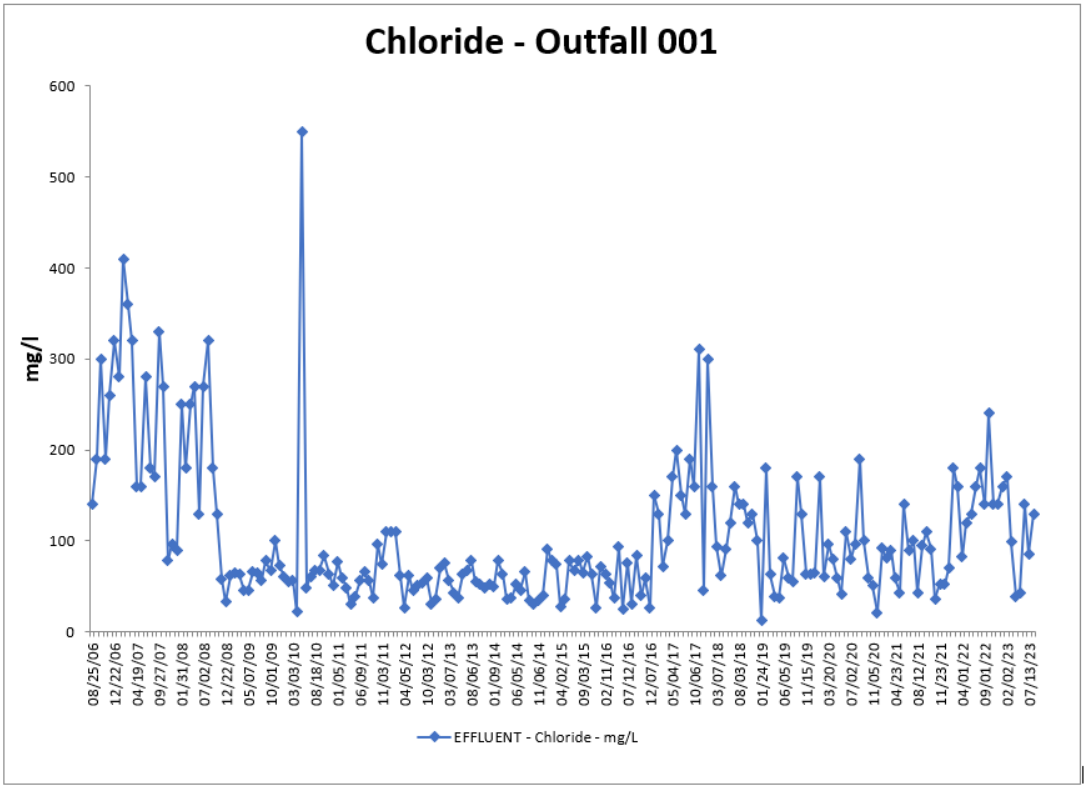

Figure 5 – Monitoring Wells – Groundwater Elevation

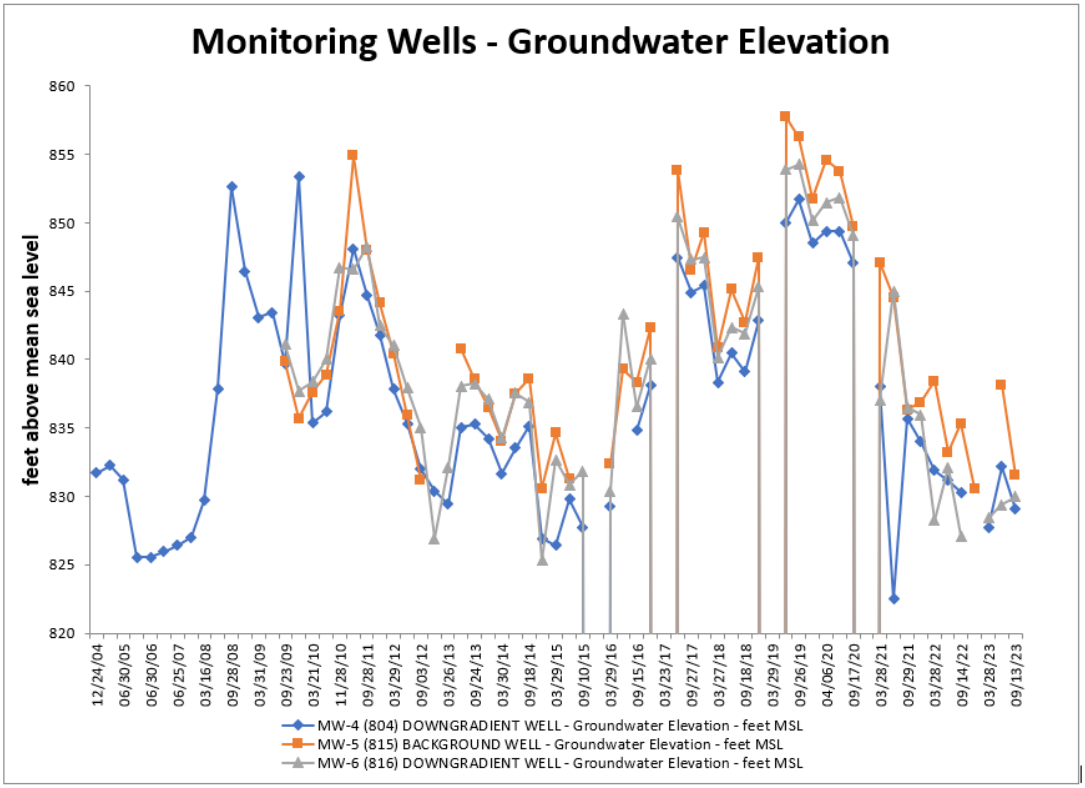

