

Memorandum

To: Walsh County Water Resources Board
From: Donna Jacob PhD, PWS; Houston Engineering, Inc.
Subject: Reservoir Sediments Characterization Memorandum
Date: May 8, 2022
Project: HEI 7135-0037 Bylin Dam

INTRODUCTION

The Walsh County Water Resource District (WCWRD) applied to the Natural Resources Conservation Service (NRCS) for the Watershed Rehabilitation Program for the North Branch Forest River Watershed Dam No. 1 (Bylin Dam). Bylin Dam, near Adams, North Dakota, was constructed in 1964 through funding and technical assistance provided by the NRCS Watershed Program and is currently owned and operated by the WCWRD. The NRCS and the WCWRD entered into a Cooperative Agreement to complete a Watershed Plan-Environmental Assessment for the review of rehabilitation of Bylin Dam. The agreement regarding environmental inventory scoping with NRCS specifies collection of samples of accumulated sediments and analysis of these samples for polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), hydrocarbons (fuels), trace metals, and nutrients at two locations within the reservoir.

MATERIALS AND METHODS

Houston Engineering, Inc. (HEI) staff (Chris Myers and Dan Sunram) collected sediment samples during a bathymetric survey on June 23, 2020. They used a Vibecore-D to obtain core samples from two strata in the sediment column: sediments present at the site before the dam was built (original sediments) and from sediments accumulated after the dam was completed (accumulated sediments). These were collected at two sampling sites (**Figure D-7-1**): one from the reservoir in the upstream portion (inlet site) and one in deeper water depths closer to the dam (reservoir pool). **Figure D-7-1** also shows the estimated depth of sediments, ranging from 0 to 2.1 m, that have accumulated behind the dam.

The sediment samples were sent to Pace Analytical Services, LLC (laboratory network) for analysis of polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), hydrocarbons (fuels), trace metals, and nutrients in the sample containers provided and following the laboratory sample collection procedures. The analyses followed standard EPA methods (see **Appendix D-7-A** for methods and results) after drying and sieving. No replicate samples were collected so statistical analysis is not appropriate, but generalized, quantitative descriptions can be made. Particle size analysis and bulk density determination were not done on these samples, but the sediment textures were noted by observation during sampling and an estimate of bulk density was compiled from the literature.

Calculations followed and evaluations included 1) the percent change between pre- and post-dam sediment analyte concentrations, 2) an estimation of the total mass of the analytes accumulated sediments (post-construction only), and 3) the accumulation rate of these analytes over the life of the dam. Many

concentration results were below the detection limits of the analyses. Where this occurred for all the values in a calculation, the result was shown as non-detectable. Where at least one value in the calculation was detectable, detectable, the other, non-detectable values (censored data) were replaced with a value equivalent to 50 % of the detection limit (Crane 2007). In order to estimate the mass of a substance in the accumulated sediments, a range and a median “typical” value for sediment density was used. A literature search for density of accumulated reservoir sediments yielded several articles where this value was reported. These reports described accumulated sediments in the channel in a Kansas reservoir (Christensen 1999, 783-1458 kg m⁻³), a reservoir in Mississippi (Bennett and Rhoton 2003, 1500 kg m⁻³), sediments in a river reservoir in Maryland (Schellick et al. 2013, 80-1080 kg m⁻³, sediments in Dougherty Dam (Dendy and Champion 1978 (401 kg m⁻³), which is a dam located in the vicinity on the North-branch Forest River, and a “typical” density (960 kg m⁻³) used by Minear and Kondolf (2009) from their analysis of the median value of a large database of dams in the US (Dendy and Champion 1978). From these, a range of densities was compiled (low to high values) and the median value from Minear and Kondolf (2009) to calculate the amounts of analytes (mass) in the volume of sediment accumulated in the dam. This accumulated volume was determined by comparing the current existing ground surface with the historic, or original soil surface. Surfaces for the current existing ground elevation and original ground elevation below the reservoir were developed based on multi-frequency sonar data collected in the field. The total difference in volume between the two surfaces is used as the total accumulated sediment volume in the reservoir. The volume was determined to be 173,921 m³ (141 acre-feet). For more details see the Existing Conditions Report (Houston Engineering, Inc. 2021). Once the total amount of analyte was determined, this value was divided by the number of years of accumulation (the dam was constructed in 1964).

