

**MONTANA DEPARTMENT OF  
ENVIRONMENTAL QUALITY**

Water Protection Bureau  
P.O. Box 200901  
Helena, MT 59620-0901

**Permit Fact Sheet  
Montana Ground Water Pollution Control System (MGWPCS)**

Permittee/Applicant: Dance Hall Hill, LLC

Permit Number: MTX000105

Facility Name: Chico Hot Springs Resort and Day Spa

Facility Location: Latitude: 45.34001°; Longitude: -110.69501°  
Section 01, Township 06 South, Range 08 East  
Park County

Facility Address: 163 Chico Road  
Two miles south-east of Emigrant, MT

Facility Contact: Colin Davis  
Operations Manager

Receiving Water: Class I Ground Water

Number of Outfalls: One

Outfall/Type: 001 – Subsurface Drainfield – Domestic Wastewater

## I. PERMIT STATUS

The following fact sheet outlines the basis for renewing a MGWPCS wastewater discharge permit to Dance Hall Hill, LLC (permittee) for the Chico Hot Springs Resort and Day Spa (facility) located south-east of Emigrant Montana. The MGWPCS permit application and supplemental materials provide the information that serves as the basis for the development of the effluent limits and the monitoring requirements outlined within this fact sheet. The scope of this permitting action is for the construction, operation, and maintenance of the wastewater treatment and disposal system.

In 1996, the DEQ public water program reviewed and approved Chico Hot Springs engineering plans and specifications (EQ# 96-1773). The wastewater treatment system was then operating at a discharge rate of approximately 7,520 gallons per day (gpd), (DEQ, 2009). In 1999, DEQ reviewed and approved the addition of two new subsurface drainfields (EQ# 17-1135) to accommodate the addition of the 13-room Hotel and Convention Center. The addition resulted in a wastewater treatment system design capacity of 11,370 gpd. On August 10, 2016, DEQ received updated plans and specifications to replace the existing wastewater treatment and disposal system. The design capacity of the replacement system has been reported to have a maximum flow of 16,346 gpd.

Chico Hot Spring's primary water supply source is the nearby cold water springs (GWIC: 184649). The respective public water supply system (MT0001564) was recently modified to include a filtration and a disinfection system (both UV and chlorination). The updated system specifications were approved by DEQ in September of 2014, with a turn-on date occurring in March of 2015. The cold water springs are further discussed in Section II.

### A. Application Info

DEQ received a MGWPCS permit application (and pertinent fees) from the permittee on May 08, 2014 to renew their existing ground water discharge permit. On May 19, 2014, DEQ replied requesting for submittal of additional application information. On August 04, 2014, DEQ received all requested information and the application was subsequently deemed complete on August 08, 2014. The complete application effectively provided administrative continuance of Chico Hot Spring's existing permit earlier issued on August 07, 2009, until such time as the permit is reissued by DEQ.

On August 10, 2016, and updated application from Chico Hot Springs was received by DEQ. The application was updated to reflect replacement of the existing wastewater treatment and disposal system for the facility. On August 19, 2016, DEQ replied requesting submittal of additional application information. On September 07, 2016, DEQ received all requested information and the modified application was deemed complete on September 09, 2016. This permit renewal will incorporate the proposed system modifications as further discussed below.

## B. Wastewater Treatment System Changes

The applicant reported that the existing system last modified in 1999 needs to be replaced. This is in addition to reports of seasonal wastewater flows occurring at around 15,000 gpd which may exceed the existing 1999 design flow of 11,370 gpd.

The proposed wastewater treatment and disposal system (Figure 3) will replace the existing system. The proposed treatment is listed as a conventional septic system which replaces the existing conventional septic system. The proposed disposal system will be a pressure dosed subsurface drainfield that will replace the existing drainfield. The proposed drainfield will be located immediately to the north and north-west of the existing drainfield. The new disposal system is needed in order to prevent effluent from surfacing in an area that has heavy recreation use and surface water ditches. The applicant reported a proposed turn-on date of approximately October 31, 2016.

## C. Permit Changes

### Permittee Name

The current permittee is listed as Chico Hot Springs Resort and Day Spa. The recent permit renewal application materials have proposed a change in permit ownership to Dance Hall Hill, LLC. The permittee shall be updated and in effect upon issuance of the permit renewal.

### Outfall Name

DEQ will retain the outfall name (Outfall 001) as the new drainfield is located immediately adjacent to the existing drainfield. Additional information regarding the proposed drainfield is provided in Section II.

### Updated Effluent Limits

DEQ notes that the proposed system will result in a modification to the effluent limit (Section IV). Modifications will incorporate the following factors of interest:

- Retention of conventional treatment (5.0 mg/L, Appendix V);
- A reported increase in design capacity; and,
- New drainfield dimensions.

The above information has resulted in a decrease in the proposed nitrogen effluent limitation (6.0 lbs/day to 5.1 lbs/day). Additional information on the updated effluent limitation is provided in Section IV.

Based on application materials, the proposed treatment system may not be able to meet the proposed nitrogen effluent limitation (5.1 lbs/day). Therefore, DEQ will establish interim effluent limits (Table 2) and require annual compliance status reports (Section VI) to document the actions taken by the permittee to meet the final effluent limits (Table 3). Discharge limitations are further discussed in Section IV.

### Effluent Sample Frequency

The effluent sample frequency for nitrogen parameters have been updated from quarterly to monthly in order to:

- Monitor potential impacts to the beneficial uses of state waters (Section IV);
- To better assess seasonal loading; and,
- To come in-line with the sampling requirements of other MGWPCS permitted facilities that contain conventional septic as their primary treatment (MTX000100, MTX000119, MTX000207).

