MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY

Water Quality Division

MONTANA POLLUTANT DISCHARGE ELIMINATION SYSTEM

Permit Fact Sheet – Major Modification

Permittee: CHS, Inc
P.O. Box 909
Laurel, Montana 59044

Permit No.: MT0000264

Receiving Waters: Italian Drain to the Yellowstone River - Outfall 001
Yellowstone River – Outfalls 002 & 003

Facility Information:

Name: CHS Inc., Laurel Refinery
Location: 802 Highway 212 South
Laurel, MT 59044

County: Yellowstone County

Contact: Shane LaCasse, EHS Manager

Fee Information:

Type: Private, Major

Number of Outfalls: Two (for fee determination only)
Outfall 001: Process Wastewater (Current)
Outfall 002: Process Wastewater (Future)
Outfall 003: Process Wastewater Alternative (Future)

I. BACKGROUND

This fact sheet provides the principal facts considered in preparing a major modification of the Montana Pollutant Discharge Elimination System (MPDES) for CHS, Inc. Only those conditions subject to modification are reopened as part of this permitting action.

A. Permit and Application Information

CHS, Inc. is the owner and operator of the Laurel Refinery. Wastewater discharge from the CHS Laurel Refinery is regulated under MPDES Permit No. MT0000264, which became effective on November 1, 2015, was modified pursuant to Board Order on June 2, 2017, and expires on October 31, 2020 (2015-issued permit).

On April 9, 2018, the Department of Environmental Quality (DEQ) received an application for a major modification from CHS, Inc, including Form 1, Form 2C, $5,000 application fee, and supplemental information. Further information was provided by George Fink of CHS during May 2018. With this application, CHS requested the following modifications:

1. *New diffuser location* – update the permit to reflect the installation of a two-port diffuser to be located 200 feet upstream from the original proposed single-port diffuser location (less than 400 feet upstream from the Italian Drain entrance into the Yellowstone River), and re-assess Reasonable Potential (RP) and the need for effluent limits using the corresponding new dilution factors.
2. *Arsenic limits* –
    1. extend the compliance date for arsenic effluent limits from November 1, 2019 until at least October 2022.
    2. evaluate whether the arsenic effluent limits are appropriate. CHS requested the following factors be considered:
        - Intake arsenic loading from supply water and groundwater;
        - Site-specific conditions, including ambient arsenic levels and available dilution;
        - SB-325 Working Group development of site-specific criteria for this stretch of the Yellowstone River.

DEQ considered these requests and is proposing the following changes as part of this public notice:

1. The permit will include revised limits and monitoring for Outfalls 002 & 003 at the new diffuser location. Available dilution for determining RP and calculating any necessary limits will be based on the updated information provided by CHS.
2. DEQ agrees to extend the arsenic compliance date but does not agree to modify the arsenic effluent limits at this time, for the reasons outlined in this Fact Sheet.

B. Description of Facility, Discharge Point(s), and Mixing Zone(s)

1. Description and Location of Facility

The CHS Laurel Refinery is a petroleum refinery designed to convert crude oil into a variety of fuels and petroleum-based products. No process changes are being proposed as part of this major modification. The facility is in Laurel, MT on the north side of the Yellowstone River.

2. Description of Wastewater Sources

The only proposed change in wastewater sources from the 2015-issued permit is the addition of 20 gallons per minute (gpm) wastewater from centrifuge processing of wastewater solids, which is not expected to change the characteristics of the wastewater from this facility.

3. Wastewater Treatment or Controls

The 2015-issued permit includes a compliance schedule deadline of November 1, 2019, for meeting new Outfall 001 effluent limits. CHS proposes to meet the Outfall 001 compliance schedule requirements by installing a diffuser that discharges directly to the Yellowstone River (proposed as Outfalls 002 and 003). This will meet the final limits deadline and no modification for Outfall 001 is requested.

The 2015-issued permit requires that the effluent limits for Outfall 002 become effective immediately upon commencement of discharge -- except for arsenic which was provided a compliance schedule deadline of November 1, 2019. (The arsenic limit remains under appeal by CHS, Inc.). As part of this permit application for a major modification, CHS proposes a phased-in approach for meeting the arsenic limits, including extending the final compliance deadline for three years, until October 2022. CHS, Inc. proposes to conduct wastewater treatment upgrades to meet the arsenic limits in up to four phases, as follows:

Table FS-01. Proposed Wastewater Treatment Upgrades

Phase 1 – Diffuser Construction		
	Diffuser outfall	June 2018 – Oct 2018
	Outfall storage tank/pumps	June 2018 – Aug 2019
	Outfall forced main pipeline	Sept 2018 – Dec 2018
Phase 2 – Reduce arsenic concentration by treatment optimization		
	Arsenic tertiary treatment, includes: • Oily water surge tank • Additional solids removal • Recycle air floatation (RAF) vessel	Mar 2019 – Aug 2020
Phase 3 – Additional arsenic reduction treatment		
	Arsenic multimedia filter	Sept 2020 – Sept 2021
Phase 4 – Potential arsenic polishing reduction (if needed)		
	Arsenic polishing filter	Aug 2021 – June 2022

See **Attachment A** for a simplified wastewater treatment system flow diagram.