RESULTS

Results show detectable concentrations of various trace metals in the original sediments and in the accumulated sediments on a dry weight basis and follow the assumption the metal concentrations in the original sediments have not been significantly altered since construction of the dam by the presence of the overlying water column. The original sediment data reflect background concentrations for soils in the area and the data for the accumulated sediments represent the metal concentrations in sediments during the past 56 years.

Core logs showing the depths of the accumulated sediments and the observations of sediment textures are shown in **Table D-7-1**. The original sediments were fine-grained materials (clay and silty clay). The accumulated sediments show other textures, with the Inlet Site core having an upper layer of muck, clay, and medium-grained sand and the Pool Site having muck and clay. The Pool Site core had finer textured particles at the surface but coarser particles in the original sediments than the Inlet Site core.

Table D-7-1: Core log information: sediment strata and textures with depth.

Stratum	Inlet Site (Core 5)	Pool Site (Core 4)
Accumulated Sediments	0-41 cm: muck and clay 41-69 cm: medium sand	0-94 cm: muck and clay
Original Sediments	> 69 cm: clay	> 94 cm: silty clay

Results of the analyses are shown in **Table D-7-2**. The hydrocarbon concentrations were below detection limits with the exception of diesel range organics. Most of the trace metals (**Figure D-7-2**) and phosphorus (P) (**Figure D-7-3**), showed similar concentrations in the original sediments between both sites, whereas the copper (Cu) was approximately double at the upstream site, and N, TOC (**Figure D-7-4**), and diesel range organics were approximately 50 % higher upstream. For the accumulated sediments, diesel range organics showed higher concentrations in the reservoir pool site sediments, and many of the trace metals and nutrients showed approximately 40-50 % higher concentration here as well (As, Cu, Pb, Ni, Zn, total N, total P, TOC). At the Inlet Site over time, the concentrations show decreases in Cu, Zn, N, P, and toc. At the Pool Site, the concentrations increase for As and N, while all other analytes remained similar. In the accumulated sediments at the Inlet Site, the metals with the highest concentrations were zinc (Zn 39.2 mg kg⁻¹), nickel (Ni, 18.5 mg kg⁻¹), and chromium (15.1 mg kg⁻¹). At the Pool Site, the highest concentration of metals in the accumulated sediments were Zn (77.1 mg kg⁻¹) and Ni (28.7 mg kg⁻¹).

Table D-7-2: Sediment analyte concentrations in original sediments and in sediments accumulated after dam construction, and the percent change at two sampling sites within the reservoir , Inlet Site (Core 5 is at the western end) and Pool Site (Core 4 is closer to the dam) Values with < indicate detection limits, < DL indicates non-detectable calculation.