### Effluent Flow Monitoring

The wastewater treatment system currently does not have an effluent flow meter. The permittee currently estimates facility flows by documenting the occurrence of pump activity (pump counts) at a drainfield dose pump.

A continuous and accurate flow monitoring method is currently needed in order to document compliance with the load based effluent limit. The permittee will therefore be required to install an effluent meter and recording device that will provide effluent flow rate measurements that are representative of the volume of the monitored discharge. The proposed installation requirements are discussed in Section VI.

Application materials indicate that the permittee has proposed to establish an effluent flow meter as part of the proposed wastewater system replacement project. The proposed flow meter is further discussed in Table 1.

## **II. FACILITY INFORMATION**

### **A. Facility Location and Operations**

Chico Hot Springs is an existing resort and spa with a hotel, bar, restaurant and convention center, located approximately two miles south-east of Emigrant Montana (Figure 1). The proposed wastewater system is designed to collect domestic-in-nature wastewaters.

<b>Table 1: Collection, Treatment, and Disposal System Summary</b>	
Outfall 001 - Domestic Wastewater	
Method of Disposal: Infiltration to shallow ground water	
Disposal Structure: Subsurface Drainfield (Outfall 001)	
A replacement drainfield is planned to be installed by October 31, 2016. It replaces the existing drainfields which is located immediately to the south (and adjacent) of the proposed drainfield location (Figure 2).	
Section 01, Township 06 South, Range 08 East	
Latitude: 45.34001°; Longitude: -110.69501°	
Contributing Sources: Domestic-in-nature sources from the following on-site buildings: Main Lodge, 13-Room Hotel building, Lower Lodge, Convention Center.	
Average Daily Design Flow (gpd): 11,370 (ft <sup>3</sup> /day): 1,520	Daily Maximum Design Flow (gpd): 16,345 (ft <sup>3</sup> /day): 2,185
Effluent Sampling Location: EFF-001: Effluent sample locale is located at the final dose tank just prior to final distribution to the drainfield. Replacement dose tanks (Figure 3) are planned to be installed by October 31, 2016.	
Flow Monitoring Equipment: FM-001: Flow meter is to be located in the flow meter vault located post treatment but prior to distribution. A Siemens Sitrans FM Mag 5000/5100W flow meter (Figure 3) is planned to be installed by October 31, 2016.	
Treatment: Conventional Septic Tanks with pressure dosed drainfield.	

### B. Effluent Monitoring

The proposed effluent sampling and flow monitoring locations are summarized in Table 1. The new system design has the dose tank and flow meter vault located on the terrace to the west of the intersection of Chico Road and Dance Hall Hill Road.

### C. Effluent Characteristics

Pursuant to ARM 17.30.1023, DEQ requires the applicant to disclose the quality of the effluent to be discharged such that the potential pollutants can be identified and the proposed discharge can be examined to determine if it will cause pollution of state water, 75-5-605, Montana Code Annotated (MCA). The applicant referenced effluent quality data from the existing treatment system. DEQ has summarized effluent characteristics reported over the previous permit cycle within Appendix I.

### D. Geology

The geothermal springs at Chico Hot Springs occurs along the northeast-trending Emigrant fault zone along the western edge of the Beartooth uplift (LaFave, 2016). In addition to the hot springs, there is also a cold water spring to the south of Chico. The DEQ Public Water Supply program believes that the cold spring is under the direct influence from surface water (MT0001564) and not directly sourced from bedrock. All spring water in the vicinity of Chico Hot Springs is used for irrigation, domestic, and recreation purposes resulting in an overall water loss to evaporation, evapotranspiration, or infiltration into the shallow subsurface. A summary on these springs is provided in Appendix II.

Chico and most of the surrounding foothills downslope of the Absaroka Range is located on surficial glacial deposits (Qgt, Lopez and Reiten, 2003). According to the Montana Bureau of Mines and Geology (MBMG) Ground Water Information Center (GWIC), most of the ground water wells in the area are finished at depths of around 200 to 300 feet in depth (MBMG, 2016). Currently there are no known shallow ground water wells located in the immediate vicinity of Chico Hots Springs. A summary on these springs is provided in Appendix II.

#### E. Hydrogeologic Characteristics

Hydrogeology information used in the development of this fact sheet document are those originally referenced by the 2001 application submitted by the permittee (DEQ, 2009). The information is considered to be conservative and typical of the underlying glacial deposits. Hydrogeology information is summarized within Appendix IV.

The nearest surface water in the direction of ground water flow (N50°W) is an unnamed ephemeral tributary approximately 4,200 feet downgradient of the drainfield. In addition, there are also multiple ditches whose intakes may originate from the Emigrant Creek drainage which is to the south and sidegradient of the drainfield. The ephemeral drainage and ditches both trend north-east along the foothills. There is a reasonable likelihood that these surface water bodies are either leaking (losing) to the subsurface or are perched. Additional discussions on this topic are provided in Appendix V.

#### F. Ground Water Quality Characteristics

As discussed above, the springs are a reasonable indicator of the potential water sources that leak into the aquifer underlying and downgradient of the discharge site. Therefore, samples collected from the springs maybe an indicator of water quality in the subsurface. Water quality samples have been collected over the previous permit cycle by the DEQ Public Water Supply program and the MBMG Ground Water Assessment program. A summary is provided in Appendix III.

### III.MIXING ZONE

The Montana Water Quality Act (75-5-103, Montana Code Annotated (MCA)) states that a mixing zone is an area of the receiving water, established in a permit, where the water quality standards may be exceeded. DEQ will maintain the existing mixing zone authorized by DEQ in 2001. The mixing zone rationale is further discussed in Appendix IV.