4. Discharge Points and Receiving Waters

Existing Outfall 001 to the Italian Drain (tributary to the Yellowstone River) will remain unchanged.

CHS is proposing to install a two-port diffuser structure with discharge directly to the Yellowstone River located ~75 feet downstream from the Billings Bench Water Association (BBWA) ditch intake. See **Attachment B**. The primary discharge will be through the lower port (Outfall 002). In case of maintenance or emergencies, CHS will change the diffuser's check valve settings to discharge through the upper port (Outfall 003).

Table FS-02 provides a description of the discharge points. **This permit will allow CHS-Laurel Refinery to discharge from only one outfall at any given time.**

Table FS-02. Description of Discharge Points

Outfall	Latitude	Longitude	Receiving Water	Receiving Water Classification
001	45º39'28"N	108º45'09"W	Italian Drain (to Yellowstone River)	B-2
002	45º39'22.32"N	108º45'10.86"W	Lower diffuser port to Yellowstone River	B-2
003	45º39'22.32"N	108º45'10.86"W	Upper diffuser port to Yellowstone River	B-2

C. Summary of Existing Permit Requirements and Effluent Quality Data

Table FS-03 provides a summary of the current wastewater quality from Outfall 001 based on Discharge Monitoring Report (DMR) data from November 1, 2015 to March 31, 2018, supplemented with facility data provided by George Fink (May 2018). The wastewater quality summarized in **Table FS-03** is assumed to be comparable to the future Outfall 002 discharge until the treatment upgrades are installed.

Table FS-03. Outfall 001 Effluent Quality (November 2015 – March 2018)

Parameter	Units	Existing Permit Limits (1)	Minimum	Average	Maximum	Number of Samples (2)
Flow	mgd	NA	1.1	1.3	2.4	29
Biochemical Oxygen Demand (BOD_5)	mg/L	NA	2.6	6.3	28	29
	lb/day	331 / 620	28/38	70/117	171/378	29
Chemical Oxygen Demand (COD)	mg/L	NA	46	65	285	29
	lb/day	2,288 / 4,425	242/593	706/1207	1,100/2,526	29
Total Suspended Solids (TSS), net	mg/L	NA	--	--	--	--
	lb/day	339 / 532	14/26	103/182	208/363	29
Oil & Grease	mg/L	10	0.1	0.6	4.0	29
	lb/day	128 / 242	ND	5.1	36	29
Ammonia	mg/L	NA	0.04	<1.5	40	29
	lb/day	191 / 418	ND	11/36	60/232	29
Hexavalent Chromium	µg/L	NA	<10	<10	<10	29
	lb/day	0.36 / 1.0	ND	ND	ND	29
Chromium, TR	µg/L	NA	<10	<10	20	29
	lb/day	5.2 / 9.1	ND	ND	0.06/0.30	29
Phenols	µg/L	NA	1.0	7.3	68	29
	lb/day	2.2 / 4.5	0.005	0.08	0.74	29
Sulfide, Total	µg/L	NA	10	< 36	80	29
	lb/day	1.8 / 3.9	ND	0.13/0.25	0.60 / 0.86	29
Sulfide, Dissolved	µg/L	NA	12	< 35	60	9
Hydrogen Sulfide (H_2S)	µg/L	NA	< 40	< 40	< 50	36
pH	s.u.	6.0 - 9.0 (6)	6.6	--	9.1	29
Temperature	˚C	NA	7.1	15.6	28	29
Fluoride	mg/L	NA	1.5	5.9	52	26
Arsenic, TR	µg/L	NA	16	39	80	25
Selenium, TR	µg/L	NA	53	116	195	17
Cyanide	µg/L	NA	<5	< 5.3	6.0	4
Lead, TR	µg/L	NA	< 0.3	< 0.33	0.4	4
Mercury, TR	µg/L	NA	0.010	0.019	0.033	4
Total Residual Chlorine	mg/L	NA	< 0.02	0.05	0.23	3
Nitrate + Nitrite	mg/L	NA	< 0.01	5.3	16.6	25

Notes: NA = Not applicable; ND = nondetect, TR = Total Recoverable

(1) Permit limits: 30-day average / daily maximum, other than pH which is the acceptable range.