Figure 6 – Monitoring Wells – Nitrite+nitrate

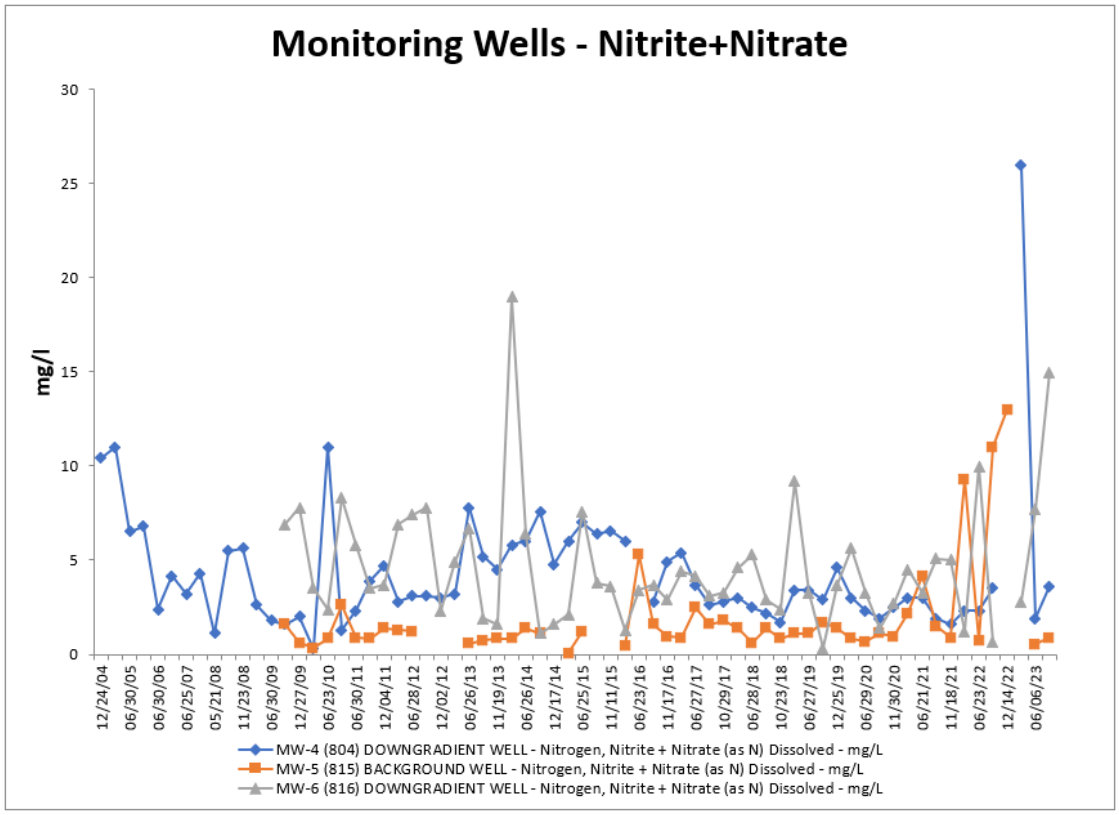

