Supplemental Fact Sheet for NPDES Permit WA0003671

Agrium Kennewick Fertilizer Operation – Kennewick Facility

September 27, 2016

Purpose of this Supplemental Fact Sheet

This supplemental fact sheet explains and documents the decisions the Department of Ecology (Ecology) made in drafting the proposed National Pollutant Discharge Elimination System (NPDES) permit modification for the Agrium U.S. Inc. (Agrium), Kennewick Fertilizer Operations – Kennewick Facility, NPDES Permit No. WA0003671.

This supplemental fact sheet complies with Section 173-220-060 of the Washington Administrative Code (WAC), which requires Ecology to prepare a draft permit and accompanying fact sheet for public evaluation before issuing an NPDES permit.

Ecology makes the draft permit modification and supplemental fact sheet available for public review and comment at least thirty (30) days before issuing the final permit. The draft permit modification and supplemental fact sheet for the Kennewick facility are available for public review and comment from August 18, 2016 until September 19, 2106. For more details on preparing and filing comments about these documents, please see **Appendix A - Public Involvement Information**.

Agrium reviewed the draft permit modification and supplemental fact sheet for factual accuracy. Ecology corrected any errors or omissions regarding the facility's location, history, discharges, or receiving water prior to publishing this draft supplemental fact sheet for public notice.

After the public comment period closes, Ecology will summarize substantive comments and provide responses to them. Ecology will include the summary and responses to comments in this supplemental fact sheet as **Appendix E - Response to Comments**, and publish it when issuing the final NPDES permit modification. Ecology generally will not revise the rest of the fact sheet, but the full document will become part of the legal history contained in the facility's permit file.

Summary

Ecology issued the NPDES permit for the Agrium Kennewick Facility on December 15, 2015. On May 23, 2016, Agrium submitted a revised NPDES permit application with a request to modify the permit to allow the discharge of contaminated stormwater from the process area at Outfall 001. Ecology has modified the permit in response to Agrium's request, to address typographical errors, and to make clarifications.

Table of Contents

I. Introduction

The Federal Clean Water Act (FCWA, 1972, and later amendments in 1977, 1981, and 1987) established water quality goals for the navigable (surface) waters of the United States. One mechanism for achieving the goals of the Clean Water Act is the National Pollutant Discharge Elimination System (NPDES), administered by the federal Environmental Protection Agency (EPA). The EPA authorized the state of Washington to manage the NPDES permit program in our state. Our state legislature accepted the delegation and assigned the power and duty for conducting NPDES permitting and enforcement to Ecology. The Legislature defined Ecology's authority and obligations for the wastewater discharge permit program in 90.48 RCW (Revised Code of Washington).

The following regulations apply to industrial NPDES permits:

- Procedures Ecology follows for issuing NPDES permits (chapter 173-220 WAC)
- Water quality criteria for surface waters (chapter 173-201A WAC)
- Water quality criteria for ground waters (chapter 173-200 WAC)
- Whole effluent toxicity testing and limits (chapter 173-205 WAC)
- Sediment management standards (chapter 173-204 WAC)
- Submission of plans and reports for construction of wastewater facilities (chapter 173-240 WAC)

These rules require any industrial facility owner/operator to obtain an NPDES permit before discharging wastewater to state waters. They also help define the basis for limits on each discharge and for performance requirements imposed by the permit.

Under the NPDES permit program and in response to a complete and accepted permit application, Ecology must prepare a draft permit and accompanying fact sheet, and make them available for public review before final issuance. Ecology must also publish an announcement (public notice) telling people where they can read the draft permit, and where to send their comments, during a period of thirty days (WAC 173-220-050). (See **Appendix A** for more detail about the public notice and comment procedures.) After the public comment period ends, Ecology may make changes to the draft NPDES permit in response to comment(s). Ecology will summarize the responses to comments and any changes to the permit in **Appendix E**. Ecology has applied this process to permit modifications as well.

II. Background Information

Agrium submitted a revised NPDES permit application on May 23, 2016 with a request to modify the permit for the Kennewick Facility to allow the discharge of contaminated stormwater from the process area to Outfall 001. The revised application can be viewed in Ecology's Permitting and Reporting Information System (PARIS; available online at https://fortress.wa.gov/ecy/wqreports/public/f?p=110:300:1476171913490938).