(2) Other than H_2S, the number of samples represents number of months with data; actual data collected weekly for most parameters.

II. RATIONALE FOR PERMIT CONDITIONS

There are two principal bases for effluent limits: technology-based effluent limits (TBELs) that specify the minimum level of treatment or control; and water quality-based effluent limits (WQBELs) that attain and maintain applicable numeric and narrative water quality standards. TBELs are based on implementing available technologies to reduce or treat pollutants while WQBELs are designed to protect the beneficial uses of the receiving water.

A. Technology-based Effluent Limits

1. Scope and Authority

No changes impacting TBELs are proposed with this major modification.

B. Water Quality-based Effluent Limits

1. Scope and Authority

Permits are required to include WQBELs if TBELs are not adequate to protect state water quality standards. No wastes may be discharged that can reasonably be expected to violate any state water quality standards. In addition, dischargers are also subject to the mixing zone rules and Montana's nondegradation policy. The purpose of this section is to provide a basis and rationale for the proposed effluent limits on the CHS discharges to protect designated uses of the receiving waters based on Montana water quality standards.

2. Receiving Water - Applicable Beneficial Uses and Numeric and Narrative Standards

No changes impacting beneficial use are noted for this major modification.

Receiving Water Characteristics

For purposes of this major modification, DEQ determined that the data supplied for the 2015 permit renewal would be sufficient.

Table FS-04. Yellowstone River Receiving Water Characteristics

Name of Receiving Water	Yellowstone River
Class of Receiving Water	B-2
Lower Bound Receiving Water Hardness (mg/L as $CaCO_3$) (1,2) (minimum and/or default is 25 mg/L, and maximum is 400 mg/L)	89
Upper Bound Receiving Water pH Value (1,3)	8.4
Upper Bound Receiving Water Temperature (°C) (1,3)	16
Are salmonid fish present in the receiving water?	Yes
Are fish in early life stages present in the receiving water?	Yes

Footnotes:
(1) The lower bound for hardness is 25th percentile and the upper bound for pH and temperature is the 75th percentile of the datasets.
(2) 25th percentile ambient hardness based on 12 data points from CHS Attachment H-1 (2014-2015) and nine data point from the Laurel Water Treatment Plant (2011 – 2013).
(3) 75th percentile ambient temperature and pH based on over 1,000 data points from the Laurel Water Treatment Plant between 2011- 2013.

In addition, DEQ summarized the 75th ambient condition for all pollutants of concern (POC) in the Yellowstone River in **Attachment C, Table C-1**. This ambient data was derived from:

- CHS Attachment H-1 from 2015 modified renewal application (12 sampling dates between 8/14/14 and 2/24/15);
- DEQ monitoring at Station Y06YELSR06 – Yellowstone River at Hwy 212 bridge near Laurel, less than 0.5 mile upstream from CHS (2015 – 2017);
- NetDMR upstream data;
- Supplemental Information provided by George Fink of CHS in May 2018; and
- Available literature and other sources.

3. Nondegradation

In developing this modified permit, DEQ concluded that the CHS discharge is not a new or increased discharge, and that existing uses of the receiving water are maintained and protected. There is no change from the 2015-issued permit.

4. Mixing Zones

A mixing zone is defined as a limited area of a water body where initial dilution of a discharge takes place, where water quality changes may occur, and where certain numeric water quality standards may be exceeded. There is no change in the general regulatory discussion from the 2015-issued permit.

Yellowstone River

CHS is requesting that source-specific mixing zones be granted for discharge from the proposed diffuser ports identified as Outfalls 002 (lower) and 003 (upper). The amount of dilution granted is based on the lowest 7-day flow over 10 years (7Q10). There are no proximate upstream flow gages. DEQ calculated the 7Q10 for the Yellowstone River at the CHS -Laurel Refinery by subtracting the 7Q10 of the Clarks Fork Yellowstone River plus the refinery discharge from the downstream 7Q10 of the Yellowstone River at Billings (see **Table FS-05**). Other than the facility discharge rate, low flow was obtained from the USGS *2015 Statistical Summaries of Streamflow in Montana, USGS – Streamflow Stats Table 1-1*.