Analyte	Units	Inlet Site Original	Inlet Site Accumulated	Inlet Site % change	Pool Site Original	Pool Site Accumulated	Pool Site % change
PCB-1016 (Aroclor 1016)	ug/kg	< 62.9	< 52.2	< DL	< 52.4	< 91.3	< DL
PCB-1221 (Aroclor 1221)	ug/kg	< 62.9	< 52.2	< DL	< 52.4	< 91.3	< DL
PCB-1232 (Aroclor 1232)	ug/kg	< 62.9	< 52.2	< DL	< 52.4	< 91.3	< DL
PCB-1242 (Aroclor 1242)	ug/kg	< 62.9	< 52.2	< DL	< 52.4	< 91.3	< DL
PCB-1248 (Aroclor 1248)	ug/kg	< 62.9	< 52.2	< DL	< 52.4	< 91.3	< DL
PCB-1254 (Aroclor 1254)	ug/kg	< 62.9	< 52.2	< DL	< 52.4	< 91.3	< DL
PCB-1260 (Aroclor 1260)	ug/kg	< 62.9	< 52.2	< DL	< 52.4	< 91.3	< DL
PCB-1262 (Aroclor 1262)	ug/kg	< 62.9	< 52.2	< DL	< 52.4	< 91.3	< DL
PCB-1268 (Aroclor 1268)	ug/kg	< 62.9	< 52.2	< DL	< 52.4	< 91.3	< DL
PCB, Total	ug/kg	< 62.9	< 52.2	< DL	< 52.4	< 91.3	< DL
Acenaphthene	ug/kg	< 62.9	< 52.2	< DL	< 52.4	< 91.3	< DL
Acenaphthylene	ug/kg	< 62.9	< 52.2	< DL	< 52.4	< 91.3	< DL
Anthracene	ug/kg	< 62.9	< 52.2	< DL	< 52.4	< 91.3	< DL
Benzo(a)anthracene	ug/kg	< 62.9	< 52.2	< DL	< 52.4	< 91.3	< DL
Benzo(a)pyrene	ug/kg	< 62.9	< 52.2	< DL	< 52.4	< 91.3	< DL
Benzo(b)fluoranthene	ug/kg	< 19.1	< 16	< DL	< 16	< 27.8	< DL
Benzo(g,h,i)perylene	ug/kg	< 19.1	< 16	< DL	< 16	< 27.8	< DL
Benzo(k)fluoranthene	ug/kg	< 19.1	< 16	< DL	< 16	< 27.8	< DL
Chrysene	ug/kg	< 19.1	< 16	< DL	< 16	< 27.8	< DL
Dibenz(a,h)anthracene	ug/kg	< 19.1	< 16	< DL	< 16	< 27.8	< DL
Fluoranthene	ug/kg	< 19.1	< 16	< DL	< 16	< 27.8	< DL
Fluorene	ug/kg	< 19.1	< 16	< DL	< 16	< 27.8	< DL

Table D-7-2: Continued

Analyte	Units	Inlet Site Original	Inlet Site Accumulated	Inlet Site % change	Pool Site Original	Pool Site Accumulated	Pool Site % change
Indeno(1,2,3-cd)pyrene	ug/kg	< 19.1	< 16	< DL	< 16	< 27.8	< DL
Naphthalene	ug/kg	< 19.1	< 16	< DL	< 16	< 27.8	< DL
Phenanthrene	ug/kg	< 19.1	< 16	< DL	< 16	< 27.8	< DL
Pyrene	ug/kg	< 19.1	< 16	< DL	< 16	< 27.8	< DL
Diesel Range Organics	mg/kg	20.70	18.40	-13	< 7.95	54.00	85
Gasoline Range Organics	mg/kg	< 25.7	< 17.3	< DL	< 18	< 30.4	< DL
Arsenic	mg/kg	4.10	3.60	-14	3.80	6.80	44
Cadmium	mg/kg	0.29	< 0.23	-152	< 0.23	< 0.41	44
Chromium	mg/kg	24.10	15.10	-60	15.40	18.60	17
Copper	mg/kg	36.70	9.30	-295	14.20	19.60	28
Lead	mg/kg	11.40	7.00	-63	11.30	16.60	32
Nickel	mg/kg	22.30	18.50	-21	35.00	28.70	-22
Zinc	mg/kg	71.40	39.20	-82	69.90	77.10	9
Nitrogen, Kjeldahl, Total	mg/kg	4500	1890	-138	2810	3350	16
Nitrogen, NO ₂ / NO ₃	mg/kg	< 0.94	< 0.79	< DL	0.93	< 1.4	-33
Nitrogen total	mg/kg	4500	1890	-138	2811	3350	16
Phosphorus	mg/kg	234	105	-123	274	245	-12
Mean Total Organic Carbon (n=2)	mg/kg	42900	25100	-71	30300	39700	24