Contaminated stormwater is currently mixed with relatively high nitrate process recycle water and used as recycle water in the fertilizer production process. Agrium has stated that the Kennewick facility often has more stormwater and process recycle water than they can recycle during the winter months. In these situations, Agrium has had to store the stormwater and process recycle water wherever they can. Agrium has used various man-made containment ponds, railcars, and tanks at both the Kennewick and Finley facilities to store the water until it could be recycled. Agrium believes the option to discharge contaminated stormwater from the process area is necessary to correct the water imbalance the facility experiences in the winter months.

A. Request to Discharge Central Ditch Stormwater to Outfall 001

In their permit modification request, Agrium proposed correcting the water imbalance by segregating the contaminated stormwater and process recycle water. This will separate the low nitrate stormwater from the high nitrate process recycle water. Agrium proposed to collect and store the stormwater runoff from the central plant drainage ditch in an onsite holding pond known as Ortho Lake. Agrium proposed to use Ortho Lake for temporary storage before discharging the stormwater to Outfall 001.

Agrium proposed discharging the central ditch stormwater into the contact side sewer above the composite sampler to mix with the process water and non-contact cooling water flow to Outfall 001. The central ditch stormwater will be pumped manually to the contact side sewer and overseen by the Environmental Specialist or his/her designee. A 24-hour composite sample will be taken on any day that stormwater is discharged to Outfall 001.

The central ditch stormwater will still be used as process feed water when needed and as available. Agrium anticipates that only in extreme and unusual precipitation events or during rapid melting of a large snowpack will stormwater overflow the central ditch and flow into the sediment control pond upstream of Outfall 002. Agrium proposes to take a grab sample from Outfall 002 in the case when such an event occurs.

Following submittal of the permit modification request, Agrium and Ecology collected samples from the central ditch to characterize the stormwater (see Table 1). Stormwater sampling was performed when good housekeeping and other BMPs to prevent stormwater contamination were being followed. Based on precipitation information for the days when samples were collected, it appears that the higher concentration results represent samples collected during "first flush" conditions when there was an antecedent dry period.

Table 1 Central Ditch Stormwater Characterization

Parameter	1/25/2016	1/29/2016	3/1/2016	4/4/2016	4/14/2016	4/14/2016 [a]
Ammonia as N milligrams/liter (mg/L)	39.9	19.8	28.7	50.8	44.6	62.0
Nitrate/Nitrite as N (mg/L)	13.9	31.6	19.4	64.6	52.3	35.5
Nitrogen, total Kjeldahl as N (mg/L)	-	-	-	70.4	54.7	-
pH (standard units)	-	7.4	7.6	6.3	6.4	-
Total suspended solids (mg/L)	-	46	40	163	78	-
Oil and grease (mg/L)	-	<1	<1	3.7	<1	-
Oil sheen (Yes/No)	-	No	No	No	No	-
Turbidity (Nephelometric Turbidity Unit)	-	8	6	22	16	-
Phosphorus, total (mg/L)	-	0.266	0.204	0.215	0.201	-
Copper, total micrograms/liter (µg/L)	-	5	7	11	9	-
Zinc, total (µg/L)	-	46	4	93	13	-
BOD_5 (mg/L)	-	9.6	8.5	23.5	9.2	-
COD (mg/L)	-	-	-	36.2	10.4	-

a Ammonia and nitrate/nitrite samples taken by Ecology.

B. Request Evaluation and Discussion

Ecology considered four main components in evaluating the effects of Agrium's proposal. First, Ecology evaluated if the additional stormwater combined with the process water and non-contact cooling water would exceed technology-based limits at Outfall 001. Second, Ecology performed a reasonable potential analysis to determine if the combined discharge with the additional stormwater would exceed water quality standards in the Columbia River. Third, Ecology evaluated if all known, available, and reasonable methods of prevention, control, and treatment (AKART) are being applied to the stormwater. And fourth, Ecology

evaluated the operational and technical details provided by Agrium to discharge the central ditch stormwater to Outfall 001.