Table FS-05. Yellowstone River Calculated 7Q10 Low Flow

Yellowstone River 7Q10 Low Flow Determination	Cubic Feet per Second (1)
Billings USGS Station 06214500	1,130 cfs
Clarks Fork Yellowstone River USGS Station 06208500	(101 cfs)
CHS - Laurel Refinery –Avg Flow (Form 2C Part II =1,413 gpm) (2)	(3 cfs)
Calculated Low Flow Upstream of the Refinery	**1,026 cfs**

Footnote:
(1) cfs = cubic feet per second; gpm = gallons per minute
(2) As requested by EPA in the 2015 Response to Comments, DEQ agreed to subtract the contribution of the CHS-Laurel Refinery to the low flow to calculate the low flow upstream of the facility.

CHS plans to construct a two-port bankside diffuser on the Yellowstone River beginning the summer of 2018 (see **Part I.B.4** of this Fact Sheet), which will become the primary discharge for the facility by November 1, 2019. The final effluent limits will apply to the diffuser immediately upon discharge.

The diffuser discharge will be in the deepest part of the river, approximately 75 feet downstream from the BBWA intake. The diffuser project entails installation of a forced main pipeline (estimated to be complete by end of 2018) and outfall tanks and pumps (estimated complete by August 2019).

CHS submitted an updated mixing zone study for the two-ports at the new location, dated August 2017, in December 2017. The 2017 mixing zone study included modeling using CORMIX Version 10.0 GTS to define the acute and chronic mixing zone boundaries, to develop a minimum predicted dilution factor, and develop the corresponding proportion of the total 7Q10 that could be considered for 'dilution credit.'

Based on the data provided, DEQ grants the mixing zones in **Table FS-06**, which are based on the worst-case (most critical) impacts assuming a future maximum daily discharge flow of 3.0 million gallons per day (mgd) [acute] and average flow 2.0 mgd [chronic/human health standard (HHS)].

Table FS-06. Yellowstone River Mixing Zones

Diffuser	Criterion Condition	Mixing Zone (MZ) Downstream Boundary	Plume Width @ End of MZ	Dilution Factor @ end of MZ (minimum)	Dilution mgd	Dilution *cfs*	Estimated % of River @ Low Flow
Outfall 002 Primary (lower)	Acute	100 feet	15 feet	34	102	*158*	15.4% (1)
	Chronic/HHS	1000 feet	68 feet	197	394	*610*	59.4% (2)
Outfall 003 Secondary (upper)	Acute	100 feet	13 feet	20	60	*92.8*	9.0% (1)
	Chronic/HHS	1000 feet	56 feet	111	222	*343.5*	33.5% (2)

Footnote: mgd = million gallons per day; cfs = cubic feet per second.

(1) Estimated percent of river at low flow available for acute dilution is calculated by multiplying the maximum acute discharge (3.0 mgd) x DF at the end of the mixing zone. After converting the acute dilution mixing zone flow from mgd to cfs, this value is divided by the 7Q10 of 1,026 cfs.

(2) Estimated percent of river at low flow available for chronic/HHS dilution is calculated by multiplying the maximum chronic discharge (2.0 mgd) x DF at the end of the mixing zone. After converting the chronic dilution mixing zone flow from mgd to cfs, this value is divided by the 7Q10 of 1,026 cfs.

5. Reasonable Potential Analysis and WQBEL Development

Pollutants of Concern

Limits must be established in permits to control all pollutants or pollutant parameters that are or may be discharged at a level that will *cause*, have the *reasonable potential to cause*, or *contribute* to an excursion above any state water quality standard. Only pollutants of concern (POC) with final limits in the 2015-issued permit, or that could be expected to be impacted by the new mixing zone calculations are included under this major modification, as summarized in **Table FS-07**.

Table FS-07. Identification of POC for 2018 Major Permit Modification

Parameter	Basis for Identifying as POC for this Modification (1)
Ammonia Chromium (Total Recoverable and Hexavalent) Phenol	TBELs & potential impact from change in dilution granted and updated information
Arsenic	Future limit & potential impact from change in dilution granted and updated information
Nitrate+Nitrite Fluoride Hydrogen Sulfide Selenium	Known present & potential impact from change in dilution granted and updated information
Footnotes: (1) Parameters with less than 10 effluent data points were not included as part of this major modification.	

Reasonable Potential Analysis Background

DEQ conducted a Reasonable Potential (RP) analysis for Outfalls 002 and 003, for each POC identified in **Table FS-07**, to evaluate whether CHS has RP to exceed standards in the Yellowstone River. RP for the discharge to cause exceedances of a WQBEL was evaluated using the following mass-balance equation (*Equation 1*):

$$C_r = \frac{Q_d C_d + Q_s C_s}{Q_d + Q_s} \qquad (\textit{Equation 1})$$

Given:

C_r = the resulting receiving water concentration
Q_d = critical effluent flow rate
C_d = critical effluent pollutant concentration
[= maximum concentration during the POR x TSD multiplier (C_{95})]
Q_s = critical stream flow (7Q10 x available dilution)
C_s = critical background receiving water pollutant concentration (75^{th} percentile)