#### IV. RATIONALE FOR PROPOSED DISCHARGE LIMITATIONS AND CONDITIONS

DEQ has a statutory duty to develop effluent limits and issue permits consistent with the Montana Water Quality Act, §75-5-101, MCA et seq. and rules adopted under that Act. Section IV presents the basis for discharge limitations in accordance with the requirements at ARM 17.30.1006, ARM 17.30.1031 and ARM 17.30.715. The bases for deriving and establishing effluent limitations are further discussed in Appendix V. Based on the information and analyses presented in Sections III and IV, pursuant to ARM 17.30.1031, DEQ proposes the following numerical effluent limitations:

<b>Table 2: Interim Effluent Limits – Outfall 001</b> <i>(Effective upon issuance through the first four years)</i>			
<b>Parameter</b>	<b>Units</b>	<b>Daily Maximum<sup>(1)</sup></b>	<b>Rationale</b>
Nitrogen, Total (as N)	lbs/day	6.0	2009 Permit
Footnotes:			
(1) See definition in Part V of permit.			

<b>Table 3: Final Effluent Limits – Outfall 001</b> <i>(Effective four years after issuance)</i>			
<b>Parameter</b>	<b>Units</b>	<b>Daily Maximum<sup>(1)</sup></b>	<b>Rationale</b>
Nitrogen, Total (as N)	lbs/day	5.1	Nondegradation Significance Criteria ARM 17.30.715(1)(d)(ii)
Footnotes:			
(1) See definition in Part V of permit.			

#### V. RATIONALE FOR MONITORING AND REPORTING REQUIREMENTS

DEQ has a statutory duty to develop effluent limits and issue permits consistent with the Montana Water Quality Act, §75-5-101, MCA et seq. and rules adopted under that Act. ARM 17.30.1031 requires that all issued MGWPCS permits contain monitoring requirements that assure compliance with the developed numeric effluent limitations and therefore water quality standards. Effluent monitoring and reporting will be required as a condition of this permit. Monitoring requirements and respective rationale is summarized in Appendix VII.

## **VI.SPECIAL CONDITIONS**

In accordance with ARM 17.30.1031, this section contains the basis for special permit conditions that are necessary to assure compliance with the ground water quality standards and the Montana Water Quality Act. The following special condition will be included in the permit.

### **A. Annual Compliance Status Report – Outfall 001 Final Effluent Limits**

The permittee shall complete a report on an annual basis which documents the status of complying with the final effluent limitations for Outfall 001 (Table 3). This report must detail any changes in operation and maintenance, plant modifications, or any other steps taken by the permittee in order to meet the final permit limits. The report must include implementation or completion dates for each respective action.

The permittee shall complete the first annual report on or before the one (1) year anniversary date of the permit effective date. Thereafter, an annual report must be completed on or before the anniversary date of the permit effective date for each subsequent year within the permit cycle. All annual reports must be received by the Department, due on or before the 28th day of the month following the completion (anniversary) date(s). The action and reporting dates are listed within Table 4.

### **B. Effluent Flow Meter Installation**

The permittee shall install a flow meter and recording device that is capable of continuous monitoring and recording of daily effluent flows at Outfall 001. The flow meter, and the respective installation location, must provide effluent flow rate measurements that are representative of the volume of the monitored discharge. The flow meter and the respective flow recording device used in obtaining the data submitted in self-monitoring reports must indicate values within 10 percent of the actual flow being measured (Permit Part II.B.). The flow meter must be installed and operational within one year of the effective date of the permit.

The permittee shall submit an as-built report that documents the final installation and location of the flow meter. The report must include implementation or completion dates for the installation action. The action and reporting dates are listed within Table 4.

## VII.COMPLIANCE SCHEDULE

A compliance schedule is included to allow a reasonable opportunity for the permittee to attain or maintain compliance with permit requirements. The actions listed in the table below must be completed on or before the respective scheduled completion date. A report documenting each respective action must be received by DEQ on or before the scheduled reporting date. Completion of all actions or deliverables must be reported to DEQ in accordance with Part II.D and Part IV.G of the permit.

<b>Table 4: Compliance Schedule</b>					
<b>Authority</b>	<b>Permit Condition</b>	<b>Action</b>	<b>Freq.</b>	<b>Scheduled Completion Date of Action<sup>(1)</sup></b>	<b>Scheduled Report Due Date.<sup>(2)</sup></b>
ARM 17.30.1006	<b>Part I.B</b>	Interim effluent limits for Outfall 001 go into effect.	<b>Milestone</b>	<i>Effective Date</i>	<i>Milestone. See effluent monitoring and reporting requirements in Table X of the Permit.</i>
ARM 17.30.1031	<b>Part I.D.1</b>	Submit a Compliance Status Report documenting actions taken to <b>meet final effluent limits</b> for Outfall 001.	<b>Annually</b>	<i>Annually on the anniversary of the effective date.</i>	<i>On or before 30 days following the completion date.</i>
ARM 17.30.1031	<b>Part I.D.2</b>	Submit a Compliance Status Report documenting <b>installation and initiation of an effluent flow meter and recording equipment</b> for Outfall 001.	<b>Once</b>	<i>One year after the effective date of the permit.</i>	<i>On or before 30 days following the completion date.</i>
ARM 17.30.1006	<b>Part I.B</b>	Final effluent limits for Outfall 001 go into effect.	<b>Milestone</b>	<i>Four years after Effective Date</i>	<i>Milestone. See effluent monitoring and reporting requirements in Table X of the Permit.</i>
Footnotes:					
(1) The actions must be completed on or before the scheduled completion dates.					
(2) Reports must be received by DEQ on or before the scheduled report due dates. The reports must include all information as required for each applicable action as listed in Section VI of the fact sheet document.					

