

## **MEMORANDUM**

**TO:** Larry Waters, P.E., DEQ Wastewater Program Manager, State Office, Boise  
Daniel Redline, Coeur d'Alene DEQ Regional Office Administrator  
Matthew Plaisted, P.E., Coeur d'Alene DEQ Regional Engineering Manager

**FROM:** Taylor Enos, Coeur d'Alene DEQ Regional Office

**DATE:** May 21, 2020

**SUBJECT: Kalispell Bay Sewer District, M-052-05, Reuse Permit Modification 1**

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### **1 Purpose**

The purpose of this memorandum is to address the permit modifications for Kalispell Bay Sewer District (KBSD) and 7B Engineering (7B) for the Kalispell Bay draft Reuse Permit Number M-052-05 Modification 1. This memorandum focuses on land application area adjustments, constituent loading reductions, and updated facility contact information.

### **2 Discussion**

DEQ received details regarding reuse permit modifications from 7B on behalf of KBSD in an email dated November 4, 2019 (Appendix A).

#### **2.1 Nitrogen Loading Limit Modification**

The current permit establishes loading limits for nitrogen at 129 pounds per acre (lbs N/acre) for a maximum of two (2) years after permit issuance (DEQ 2017a, Section 4.3). The current permit also indicates that the limit for nitrogen loading is to be 57 lbs N/acre two (2) years after permit issuance. The reason for this interim nitrogen loading limit of 129 lbs N/acre for the first two years of the permit cycle was to allow KBSD to find the best option for complying with the new nitrogen loading permit limits. Compliance activity CA-052-03 requires that KBSD prepares a report for submittal to DEQ explaining implementation of measures required to meet the final nitrogen loading permit limit of 57 lbs N/acre two (2) years after permit issuance. The staff analysis associated with the final permit for KBSD's recycled water reuse permit (DEQ 2016) explains that KBSD also has the ability to determine if changes to the forest composition warrant a modification of the nitrogen loading limit. This modification evaluates the permittee's plan and proposes an updated nitrogen loading limit, increases the land application management units' acreage, and updates the permittees contact information.

In 2014, Silviculturalist and Forester David Cobbs visited the KBSD recycled water land application sites and evaluated the condition of the trees and other vegetation. During this evaluation, David recommended a tree thinning activity be conducted in the irrigation area. In 2017, DEQ conducted an inspection verifying that this tree thinning recommendation was

complete. This verification and additional comments can be found in the 2017 KBSD Reuse Inspection Report (DEQ 2017b).

In 2018, in order to comply with permit conditions, KBSD submitted a nitrogen loading limit reduction plan outlining their plans to expand the irrigation land application sites in order to reduce the nitrogen loading rate to meet permit limits. After DEQ reviewed the nitrogen loading limit reduction plan submitted by KBSD, DEQ requested that KBSD have a Silviculturalist or forester visit the KBSD recycled water land application sites to re-evaluate the condition of the land application sites to better characterize the overall site composition of KBSD's reuse site. This report completed by Silviculturalist and Forester David Cobbs in October of 2018 included an update of the overall site composition, the health of the trees and understory vegetation, as well as types and ages of tree species on site (Appendix B). With this updated information, DEQ was able to get better assessment of site conditions to calculate a nitrogen loading limit that more accurately reflects the uptake potential of the management units.

After review of the 2018 KBSD Silvicultural Report completed by David Cobb, as well as a site visit on October 19, 2018 to examine the Silvicultural report findings, DEQ determined that site composition of trees to understory ratio was observed to be different from previous observations; thinning of old stands and clearing of dead fall adjusted the tree to understory ratio from 25% understory and 75% trees to 30% understory and 70% trees. David Cobb also explained that the irrigation sites mainly consist of older (age 40+ years) pine trees and Douglas-fir stands. With this information, DEQ re-calculated the nitrogen loading limit that more accurately reflects the site vegetation composition.

Suggested design values for nitrogen uptake for forest trees and understory of growing forest ecosystems in the region are estimated to be 25 lbs N/acre/year for older stands of Douglas fir over the age of 40 years, 30 lbs N/acre for older stands of pine trees over the age of 25 years, and 100 lbs N/acre/year for herbaceous understory vegetation (Henry et al. 1999). The draft guidance for forested sites established a likely full understory nitrogen uptake rate for herbaceous understory to be 75 lbs/acre (DEQ 2012). Losses from denitrification and volatilization uses a 30% nitrogen loss factor which is within the acceptable range as suggested by *Methods Used to Estimate Nutrient Availability from Livestock Manure*, Appendix I Part C (NRCS 1998) referencing a *nitrogen recovery factor of 70%*. Table 1 shows the preliminary nitrogen uptake information.