Technology-based Effluent Limits Review

The current permit has technology-based effluent limits based on the best available technology economically achievable (BAT) for the production of ammonia nitrate and nitric acid fertilizers as defined in the federal effluent limit guidelines in 40 CFR 418.40 Subpart D and 40 CFR 418.50 Subpart E. In developing these guidelines, EPA accounted for contaminated stormwater from process areas in determining the multipliers for each pollutant that may be discharged in the effluent from the fertilizer manufacturing process.

Table 2 compares the average process water loading and the loading for the central ditch stormwater to the current monthly average and daily maximum permit limits for ammonia and nitrate. A concentration of 65 mg/L was used in calculating the additional stormwater loading based on the maximum results found during the central ditch stormwater characterization (see Table 1).

Table 2 Technology-based Effluent Limit Evaluation

Parameter	Average Process Water Loading [a]	Stormwater Loading [b]	Average Monthly Limit (AML)	Maximum Daily Limit (MDL)	Combined Loading of Process Water and Stormwater as Percentage of the Limits	
					AML	MDL
Ammonia (as N)	1.03 pounds/day (lbs/day)	39.0 lbs/day	295 lbs/day	716 lbs/day	13.6 %	5.59 %
Nitrate (as N)	1.60 lbs/day	39.0 lbs/day	534 lbs/day	1,171 lbs/day	7.60 %	3.47 %

a	The average process water loading is based on the average process water concentrations of 0.171 mg/L and 0.265 mg/L for ammonia as N and nitrate as N, respectively. The average process water flow used in the mass loading calculation was 0.724 MGD. These averages were calculated using monitoring data from Agrium for 2011 through 2014.
b	The stormwater loading is based on ammonia and nitrate concentrations of 65 mg/L and a flow rate of 0.072 MGD (50 gallons/minute) as determined from the 2016 stormwater characterization monitoring and information provided by Agrium.

As shown in Table 2, the pollutant loading in the additional stormwater combined with process water will be well below current permit limits. Ecology has not changed the permit limits in the proposed modifications.

Water Quality-based Standards Review

The current fact sheet evaluated the reasonable potential for Agrium's process wastewater to exceed the water quality standards. With the addition of the central ditch stormwater, Ecology performed another reasonable potential analysis for the combined flow.

With Agrium's proposal to discharge contaminated stormwater to Outfall 001, there will be three sources of wastewater from the Kennewick facility that combine and discharge to the Columbia River. The central ditch stormwater will be mixed with the process wastewater. Then, the combined stormwater and process wastewater will be mixed with non-contact cooling water.

In the current fact sheet, Ecology evaluated the reasonable potential for Agrium's process water to violate water quality standards in the Columbia River. The impacts of the non-contact water on the overall effluent were not included in the reasonable potential analysis.

For the updated reasonable potential analysis, Ecology decided to evaluate the impact of Agrium's effluent using all three of the wastewater sources (central ditch stormwater, process wastewater, and non-contact cooling water). Ecology believes that this change is appropriate because the combined effluent is what actually discharges to the Columbia River.

Ecology analyzed different combinations of process wastewater concentrations and flows and non-contact cooling water flows to determine which values would cause the greatest likely effluent concentration (most conservative scenario) for use in the reasonable potential analysis. Ecology determined that the maximum process wastewater concentrations and flow and the minimum non-contact cooling water flow would cause the greatest likely effluent concentrations (see Table 3).

Table 3 Concentrations and Flows used in the Simple Mixing Evaluation

Parameter	Central Ditch Stormwater	Process Wastewater	Non-contact Cooling Water
Flow (MGD)	0.072	1.08 [a]	16.6 [b]
Ammonia as N (mg/L)	65	0.940 [a]	0.010 [c]
Nitrate/nitrite as N (mg/L)	65	1.10 [a]	0.108 [c]
Copper, total (µg/L)	15	2.0 [d]	2.0 [d]
Zinc, total (µg/L)	100	20 [d]	20 [d]

a	The maximum process wastewater ammonia and nitrate/nitrite concentrations and flow values are based on monitoring data from Agrium for 2011 through 2014.
b	The minimum non-contact cooling water flow value is based on monitoring data from Agrium for 2011 through 2014.