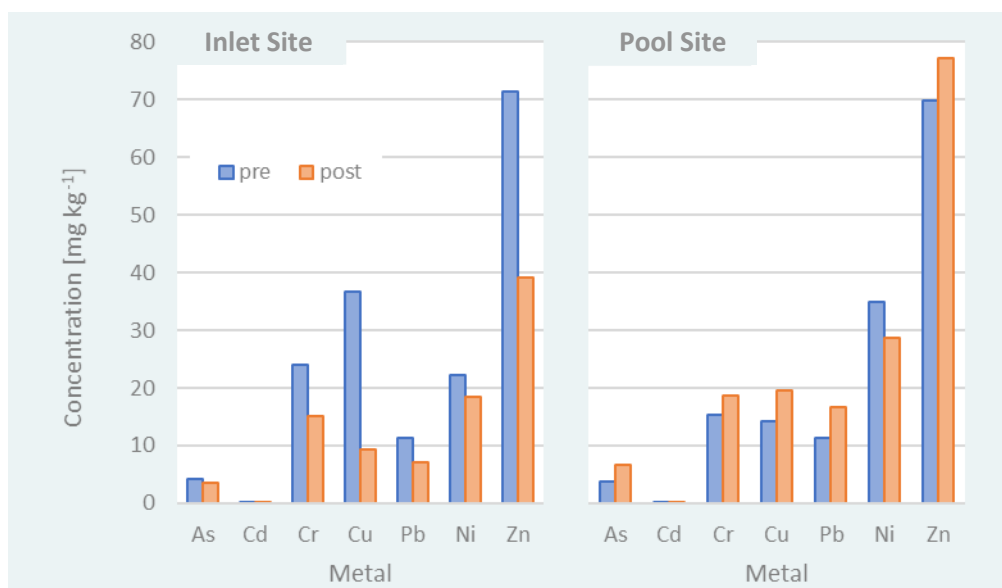


Figure D-7-1: Trace metal concentrations in original sediments (pre) and in accumulated sediments (post), both within the reservoir, Inlet Site (Site 5 at the western end) and Pool Site (Site 4 closer to the dam).

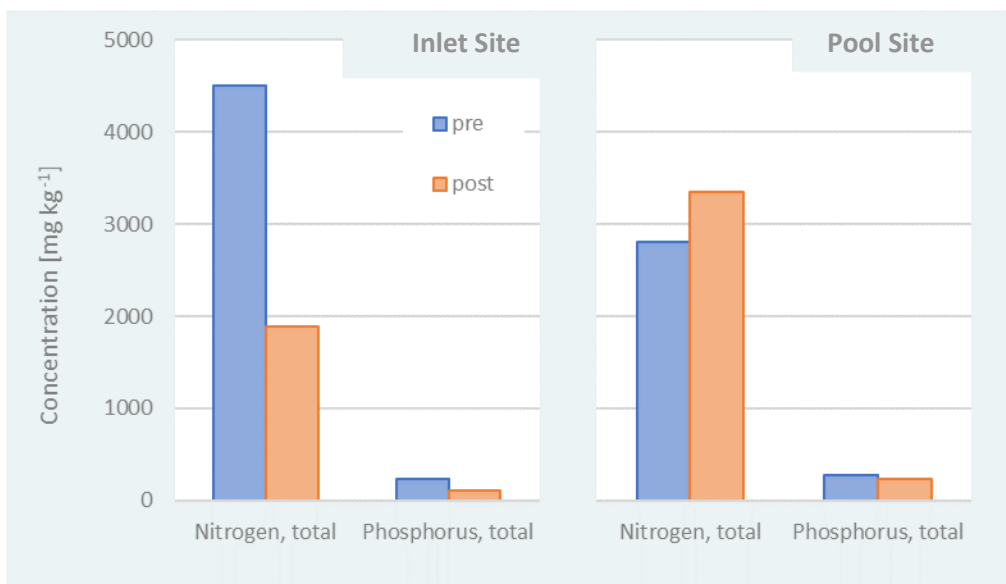


Figure D-7-2: Total nitrogen and total phosphorus concentrations in original sediments (pre) and in accumulated sediments (post), both within the reservoir, Inlet Site (Site 5 at the western end) and Pool Site (Site 4 closer to the dam).