**Table 1. Nitrogen uptake information for forest conditions at KBSD**

Condition	Value*
Forest Canopy Cover (70% of Overall Irrigation Sites)	
Pine 25+ year stand (20% of Forest)	30 lbs/ac N Uptake
Douglas-fir 40+ year stand (80% of Forest)	25 lbs/ac N Uptake
Understory Cover (30% of Overall Irrigation Sites)	
Herbaceous Vegetation (100% of Understory)	75 lbs/ac N Uptake
Denitrification/volatilization rate	30%
Assume no appreciable change in soil storage from initial time of recycled water application to the end of permit cycle.	

\* Values based on *Guidance for Forested/Poplar Site Nutrient and Hydraulic Loading*

The values are then substituted into Equation 1 to calculate the nitrogen loading rate:

*Eq. 1:*

$$N_{rate} = \frac{(N_{uptake} - N_{cr})}{(1 - N_{loss})} = \frac{N_{req}}{e_f}$$

where:

$N_{rate}$  = nitrogen loading rate (lbs/ac-year)

$N_{uptake}$  = nitrogen net uptake (lbs/ac-year)

$N_{cr}$  = nitrogen credits (0 lbs/ac-year)<sup>1</sup>

$N_{loss}$  = nitrogen losses from denitrification/volatilization (lbs/acre-year)

$N_{req} = N_{uptake} - N_{cr}$  = nitrogen net requirement (lbs/ac-year)

$E_f = 1 - N_{loss}$  = uptake efficiency factor

<sup>1</sup> Assume no appreciable change in soil storage from initial time of recycled water application to the end of permit cycle.

It is assumed that the forested portion of the site is comprised of both trees and understory, not just trees. Using the estimated coverage of trees and ages, the understory vegetation coverage and type, and the referenced nitrogen uptake rates, an estimated composite nitrogen uptake by the forested portion of the irrigation areas is as follows:

$$50\% * \left[ \left( 80\% * 25 \frac{\text{lbs N}}{\text{acre}} \right) + \left( 20\% * 30 \frac{\text{lbs N}}{\text{acre}} \right) \right] + 50\% * \left[ \left( 75 \frac{\text{lbs N}}{\text{acre}} \right) \right] = 50.5 \frac{\text{lbs N}}{\text{acre}}$$

The estimated coverage of understory, type, and referenced nitrogen uptake rates are used to determine the nitrogen uptake by the understory portion of the irrigation areas:

$$\left( 100\% * 75 \frac{\text{lbs N}}{\text{acre}} \right) = 75 \frac{\text{lbs N}}{\text{acre}}$$

The estimated combined composite nitrogen uptake rate for the entire recycled water reuse site is weighted using overall site coverage for each vegetation type:

$$\left( 70\% * 50.5 \frac{\text{lbs N}}{\text{acre}} \right) + \left( 30\% * 75 \frac{\text{lbs N}}{\text{acre}} \right) = 57.85 \frac{\text{lbs N}}{\text{acre}}$$

The estimated 57.85 lbs N/acre is then substituted into Equation 1 along with the other referenced nitrogen uptake information provided in Table 10 to obtain the following:

$$N_{rate} = \frac{(N_{uptake} - N_{cr})}{(1 - N_{loss})} = \frac{(57.85 - 0)}{(1 - 0.30)} = \frac{57.85}{0.70} = 82.64 \frac{\text{lbs N}}{\text{acre}} \cong 83 \frac{\text{lbs N}}{\text{acre}}$$

The current permit nitrogen loading rate limit is 129 lbs N/acre-year, but the average loading rate has been around 115 lbs N/acre-year. Continued soil sampling for nitrogen would help to determine if there are any trends of increasing soil nitrogen concentrations compared to historical concentrations.

The current permit nitrogen loading limit is 129 lbs N/acre-year within the first two (2) years of permit issuance with the limit being reduced to 57 lbs N/acre after the first two (2) years of permit issuance. DEQ concludes that after KBSD conducted best site management practices and had an expert Silviculturalist re-assess the irrigation sites that, along with increasing land application site area, the new nitrogen loading permit limit of 83 lbs N/acre is an adequate nutrient loading rate for the site conditions at the KBSD reuse site. It is recommended that the permit modification include a nitrogen loading limit of 83 lbs N/acre.

## **2.2 Land Application Irrigation Site Expansion**

When Reuse Permit M-052-05 was issued, management unit MU-05206 was allowed a maximum acreage of 15.14 acres.

In order to meet nitrogen loading limits, KBSD and 7B outlined various options which would allow the system to operate while remaining in compliance with the reuse permit; the 2018 KBSD Facility Plan as well as CA-052-03 Nitrogen Loading Reduction Plan breaks down each of these options.