Figure 7 - Monitoring Wells - Chloride

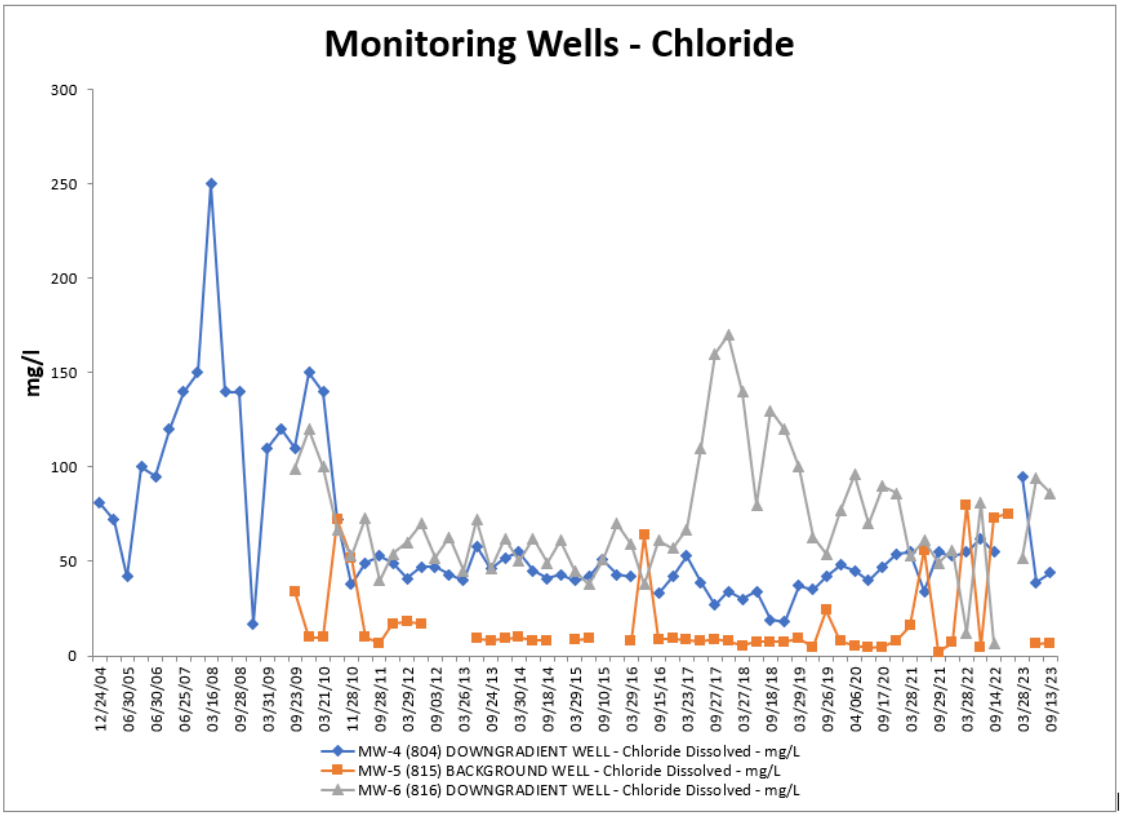

Figure 8 – Chloride at Outfall 001 and MW-6