Where the projected receiving water concentration (C_r) exceeds the lowest applicable numeric standard for the pollutant of concern, there is RP and WQBELs must be calculated. The RP analyses and supporting data are provided in **Attachment C, Tables C-1 to C-4**. The following assumptions were made:

Critical Discharge Flow (Q_d)

The critical discharge flow used for this major modification is the same as the renewal:

- Acute aquatic life – 3.0 mgd
- Chronic aquatic life/HHS – 2.0 mgd

Critical Discharge Pollutant Concentration (C_d)

To develop the critical discharge concentrations, DEQ follows the estimation procedures described in EPA's *Technical Support Document for Water Quality-based Toxics Control* (TSD) (EPA/505/2-90-001, March 1991). DEQ multiplies the maximum discharge concentration observed during the POR by a TSD multiplier, calculated using the number of effluent samples and corresponding coefficient of variation (CV). The C_d is provided in **Attachment C, Table C-2.**

Critical Receiving Water Flow (Q_s)

Critical stream flow is based on the available part of the 7Q10 considering dilution. The Yellowstone River 7Q10 is calculated as 1,026 cfs (663 mgd) (see **Part II.B.4**.). Based on the updated mixing zone study submitted as part of the 2018 major modification application (see **Table FS-06**), the amount of the low flow available for dilution ($Q_{s)}$ is:

Outfall 002 (Primary Diffuser, Lower):

- Acute = 15.4% of the 7Q10 (102 mgd dilution);
- Chronic/HHS = 59.4% of the 7Q10 (394 mgd dilution)

Outfall 003 (Secondary Diffuser, Upper):

- Acute = 9% of the 7Q10 (60 mgd dilution);
- Chronic/HHS = 33.5% of the 7Q10 (222 mgd dilution)

Critical Receiving Water Background Pollutant Concentration (C_s)

For purposes of conducting an RP analysis and determining assimilative capacity, the critical background receiving water concentration (C_s) is defined to be the 75th percentile or upper bound estimate of the interquartile range of the data. **Attachment C, Table C-1** summarizes the ambient conditions and the source of the data for the parameters reviewed under this major modification.

RP Analysis Summary

DEQ develops WQBELs for any pollutant for which there is RP to cause or contribute to exceedances of instream numeric or narrative water quality standards, after application of any approved mixing zones. **Attachment C Table C-3 and C-4** present the numeric RP analyses for Outfalls 002 and 003.

Tables FS-08 and **FS-09** summarize the data for the parameters with RP after mixing for Outfall 002 and Outfall 003:

Table FS-08. Summary of Parameters with RP (Outfall 002 Yellowstone River)

Parameter	Units	Surface Water Quality Standards			Concentration after Mixing (C_r)		RP Comments
		Acute	Chronic	Human Health	Acute	Chronic/ HHS	
Hydrogen Sulfide	µg/L	NA	2	NA	< 45	< 45	Based on nondetects; need data meeting RRV.
Arsenic, TR	µg/L	340	150	10 (1)	16	14	Natural ambient greater than HHS.

Footnotes:
(1) DEQ is currently evaluating site-specific criteria for arsenic in the Yellowstone River.

Table FS-09. Summary of Parameters with RP (Outfall 003 Yellowstone River)

Parameter	Units	Surface Water Quality Standards			Concentration after Mixing (C_r)		RP Comments
		Acute	Chronic	Human Health	Acute	Chronic/ HHS	
Ammonia	mg/L	2.6	1.2	NA	2.8	0.6	Needs information on future performance.
Hydrogen Sulfide	µg/L	NA	2	NA	< 46	< 45	Based on nondetects; need data meeting RRV.
Arsenic, TR	µg/L	340	150	10 (1)	18	15	Natural ambient greater than HHS.

Footnotes:
(1) DEQ is currently evaluating site-specific criteria for arsenic in the Yellowstone River.

The following discusses the RP analysis in more detail for those parameter with numeric RP:

- ***Hydrogen Sulfide***: Hydrogen Sulfide (H_2S) is a portion of dissolved sulfide, with the percentage dependent on pH. (4500-S^{2-} H. Calculation of Un-Ionized Hydrogen Sulfide, *Standard Methods for the Examination of Water and Wastewater*, 22nd Edition, 2012).