Parameter		Central Ditch Stormwater	Process Wastewater	Non-contact Cooling Water
c	Ecology assumed the non-contact cooling water discharge consists of ambient water. The ammonia and nitrate/nitrite concentrations are from 2006 to 2014 data at river mile 405 at WRIA 36 Esquatzel Coulee station 36A070. This is from Ecology's most recent available data upstream and closest to the discharge at river mile 322.6 (available at https://fortress.wa.gov/ecy/eap/riverwq/station.asp?theyear=2014&tab=final_data&scrolly=534&wria=36&sta=36A070&docextension=.xls&docextension=.xls).			
d	The copper and zinc concentrations are from Agrium's most recent permit application. The values were reported as non-detect. Ecology used the detection limits as conservative values in the reasonable potential analysis.			

Ecology used the values in Table 3 and simple mixing calculations to determine the concentrations of the final combined effluent (see **Appendix C**). Ecology then used these concentrations in the reasonable potential analysis (see **Appendix D**).

Ecology included copper and zinc in the simple mixing and reasonable potential analysis because these two metals were detected in the stormwater characterization sampling that Agrium and Ecology performed (as shown in Table 1).

Ecology determined that ammonia, nitrate/nitrite, copper, and zinc pose no reasonable potential to exceed the water quality criteria at the critical condition using procedures given in EPA, 1991.

AKART Review

Ecology must ensure that facilities provide AKART when it issues a permit. For stormwater, Ecology requires the implementation of BMPs to prevent, control, and minimize stormwater contamination. Monitoring and action levels are required to check the effectiveness of the BMPs. Additional measures are required when an action level is exceeded.

Ecology evaluated the stormwater BMPs Agrium outlined in their permit modification request and their current stormwater pollution prevention plan (SWPPP). Ecology believes that additional BMPs are needed to control and reduce stormwater contamination in the central ditch. The proposed permit modification requires Agrium to increase its stormwater inspections to at least once a week. Also, Agrium is required to update their SWPPP to include specific BMPs to prevent, control, and minimize stormwater contamination in the central ditch. One source of contamination to stormwater in the central ditch is track out from the cake filter room when Agrium transports high concentrated residue to outside roll-off boxes. Agrium has already made procedural changes to address this track out by loading cake filter directly into roll-off boxes rather than storing cake filter in the building prior to loading the bins.

Monitoring and action levels for ammonia and nitrate in the central ditch stormwater have been included in the proposed permit. Agrium is required to take specific actions when monitoring results are above action levels. These actions include inspecting the process area to determine the cause of the exceedance, evaluating existing BMPs, and identifying and implementing new BMPs as necessary.

Ecology believes that if Agrium applies appropriate BMPs, performs routine sampling of the stormwater, and uses adaptive management to control and reduce stormwater contamination, AKART will be met for the additional central ditch stormwater discharge to Outfall 001.

Operational and Technical Details Review

Ecology reviewed the operational and technical details in Agrium's request to discharge contaminated stormwater from the central ditch to Outfall 001. Agrium's permit modification request proposed that the central ditch stormwater be stored in Ortho Lake before being discharged to Outfall 001. Ecology believes that discharging the stormwater directly from the central ditch to Outfall 001 is more appropriate because this reduces the number of times the stormwater is transported thus reducing the potential for uncontrolled discharges. As a result, Agrium has decided to use Ortho Lake solely for the purpose of storing process recycle water.

Agrium originally proposed collecting a composite sample from the contact side sewer after the central ditch stormwater mixed with the process wastewater to determine the effectiveness of the BMPs in the process area. Ecology believes sampling the "first flush" stormwater in the central ditch will be more representative of the quality of the stormwater from the process area. The proposed permit modification requires Agrium to sample the central ditch stormwater once a month within the first 12 hours of runoff entering the central ditch. Ecology believes that this sampling frequency coupled with the weekly inspections is adequate to evaluate the effectiveness of the BMPs.

Agrium proposed using an action level of 50 lbs/day, which if exceeded, would trigger investigating the cause of the exceedance, reviewing the SWPPP, and evaluating if additional measures needed to be put in place to reduce stormwater contamination. Ecology believes the use of a mass loading action level to evaluate the effectiveness of stormwater BMPs is inappropriate because this may allow higher concentrations of nitrogen to be discharged when pumping at low flows.