## VIII.NONSIGNIFICANT DETERMINATION

DEQ determined (DEQ, 2009) that the activity is a new or increased source resulting in a change of existing water quality occurring on or after April 29, 1993 (ARM 17.30.702). The applicable water quality standards for Class I ground water and nondegradation provisions are summarized in Appendix V. Discharges in compliance with the limitations of this permit are considered nonsignificant. The permit includes monitoring, reporting and corrective action requirements to establish, confirm, and maintain compliance with the permit limits.

## IX. PUBLIC NOTICE

Legal notice information for water quality discharge permits are listed at the following website: <http://deq.mt.gov/Public/notices/wqnotices>. Public comments on this proposal are invited any time prior to close of business on November 10, 2016. Comments may be directed to:

[DEQWPBPublicComments@mt.gov](mailto:DEQWPBPublicComments@mt.gov)

or at:

Water Protection Bureau  
PO Box 200901  
Helena, MT 59620

All comments received or postmarked prior to the close of the public comment period will be considered in the formulation of the final permit. DEQ will respond to all substantive comments pertinent to this permitting action and may issue a final decision within thirty days of the close of the public comment period.

All persons, including the applicant, who believe any condition of the draft permit is inappropriate, or that DEQ's tentative decision to deny an application, terminate a permit, or prepare a draft permit is inappropriate, shall raise all reasonably ascertainable issues and submit all reasonably available arguments supporting their position by the close of the public comment period (including any public hearing). All public comments received for this draft permit will be included in the administrative record and will be available for public viewing during normal business hours.

Copies of the public notice were mailed to the applicant, state and federal agencies and interested persons who have expressed interest in being notified of permit actions. A copy of the distribution list is available in the administrative record for this draft permit. Electronic copies of the public notice, draft permit, fact sheet, and draft environmental assessment are available at the following website: <http://deq.mt.gov/Public/notices/wqnotices>.

Any person interested in being placed on the mailing list for information regarding this permit may contact the DEQ Water Protection Bureau at (406) 444-3080 or email [DEQWPBPublicComments@mt.gov](mailto:DEQWPBPublicComments@mt.gov). All inquiries will need to reference the permit number (MTX000105), and include the following information: name, address, and phone number.

During the public comment period provided by the notice, DEQ will accept requests for a public hearing. A request for a public hearing must be in writing and must state the nature of the issue proposed to be raised in the hearing.

**FIGURE 1 – Vicinity Maps**

**FIGURE 2 – Facility Maps**

**FIGURE 3 – Line Diagram and System Layout**

**APPENDIX I - ESTIMATED EFFLUENT QUALITY**

<b>Estimated Effluent Quality – Outfall 001.</b>								
<b>Parameter<sup>(1)</sup></b>	<b>Location</b>	<b>Units</b>	<b>Reported Minimum Value</b>	<b>Reported Average Value</b>	<b>Reported Maximum Value</b>	<b># of Samples</b>	<b>Source of Data</b>	<b>2009 Permit Limit</b>
Biochemical Oxygen Demand (BOD <sub>5</sub> )	EFF-001	mg/L	117	325	560	24	DMR	
Flow rate, Discharge	FM-001	gpd	8,467	9,770	10,740 <sup>(2)</sup>	24	DMR	
Nitrogen, Nitrate + Nitrite (as N)	EFF-001	mg/L	0.01	0.05	0.16	24	DMR	
Nitrogen, Total Kjeldahl (as N )	EFF-001	mg/L	18.3	43.0	71.0	24	DMR	
Nitrogen, Total (as N)	EFF-001	mg/L	15.4	42.7	71.0 <sup>(2)</sup>	24	DMR	63.0
		lbs/day	1.2	3.6	6.0	24	DMR	6.0
Phosphorus, Total (as P)	EFF-001	mg/L	1.68	5.74	11.10	24	DMR	
		lbs/day	0.14	0.47	0.93	24	DMR	
Total Suspended Solids (TSS)	EFF-001	mg/L	22	116	357	24	DMR	
Footnotes:								
DMR = Self Reported Discharge Monitoring Reports.								
EFF-001: See Table 1. Effluent characteristics collected from the existing septic tank system which is to be replaced by a new septic system to be installed by October 31, 2016.								
FM-001: See Table 1. Current effluent flows are recorded by estimating pump dose counts.								
Period of Record: 06/2010 through 06/2016.								
(1) Conventional and nonconventional pollutants only, table does not include all possible toxics.								
(2) Maximum value recorded of all quarterly reported Daily Maximum Values.								

**APPENDIX II - GROUND WATER WELL AND SPRING SUMMARY**

<b>Ground Water Well and Spring Summary</b>
Spring: Chico Hot Spring (Geothermal)
MBMG GWIC #: 260068
Status: Active/Flowing. Source of on-site geothermal water used for recreational purposes. After use in the swimming pools (or "-ool"), the geothermal discharge water enters into a unlined ditch then into one of multiple cistern(s). The water is then used for radiant heat and for on-site irrigation. Any excess water then enters into a unlined ditch and flows offsite for additional irrigation uses.
Location: The on-site spring is located immediately to the south of the parking lot located on the south side of the Chico Main Lodge and Pool building. (Figure 2).
Latitude: 45.33690° North      Longitude: 110.69260° West
Representation: A reasonable indicator of potential water sources leaking into the aquifer underlying and downgradient of the discharge site (Outfall 001).
Spring: Chico Cold Spring (Public Water Supply)
MBMG GWIC #: 184649
Status: Active/Flowing. Current source of public water supply for resort.
Location: Located on the hill (upgradient) immediately to the south of the Chico Main Lodge and Pool building.
Representation: A reasonable indicator of the potential water sources leaking into the aquifer underlying and downgradient of the discharge site (Outfall 001).
Water Well: Chico Well 2 (Private Water Well)
MBMG GWIC #: 103651
Status: Constructed in 1977
Location: Private water well for a private residence located to the South (upgradient) and Southwest (sidegradient) of the discharge site (Outfall 001).
Representation: The water well is completed in a zone of confined saturated clay over 215 feet in depth. The productivity of this well has been reported to be low.