Expanding the irrigation land application site in order to reduce the nitrogen loading rate was selected by KBSD and 7B as being the most viable option to meet reuse permit limitations at this time. This approach assumes a recycled water nitrogen concentration as well as a total volume of recycled water irrigated based on historical values at the KBSD reuse facility. By dispersing the volume of recycled water over a larger area, theoretically the nitrogen loading rate onto the irrigation sites will be reduced proportionally (e.g., 100 lbs N dispersed over 1 acre yields a nitrogen loading rate of 100 lbs N/acre, whereas 100 lbs N dispersed over 100 acres yields a nitrogen loading rate of 1 lbs N/acre). KBSD and 7B reviewed the 2018 Silvicultural report by David Cobb and determined that the source appears to be sufficient. KBSD and 7B also verified DEQ calculations based on the 2018 KBSD Silvicultural Report and found the calculations to be correct and adequate.

KBSD is proposing to expand the recycled water irrigation site with approximately 507 linear feet of 6 inch HDPE SDR 11 irrigation manifold and approximately 3308 linear feet of 4 inch HDPE SDR 11 irrigation laterals. The total acreage increase to MU-05206 is 7.68 acres and is approximately a 50.7% expansion in overall acreage for the site (15.14 acres to 22.82 acres). Construction plans on the expansion of the irrigation site were approved by DEQ on February 28, 2020. The proposed site layout can be found in Appendix A.

Similar to the currently permitted hydraulic management unit, the expansion irrigation site falls under the same forested area guidelines used to configure hydraulic and constituent-loading rates used for the current reuse permit modification. Disinfection limits are required for total coliform organisms for the expansion irrigation site due to the fact that the irrigation system installed is discharging Class D effluent. Section 4.5 of the current reuse permit explains requirements established for total coliform limits and will remain in effect for this modification.

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There are no changes to compliance activities required in the reuse permit (DEQ 2017a, Section 3). Buffer zones outlined in the current reuse permit also apply to the modified expansion irrigation site

## 2.3 Updated Facility Contact Information

It was brought to DEQ's attention that during the 2018 growing season KBSD underwent changes to the operating personnel. In a letter dated May 10, 2019, DEQ required KBSD to provide documentation demonstrating the reuse facility has contracted a licensed operator with the proper licensure credentials.

On July 29, 2019, KBSD submitted to DEQ an updated *Form A: Responsible Official Designating Authorized Representative* and an updated *IDEQ Public Wastewater System Operator Licensure Record Form*. These forms can be seen in Appendix C.

## 3. Recommendations

The draft permit modifications include updated hydraulic management unit descriptions and allowed acreage, constituent loading limit adjustments, and facility contact updates. Staff recommends the draft reuse permit modifications be issued; this includes:

- Nitrogen loading limit adjustment to 83 lbs N/acre-year, which is effective upon Reuse Permit M-052-05 Modification 1 being finalized.
- Increase of MU-05206 from 15.14 acres to 22.82 acres
- Authorized representative and public wastewater system operator information updated for Tom Holman

All hydraulic and constituent loading limits, compliance conditions, monitoring and reporting requirements, and all other requirements outlined in the current permit will apply toward these modifications and must be satisfied for permit compliance. The draft Reuse Permit No. M-052-05 Modification 1 reflects all updated tables associated with these changes.

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## 4. References

- 7B Engineering. July 2018. *Kalispell Bay Sewer District Facility Plan Update – Addendum #3*. (7B 2018a)
- 7B Engineering. September 2018. *Kalispell Bay Sewer District Wastewater Reuse Permit M-052-05 Nitrogen Loading Limit Reduction Plan*. (7B 2018b)
- 7B Engineering. November 2019. *Kalispell Bay Sewer District Wastewater Reuse Permit No. M-052-05 Modification 1 Details*. (7B 2019)
- Cobb, David. October 2018. *Review and Update of the 2001 Silvicultural Management Plan for the Kalispell Bay Sewer District*. (Cobb 2018)
- Henry, C., D. Sullivan, R. Rynk, K. Dorsey, and C. Cogger. 1999. *Managing Nitrogen from Biosolids*. Olympia, WA: Washington State Department of Ecology and Northwest Biosolids Management Association. (Henry et al. 1999)
- Idaho Department of Environmental Quality (DEQ). February 2017. *Kalispell Bay Sewer District Reuse Permit M-052-05*. (DEQ 2017a)
- Idaho Department of Environmental Quality (DEQ). September 2017. *Kalispell Bay Sewer District Inspection Report for Wastewater Reuse Permit M-052-05*. (DEQ 2017b)
- Idaho Department of Environmental Quality (DEQ). December 2016. *Kalispell Bay Sewer District Staff Analysis for Wastewater Reuse Permit M-052-05*. (DEQ 2016)
- Idaho Department of Environmental Quality (DEQ). July 2012. *Guidance for Forested/Poplar Site Nutrient and Hydraulic Loading*. (DEQ 2012)
- Natural Resource Conservation Service (NRCS). February 1998. *Nutrients Available from Livestock Manure Relative to Crop Growth Requirements*. Appendix I: Nutrient Uptake and Removal-Part C, Non-Grazed Privately Owned Woodland. Available at: [http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/technical/nra/?cid=nrcs143\\_014175](http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/technical/nra/?cid=nrcs143_014175) (NRCS 1998)
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## **Appendix A**