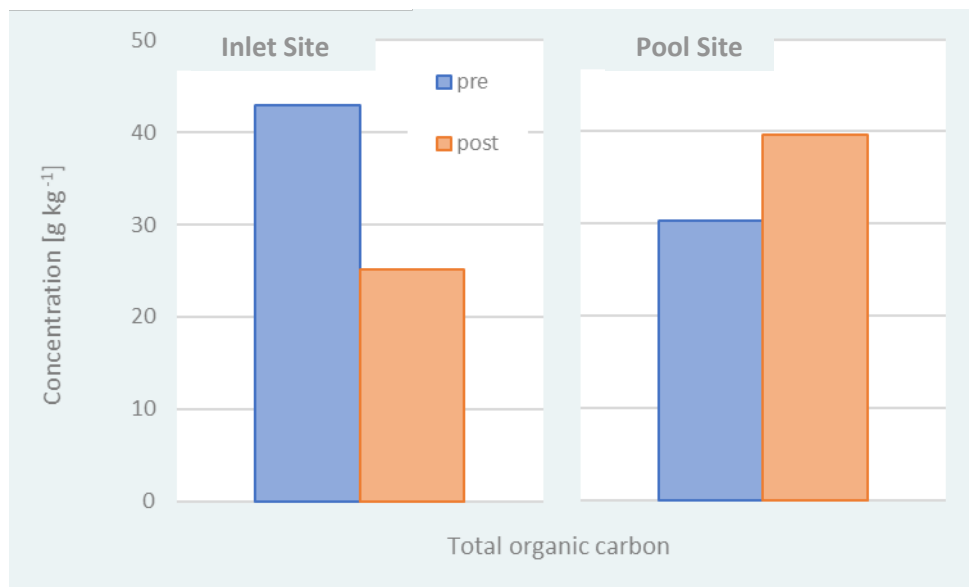


Figure D-7-3: Total organic carbon concentrations original sediments and in accumulated sediments, both within the reservoir, Inlet Site (Site 5 at the western end) and Pool Site (Site 4 closer to the dam).

Results of the estimated mass in the accumulated sediments and the and accumulation rate per year are shown in **Table D-7-3**. Diesel range organics are estimated to be 3,000 to 12,000 mg with accumulation of

100 mg yr⁻¹. Trace metals were between 14 and 19,000 kg with Zn showing the highest amounts with between 5,000 to 19,000 kg. Zinc accumulation was estimated as 200 kg yr⁻¹. The amounts of N (230 to 868 t) and P (15 to 58 t) were estimated to have accumulated at rates of 10,000 kg yr⁻¹ for N and 660 kg yr⁻¹ for P. TOC ranged from 2,865 to 10,730 t (metric tonnes) in the sediments, with an estimated rate of accumulation of 123 t yr⁻¹.

Table D-7-3: Estimated mass of analytes in the accumulated sediments and the accumulation rate per year.

Analyte	Estimated sediment density (kg m ⁻³ range)			Mean accumulation per year (using Median density, kg yr ⁻¹)
	Low 400	High 1500	Median 960 (<i>Minear and Kondolf 2009</i>)	
	Mass in accumulated sediments (mean kg, <i>n</i> =2)			
Diesel Range Organics	3,201	11,989	7,673	137
Arsenic	460	1,722	1,102	20
Cadmium	14	53	34	1
Chromium	1,490	5,581	3,572	64
Copper	1,278	4,786	3,063	55
Lead	1,043	3,908	2,501	45
Nickel	2,087	7,816	5,002	89
Zinc	5,142	19,259	12,326	220
Nitrogen total	231,729	867,899	555,455	9,919
Phosphorus total	15,475	57,958	37,093	662
Mean Total Organic Carbon (<i>n</i> =4)	2,865,057	10,730,551	6,867,552	122,635

DISCUSSION

The accumulated sediments at the inlet site consisted of a lower proportion of fine particles relative to the original sediments, and the reservoir pool site consisted of slightly finer textured particles compared with the original sediments. Enrichment of clays typically results in increased concentrations of metals because smaller particles, particularly the proportion of clay, increases the binding capacity of cations. Bennett and Roton (2003) also observed concentrations increasing by 100 % in post-impoundment reservoir sediments correlating with a change in sediment texture to finer particles. From these textures, higher concentrations would also be expected in the accumulated sediments of the reservoir pool (compared with the inlet sediments) and the original sediments at the inlet (compared with the accumulated sediments) would be higher than in the inlet sediments. Other studies have reported this pattern. For example, Bennett and Roton (2003) reported P and trace elements to be 2-3 times higher in the pool compared to upstream and this correlated with enrichment of clay in pool. This is the pattern seen for Bylin metal accumulation.