**APPENDIX III - GROUND WATER QUALITY MONITORING RESULTS**

<b>Ground Water Quality</b>						
<b>Monitor Source</b> <sup>(1)</sup>	<b>Representation</b>	<b>Parameter</b>	<b>Units</b>	<b>Reported Average Value</b>	<b># of Samples</b>	<b>Source of Data</b>
Chico Hot Spring Geothermal Spring GWIC: 260068 and Cold Spring GWIC: 184649	Potential Ambient Ground Water Quality	Nitrogen, Nitrate + Nitrite (as N)	mg/L	0.34	5	PWS
		Specific Conductivity (@ 25°C)	µS/cm	452	1	GWIC
		Total Dissolved Solids (TDS)	mg/L	269	1	GWIC
Footnotes:						
GWIC = Ground Water Information Center Water Quality Report.						
PWS = Montana DEQ Public Water Supply sample results.						
Period of Record: August 2010 through February 2016.						
(1) Refer to Section II of the Fact Sheet for the existing location of the springs.						

## APPENDIX IV – MIXING ZONE RATIONALE

The Montana Water Quality Act (75-5-103, Montana Code Annotated (MCA)) states that a mixing zone is an area of the receiving water, established in a permit, where the water quality standards may be exceeded. Mixing zones are subject to the conditions imposed by DEQ and consistent with the rules adopted by the Board of Environmental Review (Board).

The applicant has requested retention of the existing standard ground water mixing zone. DEQ determines whether a mixing zone is appropriate pursuant to the requirements and procedures of ARM 17.30.501 et seq. DEQ must conduct a water quality assessment in accordance with ARM 17.30.506 to determine if and what type of mixing zone may be authorized. A person applying to DEQ for a mixing zone must indicate the type of mixing zone requested and supply information of sufficient detail for DEQ to make a determination regarding the authorization of the mixing zone (ARM 17.30.515).

A mixing zone may be denied if it will threaten or impair existing uses (Section IV) in accordance with ARM 17.30.505. In making this determination DEQ will consider whether current available data can accurately predict ground water or pollutant movement, or whether there is sufficient unpredictability that might result in adverse impacts due to a particular concentration of a parameter within the mixing zone [ARM 17.30.506; and 517].

For purposes of authorization determination, DEQ will reference the following rules for water quality assessment of the mixing zone. A mixing zone may be granted for individual parameters in a discharge (ARM 17.30.505). As part of the water quality assessment described above, the concentration of pollutants at the downgradient boundary of the mixing zone must be estimated in accordance with ARM 17.30.517 to determine if the discharge qualifies for a (500 foot) ground water mixing zone. After review of the application materials, DEQ will perform the following modifications to the existing mixing zone:

- Reanalysis of the dimensions of the proposed drainfields (Figure 3); and,
- Removal of the 7% assumption of nitrogen reduction that occurs beneath the drainfield, as the generalized reduction is not currently justified within the current mixing zone administrative rules (ARM 17.30.5).

After an assessment of the application information (ARM 17.30.505), and in pursuant to administrative procedures (ARM 17.30.515), DEQ will maintain the existing mixing zone for the parameters listed within the table below as the potential impact to beneficial uses may be minimal (Section II and Section IV).

<b>Mixing Zone and Hydrogeology Information - Outfall 001</b>		
<b>Parameter</b>	<b>Units</b>	<b>Value</b>
Mixing Zone Type	-	Standard
Authorized Parameters	-	Total Nitrogen
Ambient Ground Water Concentrations, Nitrate + Nitrite	mg/L	0.34
Ground Water Flow Direction	azimuth/bearing	N50°W
Length of Mixing Zone	feet	500
Thickness of Mixing Zone	feet	15
Outfall Width, Perpendicular to Ground Water Flow Direction	feet	340
Width of Mixing Zone at Down Gradient Boundary	feet	427.5
Cross Sectional Area of Mixing Zone (A)	ft <sup>2</sup>	6412.5
Hydraulic Conductivity (K)	feet/day	54
Hydraulic Gradient (I)	ft/ft	0.0437
Volume of Ground Water Available for Mixing (Q <sub>gw</sub> )	ft <sup>3</sup> /day	15,132

## **APPENDIX V - RATIONALE FOR PROPOSED DISCHARGE LIMITATIONS AND CONDITIONS**

DEQ has a statutory duty to develop effluent limits and issue permits consistent with the Montana Water Quality Act, §75-5-101, MCA et seq. and rules adopted under that Act. This section presents the basis for discharge limitations in accordance with the requirements at ARM 17.30.1006, ARM 17.30.1031 and ARM 17.30.715.

### **A. Water Use Classification & Applicable Water Quality Standards**

The receiving water is Class I ground water and high quality waters of the state (75-5-103, MCA). The quality of Class I ground water must be maintained so that these waters are suitable for the following beneficial uses with little or no treatment (ARM 17.30.1006):

- Public and private water supplies;
- Culinary and food processing purposes;
- Irrigation;
- Drinking water for livestock and wildlife; and,
- Commercial and industrial purposes.