  H_2S has a chronic aquatic life standard of 0.002 mg/L (or 2 µg/L). DEQ cannot determine if CHS has RP to exceed the H_2S standard because of the limits on the analytical capabilities:

  - **C_s of < 45 µg/L H_2S** – three upstream samples were nondetect, with one reporting limit of 50 µg/L and two of 40 µg/L.
  - **C_d of < 57 µg/L H_2S** – all 36 effluent samples (July 2017- May 2018) were nondetect with reporting limits of 40 to 50 µg/L x TSD multiplier of 1.14.

  The H_2S Required Reporting Value (RRV) of 20 µg/L is greater than the chronic aquatic life water quality standard of 2 µg/L. However, the lab's reporting limit did not meet the RRV for either ambient or effluent monitoring. DEQ determined that the available data is not sufficient to conduct a H_2S RP analysis for either Outfall 002 or Outfall 003. Additional ambient and effluent monitoring will be required at levels sufficient to meet the RRV.

- ***Arsenic, total recoverable –*** CHS Laurel Refinery has RP to contribute to the exceedance of the arsenic Human Health Standard (HHS) in the Yellowstone River. The 75th percentile of the upstream concentration for this segment of the Yellowstone River is 14 µg/L which is greater than the HHS of 10 µg/L. Therefore, there is no assimilative capacity and CHS Laurel Refinery has RP to contribute to the exceedence of the HHS. DEQ discusses this further in the WQBEL section.
- ***Ammonia, total as N –*** CHS Laurel Refinery has RP to exceed ammonia when discharging from Outfall 003 but not when discharging from Outfall 002. DEQ discusses ammonia WQBEL development further in the WQBEL section.
- ***Chromium (total recoverable and hexavalent), Phenol, Nitrate + Nitrite, Fluoride, and Selenium*** – due to dilution with the Yellowstone River, there is no RP to exceed standards for these pollutants from either Outfall 002 or Outfall 003.

Summary of WQBEL Evaluation – Outfalls 002 & 003

***Ammonia*:**

Circular DEQ-7 includes ammonia aquatic life standards developed based on a combination of pH and temperature of the receiving stream, the presence or absence of salmonid fish species, and the presence or absence of fish in early life stages. DEQ reviewed upstream data to evaluate the ambient pH and temperature of the river (see **Table FS-04**). Furthermore, the Yellowstone River in this area is classified as B-2 water, which is suitable for growth and marginal propagation of salmonid fishes. **Table FS-10** summarizes the development of the ammonia water quality standards for the Yellowstone River in this area:

Table FS-10: Total Ammonia-Nitrogen Water Quality Standards for Yellowstone River

Condition	Period	Salmonids Present	Early Life Stages	Ambient Conditions (1)		**Water Quality Standard (mg/L) (2)**
				pH (s.u.)	Temperature (°C)	
Acute Criterion	Annual	Yes	NA	8.4	NA	**2.59**
Chronic Criterion	Annual	NA	Yes	8.4	16.0	**1.17**

Footnotes: NA – Not Applicable
(1) Based on 75th percentile of data.
(2) Acute and chronic standards based on Department Circular DEQ-7 (May 2017)

DEQ followed the estimation procedures described in EPA's TSD to calculate the critical ammonia effluent concentration (C_d) as 58 mg/L (see **Attachment C, Table C-2**).

There is no RP to exceed the above standards for Outfall 002. There is RP to exceed the acute ammonia standard for Outfall 003 (C_r of 2.8 mg/L > acute standard of 2.6 mg/L). However, because of the potential for additional treatment of the effluent due to the upcoming wastewater treatment plant upgrade to reduce ammonia effluent concentrations, DEQ has determined that no ammonia limit will be proposed for this major modification. Additional monitoring will be required for future evaluation.

***Arsenic, Total Recoverable*:**

The 2015-issued permit included final arsenic effluent limits for Outfalls 001 & 002. Because the Laurel Refinery could not immediately meet the proposed arsenic limits, DEQ provided a compliance schedule of November 1, 2019, to allow time for CHS to meet the new limits.

As part of this major permit modification, CHS has requested the following changes:

1. *Extend arsenic compliance deadline*. CHS requested that DEQ extend the arsenic compliance deadline from November 1, 2019 until at least October 2022. Based on review of CHS' proposed phased-in timeline for project completion (see **Table FS-01**) and a review of the progress made by CHS to-date, DEQ agrees that the request to extend the compliance date for meeting future arsenic limits to November 1, 2022 is reasonable.
    - CHS has evaluated, designed, and is installing upgrades to their refinery's wastewater treatment facility. CHS is undertaking significant treatment process changes during 2018 and 2019, including Phase 1 - the construction of the new wastewater diffuser with a forced main pipeline and Phase 2 - treatment process changes including additional oil & grease removal, additional solids removal, and installation of air floatation for arsenic tertiary treatment. These changes are anticipated to reduce the effluent arsenic concentrations down to ~ 20 µg/L, although CHS cannot predict how well the treatment system will work with any certainty. Optimization of each additional treatment process step will take time.
    - As part of the evaluation, CHS has conducted several arsenic-removal pilot studies including one with walnut shell filters, another with multimedia filters, and another with a granular ferric oxide bed. In addition to evaluating the treatment capabilities and liabilities of each, CHS observed a wide range of iron, aluminum, and manganese concentrations in the pilot study discharge and needs to ascertain that these treatment chemicals do not themselves cause or contribute to an exceedence of a standard.
    - CHS has proposed to pursue additional treatment, if necessary to meet future arsenic limits. Because each additional treatment step adds significant capital and maintenance costs, CHS needs to know how close each additional arsenic treatment step can get to achieving the final arsenic limits.
2. *Arsenic limit re-evaluation.* CHS requested DEQ consider the following factors to potentially revise the arsenic effluent limits:
    - Intake arsenic loading from supply water and groundwater. CHS requested that DEQ consider changing the arsenic limit to a "net" limit in the same manner as the net TSS limits. However, federal and state regulations allow net credit (i.e., discounting intake TSS) for TBELs under 40 CFR 122.45(g)(1)(ii) and ARM 17.30.1345(9)(a)(ii). Because arsenic effluent limits are WQBELs, there is no regulation that would allow for net credit.
    - Site-specific conditions, including ambient arsenic levels and available dilution. DEQ conducted ambient monitoring for total recoverable arsenic in this segment of the Yellowstone River, resulting in 20 data points between May 1, 2015 and September 6, 2017.

- SB-325 Working Group is developing site-specific arsenic criteria for this stretch of the Yellowstone River. Unless and until the final results for the Yellowstone River Nonanthropogenic Arsenic Standards are approved by the BER, DEQ cannot implement the a site-specific standard or modify the arsenic effluent limits.

The final arsenic WQBELs remain unchanged. The compliance deadline has been changed to November 1, 2022.

III. FINAL EFFLUENT LIMITS

The final effluent limits in the permit are based on the more stringent of the calculated TBELs and WQBELs for each parameter, subject to an anti-backsliding analysis.

A. Anti-backsliding Analysis

With some exceptions, effluent limits or conditions in reissued permits must be at least as stringent as those in the existing permit. As there is no proposed change to TBELs or WQBELs with this major modification, there is no consideration for anti-backsliding requirements.

B. Interim Effluent Limits

The Outfall 001 Interim Limit narrative was changed from "There shall be no discharge from Outfall 002 at any time there is a discharge from Outfall 001" to "There shall be no discharge from Outfall 001 at any time there is discharge from Outfall 002 or Outfall 003."

C. Final Effluent Limits

Outfall 001 – Italian Ditch

There are no changes to the Outfall 001 effluent limits, other than a change to the following narrative condition:

- There shall be no discharge from Outfall 001 at any time there is discharge from Outfall 002 or Outfall 003.

Outfall 002 – Diffuser to Yellowstone River

This section was changed to reflect that the limits are effective for both Outfalls 002 and 003. There were no numeric effluent limit changes made to the table, other than a change to the arsenic effective date in Footnote (1). The following narrative conditions were updated:

- There shall be no discharge from Outfall 002 at any time there is discharge from Outfall 001 or Outfall 003.
- There shall be no discharge from Outfall 003 at any time there is discharge from Outfall 001 or Outfall 002.

IV. RATIONALE FOR MONITORING AND REPORTING REQUIREMENTS

A. Monitoring Locations and Frequency

Self-monitoring of effluent shall be conducted, following final treatment, at the following locations, unless another location is requested and approved by DEQ in writing:

- Outfall 001 –at the flow meter & sampling location; and
- Outfalls 002 or 003 – at the outlet of the discharge pumps prior to the forced main.

Samples will reflect the nature of the discharge. Samples shall be collected, preserved and analyzed in accordance with approved procedures listed in 40 CFR 136. Unless DEQ specifies another reporting level, data supplied by CHS must either have a detection or meet the Required Reporting Value (RRV), which is the detection level that must be achieved as listed in Circular DEQ-7. The RRV is DEQ's best determination of a level of analysis that can be achieved by the majority of the commercial, university, or governmental laboratories using EPA-approved methods or methods approved by DEQ. With this major modification, the RRV has been included in the monitoring table requirements.

At a minimum, the following constituents shall be monitored at the frequencies and with the types of measurements indicated; samples or measurements shall be representative of the volume and nature of the monitored discharge.