Concentrations of PCBs, PAHs, other hydrocarbons were below detection limits, indicating these substances are not a problem at this reservoir. Nitrogen showed concentrations similar other reservoirs (Christensen 1999, 30-3210 mg kg⁻¹). The P concentrations were somewhat lower than other reports (Christensen 1999, 251-904 mg kg⁻¹). Reports from other reservoirs show TOC concentrations ranging from

3440-19,900 mg kg⁻¹, Christensen 1999), while those for accumulated sediments at Bylin Dam were much higher at 25,100 to 39,700 mg kg⁻¹. The very high concentration of TOC in the sediments may be a controlling factor in the concentrations of other nutrients and some metals (Khaledian et al 2017), including total N and Zn (**Figure D-7-5**).

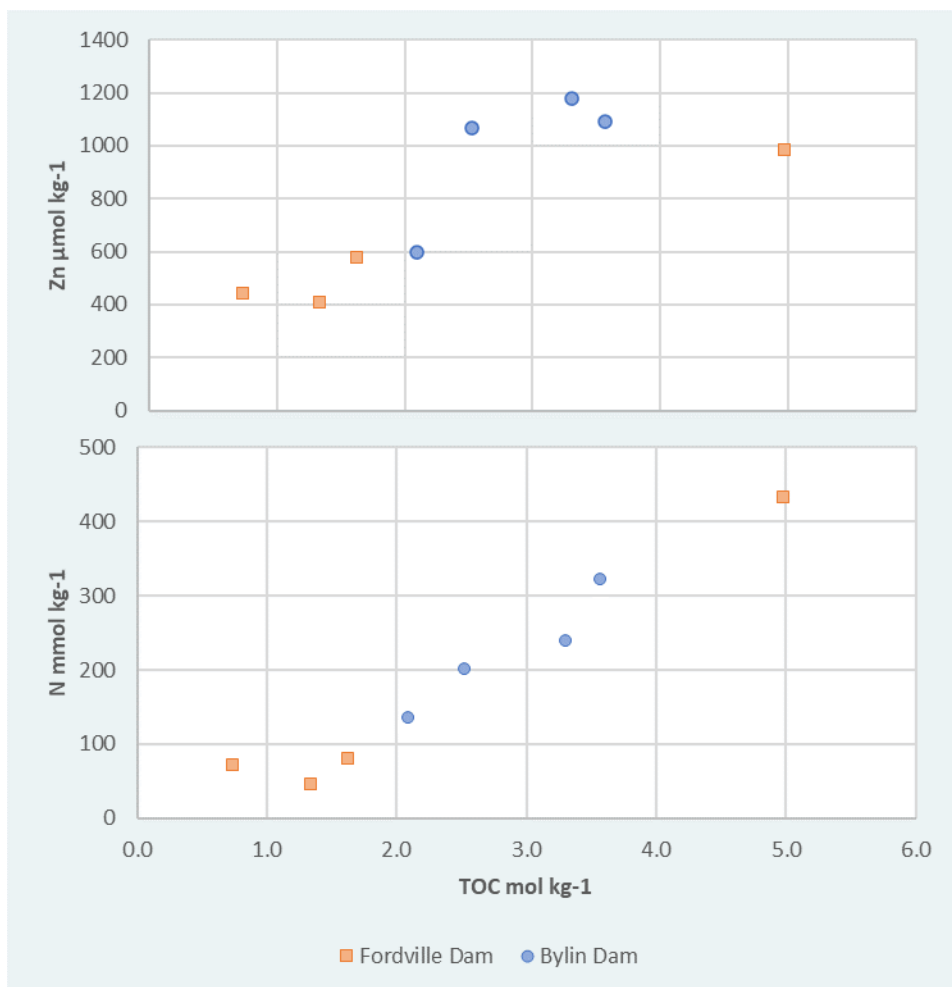


Figure D-7-4: Total nitrogen and zinc as a function of total organic carbon in Fordville Dam and Bylin Dam reservoir accumulated sediments.