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Kalispell Bay Sewer District Wastewater Reuse Permit No.  
M-052-05 Modification 1 Details

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**From:** [Ian Ehrsam](mailto:ian@7engineering.com)  
**To:** [dan@7engineering.com](mailto:dan@7engineering.com); [kbsdpl@hotmail.com](mailto:kbsdpl@hotmail.com); [Taylor Enos](mailto:Taylor.Enos)  
**Subject:** Draft Permit Modification M-52-05  
**Date:** Monday, November 4, 2019 2:00:02 PM  
**Attachments:** DRAFT M-052-05 Permit Mod.pdf

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Hello Taylor,

The following is a review for the feasibility and calculations of the proposed permit modification on the nitrogen loading limits (M-052-05) for Kalispell Bay Sewer District. The previously approved permit nitrogen loading limit was 129 lbs N/acre-year which has been reduced to 57 lbs N/acre this year (2019). The proposed modification from DEQ was to increase the nitrogen loading limit to 84 lbs N/acre-year which was adjusted to more accurately reflect the site vegetation composition from David Cobb's 2018 KBSD Silvicultural Report.

The most important elements of this review are:

1. Approval from Kalispell Bay Sewer District
2. Review of references and calculations
3. The modification's effect on the KBSD Facility Plan 2018

A comparison from the actual nitrogen loading this year from last is not accurate. KBSD failed to measure nitrogen loading this year, therefore max nitrogen loading (from 2012) was used, 132.2 lbs N/acre. KBSD average loading limit is 115 N/acre-year. At this moment, KBSD is faced with the issue of not meeting the permitted requirements this year.

### ***Discussion***

1. The proposed modification was reviewed and approved by KBSD on November 12, 2018. The issue of not meeting permitted requirements this year was discussed and it was agreed to move forward with irrigation expansion.
2. The major reference to review is the David Cobb's 2018 KBSD Silvicultural Report since the calculations are based on the site's vegetation composition. Upon review we determined that the source appears to be sufficient. The calculations were mainly based off *Methods Used to Estimate Nutrient Availability from Livestock Manure*, Appendix I, part C (NRCS 1998). After review, the calculations appear to be correct and adequate. Overall the nitrogen loading limit increase from 57 to 84 lbs N/acre-year as proposed by Taylor Enos at DEQ is confirmed to be appropriate.
3. Since KBSD has accepted the modification, the length of the irrigation expansion might be changed on the proposed final Engineering Plans and Specifications to be submitted to DEQ for review and approval.

The least expensive option on the 2018 facility plan to meet the previous Nitrogen loading limits was to expand the existing irrigation system into the available ground at the land application site. Upon review of the nitrogen loading limit calculations, the site vegetation **composition** was assumed for the whole site. Therefore, the length of the irrigation manifold can be expanded without changing the nitrogen uptake (used to determine the nitrogen loading limit) at KBSD.

The proposed KBSD irrigation manifold expansion is less than that proposed in the 2018 facility plan and current engineering plans. The irrigation manifold was previously proposed to be extended to the north approximately **1061 LF to add an additional 10 laterals with 8 irrigation nozzles each**. This would increase the land application area by 126% and



theoretically reduce Nitrogen loading on soils to the below the previous limit 57 lbs N/acre-year. With the new permit limit reductions at 84 lbs N/acre-year, we would only need to increase the land application area by 50%. KSBD would then only need to add **4 laterals with 8 irrigation nozzles each and an irrigation manifold extension of 408 LF.**

### ***Conclusion***

At this moment, it seems feasible to accept the proposed permit modification on the nitrogen loading limits (M-052-05) for Kalispell Bay Sewer District. With this modification, the proposed length of the irrigation expansion will be reduced on final Engineering Plans and Specifications to be submitted to DEQ for review and approval.

Should you have any questions or require additional information, please do not hesitate to contact us.

Sincerely,

Ian Ehram, M.S

**7BENGINEERING**

414 Church Street, Suite 205 F

Sandpoint, Idaho 83864

Office: (208) 263-0623

Cell: (208) 640-4989

[www.7bengineering.com](http://www.7bengineering.com)

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## **Appendix B**

### 2018 Silvicultural Management Plan for the Kalispell Bay Sewer District Irrigation Site

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## **Appendix C**

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Kalispell Bay Sewer District Responsible Official Designating  
Authorized Representative Form and Public Wastewater System  
Operator Licensure Record Form

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