Persons may not cause a violation of the following specific water quality standards in Class I ground water, pursuant to ARM 17.30.1006, except within a DEQ approved mixing zone as provided in ARM 17.30.1005:

- The human health standards for ground water listed in Circular DEQ-7;
- For concentrations of parameters for which human health standards are not listed in DEQ-7, no increase of a parameter to a level that renders the waters harmful, detrimental, or injurious to the beneficial uses listed for Class I water. DEQ may use any pertinent credible information to determine these levels; and,
- No increase of a parameter that causes a violation of the nondegradation provisions of 75-5-303, MCA.

The nondegradation rules (ARM 17.30.701, et seq.) implement Montana's nondegradation policy, which applies to any activity of man resulting in a new or increased source which may cause degradation (ARM 17.30.705). In accordance with ARM 17.30.706, DEQ is required to determine whether a new or increased source may cause degradation or whether it is nonsignificant according to ARM 17.30.715.

DEQ performed a significance determination for the proposed activity as part of the 2009 permit determination (DEQ, 2009). The determination established that the proposed discharge is a new or increased source (ARM 17.30.702) because it is an activity resulting in a change of existing water quality occurring on or after April 29, 1993. Discharges in compliance with the nonsignificance criteria established within this permit, do not constitute a significant activity.

As previously discussed in Section II, a new drainfield is being constructed adjacent to the old drainfield which is to be abandoned. As such the dimensions of the new drainfield will be

reanalyzed during the development of the nitrogen effluent limitations and the Phosphorus Breakthrough Analysis (Appendix VI).

The applicable ground water standards pursuant to ARM 17.30.1006 and the nondegradation-nonsignificance criteria at ARM 17.30.715 for the identified parameters are summarized in the table below and will be used as the basis for developing effluent limitations in the permit.

<b>Applicable Ground Water Quality Standards.</b>					
<b>Parameter<sup>(1)</sup></b>	<b>Units</b>	<b>17.30.1006(1)(b)(i) Human Health Standards - Ground Water</b>	<b>17.30.1006(1)(b)(ii) Beneficial Uses - Ground Water</b>	<b>Pollutant Category<sup>(2)</sup></b>	<b>17.30.715 Nondegradation - Nonsignificance Criteria<sup>(3)(4)</sup></b>
Nitrogen, Nitrate + Nitrite (as N)	mg/L	10.0	-	T	5.0
Nitrogen, Total (TN)	mg/L	-	10.0	-	5.0
Phosphorus, Total Inorganic	-	-	-	H	Surface water breakthrough time greater than 50 years <sup>(4)</sup>

Footnotes:

These standards establish the maximum allowable changes in ground water quality and are the basis for limiting discharges to ground water, ARM 17.30.1005(1); Circular DEQ-7 (2012), Footnote 16; and ARM 17.30.715(1)(d).

(1) The list only includes identified parameters of interest.

(2) Circular DEQ-7 (2012): Carcinogen (C), Harmful (H), and Toxic (T) parameter. Toxic pollutant with a Bioconcentrator (B) factor.

(3) Activities that comply with the nondegradation significance criteria are considered not to be significant. Total Nitrogen is measured due to potential chemical transformation and cumulative impacts per ARM 17.30.715(2).

(4) Changes in receiving ground water quality are not significant if water quality protection practices approved by the DEQ have been fully implemented and if the listed nonsignificance criteria is met.

## B. Development of Effluent Limits

ARM 17.30.1006 and 17.30.715 set forth the basis for developing effluent limitations that will protect water quality. The ground water quality standards establish the maximum allowable changes to ground water quality; are the basis for limiting discharges to ground water; and may only be exceeded within a mixing zone authorized by DEQ.

### 1) Water Quality Based Effluent Limitations

#### a. Nitrogen

Application materials indicate that nitrogen will be present in the proposed wastewater stream (Section II). To protect beneficial uses [ARM 17.30.1006(1)(b)(ii)], there shall be no increase of a parameter to a level that renders the waters harmful, detrimental, or injurious to the beneficial uses. Therefore, no wastes may be discharged such that the waste either alone or in combination with other wastes will violate or can reasonably be expected to violate any standard. DEQ will establish the effluent limitations for nitrogen based on the

projection that the entire nitrogen load in the wastewater stream may ultimately be converted to nitrate (USEPA, 2002a).

The allowable discharge concentrations will be derived from a mass-balance equation (ARM 17.30.517) which is a simple steady-state model, used to determine the POI concentration after accounting for other sources of pollution in the receiving water and any dilution as provided by a mixing zone. The equation factors in cumulative impacts of existing upgradient discharges and will limit the discharger to the assimilative capacity currently available in the receiving aquifer. There are no other known dischargers in the downgradient vicinity of Outfall 001. The mass-balance equation (Equation 1) derived for ground water is as follows:

Equation 1:

$$Q_{gw}C_{gw} + Q_{eff}C_{eff} = Q_{comb}C_{proj}$$

Where:

$Q_{gw}$	=	ground water available for mixing
$C_{gw}$	=	ambient receiving ground water concentration
$Q_{eff}$	=	maximum design capacity of wastewater system
$C_{eff}$	=	effluent pollutant concentration
$Q_{comb}$	=	combined ground water and effluent ( $Q_{comb} = Q_{gw} + Q_{eff}$ )
$C_{proj}$	=	projected pollutant concentration (after available mixing)

The mass-balance equation has been arranged to calculate effluent limits so that the discharge does not cause or contribute to an exceedance of the most restrictive water quality standard. This equation can be applied to any effluent and receiving water where the applicable dilution ratio is known. This equation will only be used for nitrogen which has been authorized mixing (Section III).