Variables that affect sediment concentrations in reservoirs include sediment particle size (Strand and Pemberton 1982, Christensen 1999), management (stable pool versus drawdown, Strand and Pemberton 1982), depth of sediments (Bennett and Rhoton 2003), sediment type, reservoir management (stable pool versus drawdown, Strand and Pemberton 1982), depth of sediments (Bennett and Rhoton 2003), and surrounding land use (tilled land, e.g. fertilizers increasing Zn and Ni in sediments, Mortvedt 1995, Camelo et al. 1997). Full evaluation is beyond the scope of this study, but a more comprehensive research effort may be able to determine stronger causal relationships and reach conclusions. Possible explanations for the higher concentrations of metals and organics at the inlet accumulated sediments, as opposed to the expected increase in the pool, may include recent sedimentation at a delta or fluctuating water cover at the shallower location.

For all analytes examined, none were exceeding the US Environmental Protection Agency (EPA) guidelines for deleterious impacts on aquatic organisms (Ingersoll et al. 2000, MacDonald et al. 2000, **Table D-7-5**).

Table D-7-4: Mean concentrations ($n=2$) in accumulated sediments (post-construction) and the consensus-based probable effect concentration (PEC) (Ingersoll et al. 2000, MacDonald et al. 2000), < value or < DL indicates below detection limits, - indicates no threshold specified.

Analyte	Units	Mean sediment concentration ($n=2$)	PEC
PCB, Total	ug/kg	< DL	676
Acenaphthene		< DL	-
Acenaphthylene		< DL	-
Anthracene		< DL	845
Benzo(a)anthracene		< DL	1050
Benzo(a)pyrene		< DL	1450
Benzo(b)fluoranthene		< DL	-
Benzo(g,h,i)perylene		< DL	-
Benzo(k)fluoranthene		< DL	-
Chrysene		< DL	1290
Dibenz(a,h)anthracene		< DL	-
Fluoranthene		< DL	2230
Fluorene		< DL	536
Indeno(1,2,3-cd)pyrene		< DL	-
Naphthalene		< DL	561
Phenanthrene		< DL	1170
Pyrene		< DL	1520
Diesel Range Organics	mg/kg	36.2	-
Gasoline Range Organics		< DL	-
Arsenic		5.20	33.0
Cadmium		< 0.23	4.98
Chromium		16.9	111
Copper		14.5	149
Lead		11.8	128
Nickel		23.6	48.6
Zinc		58.2	459

The mass of the analytes in the accumulated sediments depends upon the analyte concentration (measured), sediment density (estimated), and the sedimentation rate (known). Because the bulk density was not directly measured for this study, but calculated using a “typical” value, the true mass is an estimate. The accumulation rates of N and P were compared with the results of the PTMApp model (**Appendix D-7-B**), which also estimated the overland sediment delivery rate with concomitant N and P contribution to the

reservoir sediments. The PTMApp results estimated similar sediment contribution into the reservoir, and N and P results were higher with the model (**Table D-7-6**).

Table D-7-5: Comparison between estimated accumulation rates in other studies and the current estimation.

Parameter	PTMApp Modeling Overland Contribution Appendix D-7-B)	Current Accumulation Analysis
Sediment t yr ⁻¹	3,887	3,943 measured
Total nitrogen kg yr ⁻¹	23,337	9,919 estimated
Total phosphorus kg yr ⁻¹	1,133	662 estimated