The proposed permit modification establishes action levels for ammonia and nitrate/nitrite based on the maximum concentrations measured in the central ditch stormwater during the 2016 characterization sampling. This sampling represented conditions when good housekeeping and other BMPs to reduce stormwater contamination were being followed. Ecology chose a concentration action level of 65 mg/L for ammonia and nitrate. In the event an action level is exceeded, the proposed permit modification requires Agrium to inspect the central ditch collection area to investigate the cause of the exceedance, review existing BMPs

in the SWPPP, and make appropriate changes as necessary. Agrium is also required to notify and report to Ecology any exceedances of action levels and the corrective actions that are taken.

III. Proposed Permit Changes

Ecology proposes to make the following significant revisions to the current permit. In addition to the changes made to address Agrium's permit modification request, Ecology made a number of minor changes to fix formatting errors and make clarifications.

1. Modification Date

   The first page of the permit was revised to include the "Modification Date" which will be added at final issuance. The header on subsequent pages was changed to include the "Modified Date" which will also be added at final issuance.

2. Table of Contents

   The Table of Contents was revised to reflect the proposed changes made to the permit.

3. Summary of Permit Report Submittals

   The "Sampling Analysis Plan" from Special Condition S2.C was removed from the Summary of Permit Report Submittals table to reflect the proposed changes made to the permit.

4. Contact water/wastewater

   All references throughout the draft permit modification to "contact water" and "contact wastewater" were changed to "process water" and "process wastewater" to better represent the meaning of the waste stream and to avoid confusion.

5. Central Ditch Stormwater

   Special Condition S1.B "Central Ditch Stormwater" was added to the permit to authorize and establish conditions for the discharge of central ditch stormwater to Outfall 001. These conditions include a limit on flow rate, prohibitions, inspection requirements, action levels for ammonia and nitrate, and corrective measures for monitoring results above action levels.

6. Stormwater Benchmarks for Outfall 002

   Special Condition S1.B was changed to Special Condition S1.C.

7. Mixing Zone Authorization

   Special Condition S1.C was changed to Special Condition S1.D.

8. Process Wastewater Discharge Monitoring Schedule

   The heading in Special Condition S2.A was changed to "Wastewater Discharge Monitoring Schedule" to reflect the fact that more than just process wastewater is covered by the condition.

9. A new section titled "Stormwater at Central Ditch Pump" was added to the monitoring requirements in Special Condition S2.A. Since a new section was added, the subsequent numbers were revised to reflect the addition. Footnote "a" in the table in Special Condition S2.A was revised to explain the frequency and conditions of monitoring the central ditch stormwater.

10. Stormwater Sediment Control Pond Sampling Analysis Plan

    Special Condition S2.C "Stormwater Sediment Control Pond Sampling Analysis Plan" was changed to "Stormwater Sediment Control Pond Monitoring". Ecology determined that the probability of the central ditch stormwater being discharged to the sediment control pond will not be frequent enough to warrant submittal of a sampling analysis plan. Instead, Ecology is requiring monitoring for a list of parameters every time the central ditch stormwater is discharged to the pond.

11. O&M Manual Submittal and Requirements

    Special Condition S4.A.a "O&M Manual Submittal and Requirements" was changed to "O&M Manual Submittal Requirements" for clarification. Ecology is requiring that Agrium "Review the O&M manual at least annually and update the manual as needed." Ecology believes that the operations and maintenance manual should be reviewed on a regular basis and updated when deficiencies are noted or information changes. Subsequent numbers in the condition were revised to reflect the addition of the new requirement.

12. O&M Manual Components

    Ecology included an additional requirement in Special Condition S4.A.b "O&M Manual Components" which requires Agrium to include "Operating, maintenance, and inspection details for Ortho Lake, including but not limited to, the amount of minimum freeboard that will be maintained and the frequency at which the Permittee will check the leak detection system". Ecology believes that additional conditions regarding the operation and inspection of the impoundment is necessary.

13. List Formatting

    Ecology changed the bulleted list to numbers in Special Conditions S4.B.b "Anticipated Bypasses for Non-essential Maintenance and Bypasses which may Cause Permit Violations" and S11.A "SWPPP Submittals". Ecology also fixed the numbered list in Special Condition S12 "Outfall Evaluation".

14. SWPPP Submittals

    Item 3 in Special Condition S11.A "SWPPP Submittals" was changed from "Submit to Ecology for review substantial changes . . ." to "Submit to Ecology for review and approval any substantial changes . . .". Ecology believes approval of the SWPPP is necessary based on the significant plan changes required by the proposed permit modifications.