Equation 2:

$$C_{lmt} = C_{std} + D(C_{std} - C_{gw})$$

Where:

$C_{lmt}$	=	effluent limitation concentration
$C_{std}$	=	water quality standard concentration
$C_{gw}$	=	ambient receiving ground water concentration
$D$	=	dilution ratio ( $Q_{gw}/Q_{eff}$ )

A mass-balance approach is used to calculate the effluent quality of the discharge that meets the most restrictive water quality standard at the end of the mixing zone. Numeric effluent limitations are expressed as loads since this type of limitation inherently regulates both volume and strength of the effluent as prescribed by 75-5-402(3), MCA. Load limits ensure compliance with the ground water standards at the end of the mixing zone. DEQ will therefore only be establishing one nitrogen water quality based effluent limitation in this

permit, and it will be based on load. Based on the proposed design capacity, the respective load effluent limitation is:

$$5.1 \text{ lbs/day}$$
$$[(8.34 \times 10^{-6}) * 37.3 \text{ mg/L} * 16,345 \text{ gpd}]$$

as based on the following equation:

Equation 3:

$$L_{\text{lim}} = \text{CON} * C_{\text{eff}} * \text{DC}_{\text{eff}}$$

Where:

$L_{\text{lim}}$  = effluent limitation-load  
 $C_{\text{eff}}$  = allowable effluent concentration  
 $\text{DC}_{\text{eff}}$  = design capacity of wastewater treatment system (gpd)  
CON = conversion factor [ $8.34 \times 10^{-6}$ ]

b. Phosphorus

The 2009 permit (DEQ, 2009) performed a nondegradation analysis in determining whether the discharge of phosphorus could result in a significant activity. The 2009 permit determination found the activity to be not significant as the evaluation of the adsorptive capacity of soils in the area resulted in an estimated breakthrough time of greater than 50 years (ARM 17.30.715).

As previously discussed, the applicant is installing new drainfields in an area adjacent to the current drainfield. The drainfield relocation will result in additional soil that is available for sorption through vertical migration. This results in an overall net gain in soil available for sorption when compared to the original phosphorus breakthrough analysis (DEQ, 2009).

In addition, and as discussed in Section II, the closest downgradient surface water bodies is a ditch and an ephemeral drainage. DEQ's recent analysis of the surficial geology, water wells, and watershed has determined there is a reasonable likelihood that these surface water bodies are either leaking (losing) to the subsurface or are perched. It is therefore reasonable to conclude that the current distance to surface water body factor (4,200 feet) is conservative in-nature as these surface water bodies are most likely not in connection to the receiving ground water.

For documentation purposes, DEQ has updated the original 2009 breakthrough which is located in Appendix VI. The updated analysis has retained factors which are highly conservative in-nature. In examination, DEQ concurs with the original analysis findings that a phosphorus discharge to ground water would not reach surface water in a significant amount of time. At the proposed discharge load, the phosphorus breakthrough is conservatively expected to occur in 159 years. A phosphorus breakthrough that would occur within 50 years would be considered significant (ARM 17.30.715), therefore a limit for phosphorus will not be included within the proposed permit.

### C. Final Effluent Limitations

Based on the information and analyses presented in Sections III and IV and pursuant to 75-5-402, MCA and ARM 17.30.1031, DEQ proposes to continue numerical effluent limitations. The numeric effluent limitations are expressed as loads whenever possible since this type of limitation inherently regulates both the volume and the strength of the effluent as prescribed at 75-5-402(3), MCA. Load limits also ensure compliance with the ground water standards at the end of the mixing zone. The proposed final effluent limits are listed in Section IV.

**APPENDIX VI – PHOSPHOROUS BREAKTHROUGH ANALYSIS**

**MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY (DEQ)**

**PHOSPHOROUS BREAKTHROUGH ANALYSIS**

**SITE NAME:** Chico Hot Springs  
**COUNTY:** Park County  
**Permit #:** MTX000105  
**NOTES:** Variables used are based on conservative measurements.  
Design Capacity = 11,370 gpd (1,520 ft<sup>3</sup>/day).  
Modified to reflect the drainfield replacement.  
Multiple drainfield zones result in a total area of 15,912 ft<sup>2</sup>.  
Actual effluent characteristic for total phosphorous used, 5.74 mg/L  
The analysis does not credit the sorption of phosphorous by the soil underlying the old drainfield (2009).

<b><u>VARIABLES</u></b>	<b><u>DESCRIPTION</u></b>	<b><u>VALUE</u></b>	<b><u>UNITS</u></b>
Lg	Length of Primary Drainfield as Measured Perpendicular to Ground Water Flow	340	ft
L	Length of Primary Drainfield's Long Axis	15912	ft
W	Width of Primary Drainfield's Short Axis	1	ft
B	Depth to Limiting Layer from Bottom of Drainfield Laterals*	6	ft
D	Distance from Drainfield to Surface Water	4200	ft
T	Phosphorous Mixing Depth in Ground Water (0.5 ft for coarse soils, 1.0 ft for fine soils)**	0.5	ft
Sw	Soil Weight (usually constant)	100	lb/ft <sup>3</sup>
Pa	Phosphorous Adsorption Capacity of Soil (usually constant)	200	ppm
#	Number of proposed wastewater treatment systems	1	

<b><u>CONSTANTS</u></b>		
PI	Phosphorous Load per proposed wastewater treatment system	199 lbs/yr
X	Conversion Factor for ppm to percentage (constant)	1.0E+06

<b><u>EQUATIONS</u></b>		
Pt	Total Phosphorous Load = (PI)(#)	199 lbs/yr
W1	Soil Weight under Drainfield = (L)(W)(B)(Sw)	9547200 lbs
W2	Soil Weight from Drainfield to Surface Water = [(Lg)(D) + (0.0875)(D)(D)] (T)(Sw)	148575000 lbs
P1	Total Phosphorous Adsorption by Soils = (W1 + W2)[(Pa)/(X)]	31624 lbs

<b><u>SOLUTION</u></b>		
BT	Breakthrough Time to Surface Water = P / Pt	159 years

BY: Chris Boe  
DATE: August 18, 2016

**NOTES:** \* Depth to limiting layer is typically based on depth to water in a test pit or bottom of a dry test pit minus two feet to account for burial depth of standard drainfield laterals.