The Effluent Monitoring Requirements table in the permit Part I.C.1 has been changed as follows:

- Outfall 003 requirements added;
- Required Reporting Values (RRVs) added for relevant parameters; and
- Monitoring for manganese oxide for Outfall 001 and dissolved aluminum for both outfalls added.

In addition, the composite monitoring aliquot requirements in the permit were changed as follows: Composite samples shall, as a minimum, be composed of two or more discrete aliquots (samples) of equal volume and time collected in a 24-hour period until November 1, 2019. After this date, composite samples shall, as a minimum, be composed of four or more discrete aliquots (samples) of equal volume. The definition was also changed to reflect four aliquots.

Upstream Monitoring

RRVs have been added to the upstream monitoring table in the permit Part I.C.3

B. Whole Effluent Toxicity (WET)

No changes were made to the WET testing requirements with this major modification.

C. Reporting Requirements

No changes were made to the reporting requirements with this major modification.

V. RATIONALE FOR COMPLIANCE SCHEDULE/ SPECIAL CONDITIONS

A. Schedule of Compliance for Meeting Final Effluent Limits

1. CHS shall meet the final effluent limits as follows:
   - Arsenic, total recoverable – November 1, 2022
   - All other parameters – November 1, 2019

CHS Laurel Refinery shall submit an annual report addressing work performed and anticipated work to be completed to meet the final effluent limits. The annual report must be post-marked no later than January 28th of each year, and include actions taken in the previous year and planned actions for the upcoming year.

B. Additional Monitoring, Reporting, and Special Studies

1. Whole Effluent Toxicity (TIE/TRE)

No changes were made to the WET TIE/TRE requirements with this major modification.

2. Notification Regarding Use of Outfalls 001 through 003

CHS Laurel Refinery currently discharges through Outfall 001. Therefore, the permit monitoring requirements are currently required only for Outfall 001 and discharge is not allowed through Outfall 002 or Outfall 003. Once CHS completes construction of the diffuser, notification to DEQ of the planned change in discharge location is required, in writing, at least 30 days in advance of re-directing the discharge. Upon such a notification, CHS will be authorized to discharge under the specified outfall in accordance with this permit, without further permitting activities.

The permit monitoring requirements will be required only for the specified outfall, until CHS again needs to change outfalls. CHS will be required to notify DEQ of future outfall changes as follows:

- Planned maintenance activities: notify DEQ in writing 30 days prior to changing the outfall used for discharge, including which outfall will be used and the expected starting and ending dates; and
- Emergencies: notify DEQ verbally within 24-hours and in writing seven days after changing the outfall used for discharge.

3. Total Residual Chlorine

The 2015-issued permit required CHS to submit results of lab analyses to document the extent of interference by magnesium oxide on Total Residual Chlorine (TRC) analytical results by no later than November 1, 2017. CHS submitted the TRC report; however, the lab method was later found to be incorrect (it was not 40 CFR 136-approved method for wastewater) and the report is therefore inconclusive.

In a response letter dated January 31, 2018, DEQ notified CHS that TRC must be included in the Permit's Part I.E.1 planning requirements for meeting Outfall 001 limits, that are due November 1, 2019. Unless CHS notifies DEQ that the TRC concentration in the discharge can be considered 100% TRC (with no 'credit' for the interference), CHS Laurel Refinery must submit an annual report to DEQ summarizing their progress towards meeting the TRC

final limits for Outfall 001. The annual report must be post-marked no later than January 28th, and include actions taken in the previous year and planned actions for the upcoming year.

4. Storm Water Management

CHS Laurel Refinery has two outfalls for storm water which are currently covered under Montana storm water industrial general permit (GP) authorization MTR000099. In a DEQ letter to CHS dated August 13, 2018, DEQ required CHS Laurel Refinery to evaluate whether discharge from the two storm water outfalls that are currently authorized under the GP should be classified as "contaminated" and permitted under this individual MPDES permit or "uncontaminated" and eligible to remain authorized under the GP by no later than **September 20, 2018**.

C. Rationale for Standard Conditions

No change to Standard Conditions with this major modification.

VI. NONSIGNIFICANCE DETERMINATION

The proposed effluent limits have been maintained below the nondegradation levels and do not constitute a new or increased source of pollutants pursuant to ARM 17.30.702(16). Therefore, a nonsignificance analysis is not required.

VII. ATTACHMENTS

Attachment A.	Water Flow Diagram
Attachment B.	Facility Map
Attachment C.	RP Analysis

By: Christine Weaver, August 2018

Attachment A – Future CHS Refinery Wastewater Treatment System Simplified Flow Diagram

Attachment B – Proposed Facility Wastewater Flow Map

Attachment C –Reasonable Potential Calculations for Outfalls 002 & 003