15. SWPPP Modifications

    The submittal date in Special Condition S11.C "SWPPP Modifications" was changed from ". . . within thirty (60) days . . ." to ". . . within sixty (60) days.

16. SWPPP Central Ditch Stormwater

    Ecology added a new subsection to Special Condition S11.E titled "SWPPP Central Ditch Stormwater". This subsection requires Agrium to update the SWPPP to address the discharge of central ditch stormwater to Outfall 001. Agrium must describe the potential sources of pollution to stormwater in the central ditch and identify the specific BMPs that will be implemented to prevent, control, and minimize stormwater contamination. Agrium must submit an updated SWPPP addressing the central ditch stormwater to Ecology for review and approval within one month of the effective date of the proposed permit modification. Discharge of the central ditch stormwater to Outfall 001 is contingent upon Ecology's approval of the revised SWPPP.

17. Appendix A

    Ecology changed some of the formatting in Appendix A for better readability and more clarity.

IV. References for Text and Appendices

Environmental Protection Agency (EPA)

1991. *Technical Support Document for Water Quality-based Toxics Control*. EPA/505/2-90-001.

Washington State Department of Ecology.

2014. River and Stream Water Quality Monitoring data available on the World Wide Web. Accessed June 2016. www.ecy.wa.gov/programs/eap/fw_riv/rv_main.html.

Laws and Regulations. http://www.ecy.wa.gov/laws-rules/index.html.

Appendix A -- Public Involvement Information

Ecology proposes to issue a permit modification to Agrium Kennewick Fertilizer Operations – Kennewick Facility. This supplemental fact sheet describes the changes made to the current permit and Ecology's reasons for making the changes.

Ecology will place a Public Notice of Draft on August 18, 2016 in The Tri-City Herald. and on August 19, 2016 in tú Decides, to inform the public and to invite comment on the proposed draft National Pollutant Discharge Elimination System permit modification and supplemental fact sheet.

The notice:

- Tells where copies of the draft Permit and Fact Sheet are available for public evaluation (a local public library, the closest Regional or Field Office, posted on our website).
- Offers to provide the documents in an alternate format to accommodate special needs.
- Urges people to submit their comments, in writing, before the end of the Comment Period
- Tells how to request a public hearing of comments about the proposed NPDES permit.
- Explains the next step(s) in the permitting process.

Ecology has published a document entitled *Frequently Asked Questions about Effective Public Commenting* which is available on our website at https://fortress.wa.gov/ecy/publications/SummaryPages/0307023.html.

You may obtain further information from Ecology by telephone, (360) 407-6934, or by writing to the address listed below.

Greg Gould
Department of Ecology
Industrial Section
PO Box 47600
Olympia, WA 98504-7600

The primary author of this permit modification and supplemental fact sheet is Greg Gould.

Appendix B -- Your Right to Appeal

You have a right to appeal the proposed permit modifications to the Pollution Control Hearing Board (PCHB) within 30 days of the date of receipt of the final permit. The appeal process is governed by chapter 43.21B RCW and chapter 371-08 WAC. "Date of receipt" is defined in RCW 43.21B.001(2) (see glossary).

To appeal you must do the following within 30 days of the date of receipt of this permit:

1. File your appeal and a copy of this permit with the PCHB (see addresses below). Filing means actual receipt by the PCHB during regular business hours.
2. Serve a copy of your appeal and this permit on Ecology in paper form - by mail or in person. (See addresses below.) E-mail is not accepted.

You must also comply with other applicable requirements in chapter 43.21B RCW and chapter 371-08 WAC.

ADDRESS AND LOCATION INFORMATION

Street Addresses	Mailing Addresses
Department of Ecology Attn: Appeals Processing Desk 300 Desmond Drive SE Lacey, WA 98503	**Department of Ecology** Attn: Appeals Processing Desk PO Box 47608 Olympia, WA 98504-7608
Pollution Control Hearings Board 1111 Israel RD SW STE 301 Tumwater, WA 98501	**Pollution Control Hearings Board** PO Box 40903 Olympia, WA 98504-0903

Appendix C -- Technical Calculations

Several of the Excel® spreadsheet tools used to evaluate a discharger's ability to meet Washington State water quality standards can be found on Ecology's webpage at http://www.ecy.wa.gov/programs/wq/permits/guidance.html.