## **APPENDIX VII – RATIONALE FOR MONITORING AND REPORTING REQUIREMENTS**

ARM 17.30.1031 requires that all issued MGWPCS permits contain monitoring requirements that assure compliance with the developed numeric effluent limitations and the water quality standards. Effluent monitoring requirements will be maintained as conditions of this permit.

### **A. Effluent Monitoring - Compliance**

Final numeric effluent limitations were updated in this permit with specific magnitudes and durations based on site-specific conditions that ensure the discharge will not cause or contribute to an exceedance of an applicable water quality standard (see Sections III and IV). Accordingly, the permittee will be required to monitor and report monitoring results at a specified frequency in order to demonstrate compliance with the applicable effluent limitations. Effluent monitoring and reporting requirements are summarized in the table below. All analytical methods must be in accordance with the Code of Federal Regulations, 40 CFR Part 136 for each monitored parameter.

### **B. Effluent Monitoring - Sampling**

Samples shall be representative of the nature of the monitored discharge (Permit Part II.A.). The proposed modifications to the treatment system will result in a new effluent sample location. The location of the effluent sample location (EFF-001) is described in Table 1 and shown in Figure 3. Effluent monitoring and reporting requirements are summarized in the table below.

### **C. Effluent Monitoring - Flow**

Measurements shall be representative of the volume of the monitored discharge (Permit Part II.A.). The applicant will be required to install, maintain and report flow measurements using a flow-measuring device capable of measurements that are within 10 percent of the actual flow (Permit Part II.B.). The proposed location of the flow measuring device (FM-001) is described in Table 1 and shown in Figure 3. The installation requirements are described within Section VI. Flow monitoring and reporting requirements are summarized in the table below.

<b>Effluent Monitoring and Reporting Requirements – Outfall 001</b>							
<b>Parameter/Method</b>	<b>Monitor Location</b>	<b>Units</b>	<b>Sample Type<sup>(1)</sup></b>	<b>Minimum Sample Frequency</b>	<b>Reporting Requirements<sup>(1)(2)</sup></b>	<b>Report Freq</b>	<b>Rationale</b>
Flow Rate, Effluent <sup>(3)</sup>	FM-001	gpd	Continuous	Continuous	Daily Maximum Quarterly Average	Quarterly	Permit Compliance
Nitrogen, Nitrite+Nitrate (as N)	EFF-001	mg/L	Composite	1/Month	Daily Maximum Quarterly Average	Quarterly	Permit Compliance
Nitrogen, Total Ammonia (as N)	EFF-001	mg/L	Composite	1/Month	Daily Maximum Quarterly Average	Quarterly	Effluent Characterization
Nitrogen, Total Kjeldahl (TKN)(as N)	EFF-001	mg/L	Composite	1/Month	Daily Maximum Quarterly Average	Quarterly	Permit Compliance
Nitrogen, Total (as N) <sup>(4)</sup>	EFF-001	mg/L	Calculate	1/Month	Daily Maximum Quarterly Average	Quarterly	Permit Compliance
		lbs/day <sup>(5)</sup>	Calculate	1/Month	Daily Maximum <sup>(6)</sup> Quarterly Average <sup>(7)</sup>	Quarterly	
Phosphorus, Total (as P)	EFF-001	mg/L	Composite	1/Quarterly	Quarterly Average	Quarterly	Current Permit Requirement
Footnotes:							
Compositing Period: 6 to 24 hours							
EFF-001: see Table 1 of the Fact Sheet document.							
FM-001: see Table 1 of the Fact Sheet document.							
If no discharge occurs during the reporting period, “no discharge” shall be recorded within the effluent Discharge Monitoring Report (DMR) report.							
Parameter analytical methods shall be in accordance with the Code of Federal Regulations, 40 CFR Part 136, unless specified above.							
(1) See definitions in Part V of the permit.							
(2) Daily Maximum: Report highest measured daily value for the reporting period on Discharge Monitoring Report (DMR) form.							
(3) Requires recording device or totalizing meter, must record daily effluent volume.							
(4) Total Nitrogen is the sum of Nitrate + Nitrite and Total Kjeldahl Nitrogen.							
(5) Load calculation: lbs/day = (mg/L) x flow (gpd) x [8.34 x 10 <sup>-6</sup> ].							
(6) Daily Maximum Load calculation: lbs/day = the maximum of all calculated individual daily average loads (lbs/day) recorded during the reporting period.							
(7) Quarterly Average Load calculation: lbs/day = the average of all calculated individual daily average loads (lbs/day) recorded during the reporting period.							

## APPENDIX VIII - REFERENCES CITED

40 CFR § 136 – Guidelines Establishing Test Procedures for the Analysis of Pollutants. 2011.

Administrative Rules of Montana, Title 17, Chapter 30, Water Quality:

- Subchapter 2 - Water Quality Permit Fees.
- Subchapter 5 – Mixing Zones in Surface and Ground Water.
- Subchapter 7 – Nondegradation of Water Quality.
- Subchapter 10 – Montana Ground Water Pollution Control System.

Department of Environmental Quality, Water Quality Circulars:

- Circular DEQ-2 – Design Standards for Wastewater Facilities.
- Circular DEQ-4 – Montana Standards for On-Site Subsurface Sewage Treatment Systems.
- Circular DEQ-7 – Montana Numeric Water Quality Standards, Required Reporting Values, and Trigger Values.

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Prepared By: Chris Boe, September 27, 2016