Simple Mixing:

Ecology uses simple mixing calculations to assess the impacts of certain conservative pollutants, such as the expected increase in fecal coliform bacteria at the edge of the chronic mixing zone boundary. Simple mixing uses a mass balance approach to proportionally distribute a pollutant load from a discharge into the authorized mixing zone. The approach assumes no decay or generation of the pollutant of concern within the mixing zone. The basic mass balance for two waste streams combining into one is given as:

$$Q_1 C_1 + Q_2 C_2 = Q_c C_c \quad (1)$$

where: Q_1 = Flow of waste stream 1
C_1 = Concentration of waste stream 1
Q_2 = Flow of waste stream 2
C_2 = Concentration of waste stream 2
Q_c = Flow of combined waste streams 1 and 2 ($Q_1 + Q_2$)
C_c = Concentration of combined waste streams

At the Agrium Kennewick Facility, the central ditch stormwater will be combined with process wastewater and then with non-contact cooling water prior to being discharged at Outfall 001.

In order to evaluate the impact of Agrium's combined discharge on the receiving water, Ecology used the simple mixing calculations in a two-step process.

First, Ecology determined the pollutant concentration and flow value for the combined central ditch stormwater and process wastewater using the following equation:

$$Q_{sw} C_{sw} + Q_p C_p = Q_c C_c \quad (2)$$

where: Q_{sw} = Flow of central ditch stormwater
C_{sw} = Concentration of central ditch stormwater
Q_p = Flow of process wastewater
C_p = Concentration of process wastewater
Q_c = Flow of combined stormwater and process wastewater ($Q_{sw} + Q_p$)
C_c = Concentration of combined stormwater and process wastewater

Second, Ecology determined the concentration and flow value for the combined stormwater and process wastewater from step one and the non-contact cooling water using the following equation:

$$Q_c C_c + Q_{nc} C_{nc} = Q_f C_f \quad (3)$$

where: Q_c = Flow of combined stormwater and process wastewater
C_c = Concentration of combined stormwater and process wastewater
Q_{nc} = Flow of non-contact cooling water
C_{nc} = Concentration of non-contact cooling water
Q_f = Flow of final effluent (combined stormwater, process wastewater, and non-contact cooling water; $Q_c + Q_{nc}$)
C_f = Concentration of final effluent (combined stormwater, process wastewater, and non-contact cooling water)

Ecology used the calculated concentrations of the final effluent (represented as C_f in Equation 3 above) in the reasonable potential analysis (see **Appendix D**). Below are example calculations for ammonia as N using the values from Table 3 of this supplemental fact sheet. Ecology performed similar calculations for nitrate/nitrite as N, copper, and zinc.

Step 1: Determine the concentration of ammonia as N and flow value for the combined central ditch stormwater and process wastewater using Equation 2.

Q_{sw} = Flow of central ditch stormwater = 0.072 MGD
C_{sw} = Concentration of ammonia as N in central ditch stormwater = 65 mg/L
Q_p = Flow of process wastewater = 1.08 MGD
C_p = Concentration of ammonia as N in process wastewater = 0.940 mg/L
Q_c = Flow of combined stormwater and process wastewater
$Q_{sw} + Q_p = 0.072 + 1.08 = 1.152$ MGD
C_c = Concentration of ammonia as N in combined stormwater and process wastewater (Equation 4 below solves for this variable)

$$C_c = \frac{Q_{sw}C_{sw}+Q_pC_p}{Q_c} \quad (4)$$

$$C_c = \frac{(0.072\ MGD)(65\ mg/L)+(1.08\ MGD)(0.940\ mg/L)}{1.152\ MGD} = 4.94375\ mg/L \quad (5)$$

Step 2: Determine the concentration of ammonia as N and flow value for the combined wastewater from step one and the non-contact cooling water using Equation 3.

Q_c = Flow of combined stormwater and process wastewater = 1.152 MGD
C_c = Concentration of ammonia as N in combined stormwater and process wastewater = 4.94375 mg/L
Q_{nc} = Flow of non-contact cooling water = 16.6 MGD
C_{nc} = Concentration of ammonia as N in non-contact cooling water = 0.010 mg/L
Q_f = Flow of final effluent (combined stormwater, process wastewater, and non-contact cooling water)
$Q_c + Q_{nc} = 1.152 + 16.6 = 17.752$ MGD
C_f = Concentration of final effluent (combined stormwater, process wastewater, and non-contact cooling water; Equation 6 below solves for this variable)

$$C_f = \frac{Q_c C_c + Q_{nc} C_{nc}}{Q_f} \quad (6)$$

$$C_f = \frac{(1.152\ MGD)(4.94375\ mg/L) + (16.6\ MGD)(0.010\ mg/L)}{17.752\ MGD} = 0.33\ mg/L \quad (7)$$

See **Appendix D** where the concentration of 0.33 mg/L (330 µg/L) for ammonia as N in the final effluent is used in the reasonable potential analysis.

Ecology also applied the dilution factors approved for Outfall 001 at the Kennewick facility in evaluating the reasonable potential to exceed water quality standards. The predicted concentration at the edge of a mixing zone (C_{mz}) is based on the following calculation:

$$C_{mz} = C_a + \frac{(C_e - C_a)}{DF} \quad (8)$$

where: C_e = Effluent Concentration
C_a = Ambient Concentration
DF = Dilution Factor

Reasonable Potential Analysis:

The process and formulas for determining reasonable potential and effluent limits are taken directly from the *Technical Support Document for Water Quality-based Toxics Control*, (EPA 505/2-90-001). The adjustment for autocorrelation is from EPA (1996a), and EPA (1996b).

Appendix D -- Reasonable Potential Analysis for Outfall 001

Facility	Agrium KFO – Kennewick Facility
Water Body Type	Freshwater
Receiving Water Hardness	68 mg/L

Dilution Factors	**Acute**	**Chronic**
Aquatic Life	15	27
Human Health Carcinogenic	-	27
Human Health Non-Carcinogenic	-	27

Pollutant			**Ammonia as N**	**Copper, total**	**Nitrate/nitrite as N**	**Zinc, total**
Effluent Data	# of Samples (n)		57	1	289	1
	Coefficient of Variation (Cv)		0.91	0.6	0.459	0.60
	Effluent Concentration, µg/L (Calculated from simple mixing)		330	2.053	-	20.324
	Effluent Concentration, µg/L (Calculated from simple mixing)		-	-	432	-
Receiving Water Data	Maximum or 90th Percentile Conc., µg/L		10	2	108	20
	Geo Mean, µg/L		-	0	108	-
Water Quality Criteria	Aquatic Life Criteria, µg/L	Acute	1,665	11.8319	-	82.545
		Chronic	224	8.16411	-	75.376
	WQ Criteria for Protection of Human Health, µg/L		-	1300	10000	-
	Metal Criteria Translator, decimal	Acute	-	0.996	-	0.996
		Chronic	-	0.996	-	0.996
	Carcinogen?		N	N	N	N
Aquatic Life Reasonable Potential						
Effluent percentile value			0.950	0.950	-	0.950
s	$s^2=\ln(CV^2+1)$		0.777	0.555	-	0.555
Pn	$Pn=(1\text{-confidence level})^{1/n}$		0.949	0.050	-	0.050
Multiplier			1.00	6.20	-	6.20
Max concentration (µg/L) at edge of…		Acute	31	2.712	-	27.031
		Chronic	22	2.395	-	23.906
Reasonable Potential? Limit Required?			**NO**	**NO**	-	**NO**

Pollutant		**Ammonia as N**	**Copper, total**	**Nitrate/nitrite as N**	**Zinc, total**
Human Health Reasonable Potential					
s	$s^2=\ln(CV^2+1)$	-	0.55451	0.4372	-
Pn	Pn=(1-confidence level)1/n	-	0.050	0.990	-
Multiplier		-	2.48953	0.3634	-
Dilution Factor		-	27	27	-
Max Conc. at edge of Chronic Zone, µg/L		-	0.1893	120.00	-
Reasonable Potential? Limit Required?		-	**NO**	**NO**	-

References:

- WAC 173-201A

- Technical Support Document for Water Quality-based Toxics Control, US EPA, March 1991, EPA/505/2-90-001, pages 56/99

Appendix E -- Response to Comments

Ecology received no comments during the public review period.