CONCLUSION

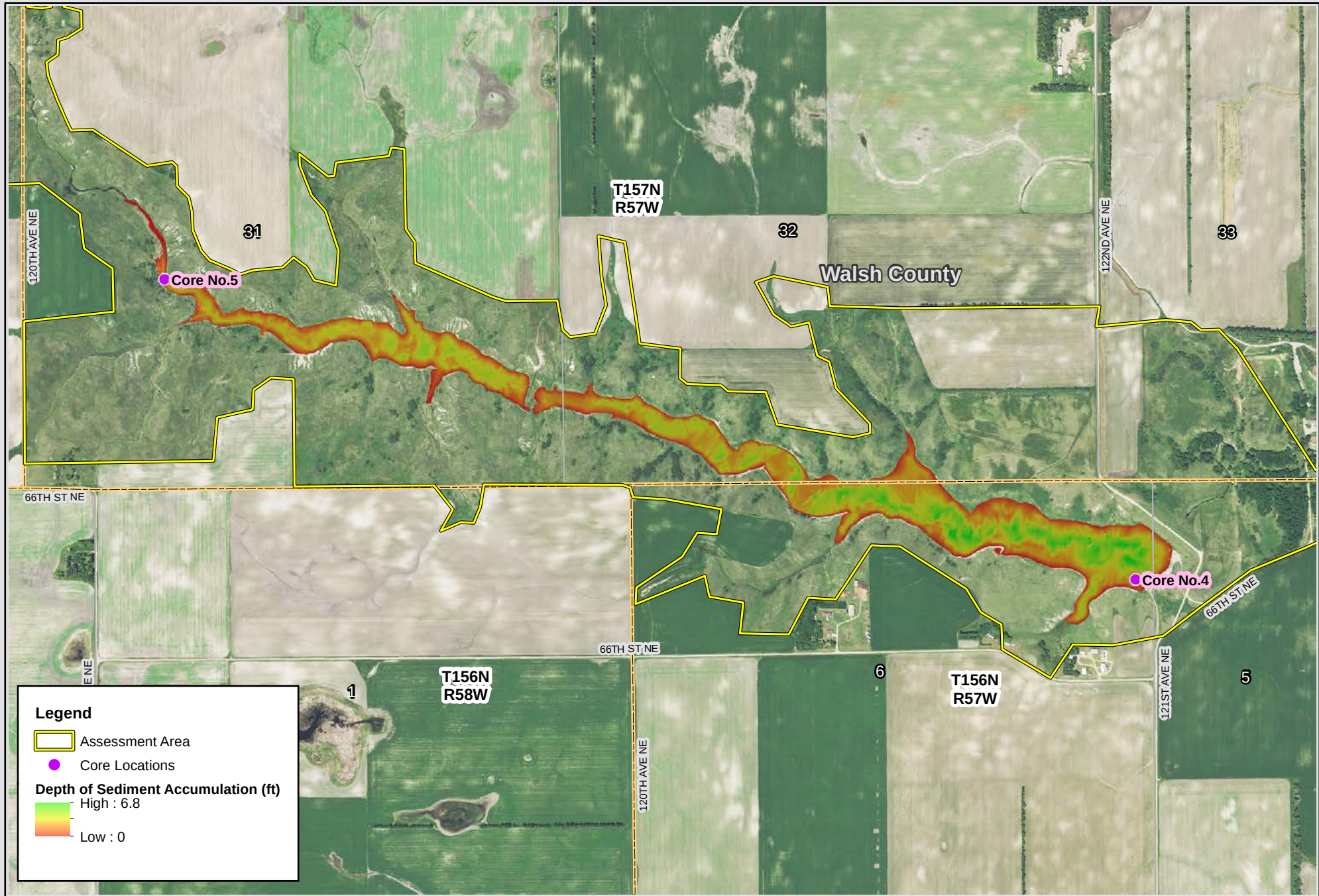
Since Bylin Dam was constructed, large volumes of sediment have accumulated in the reservoir (pool sediments). In these sediments polychlorinated biphenyls (PCBs) and polycyclic aromatic hydrocarbons (PAHs) are not problematic. Diesel range organics and arsenic showed increased concentrations in the accumulated sediments (compared with original sediments), and a suite of trace metals showed increasing concentrations (cadmium, lead, copper, chromium), but a decrease in nickel. These metals showed amounts accumulated in the reservoir sediments in the magnitude 34 to 12,000 kg. Phosphorus and nitrogen concentrations have decreased slightly compared with original sediments, likely as a result of a change in particle texture (increased sand proportion). None of the analytes exceed toxicity thresholds (probable effect concentration). The sedimentation rate was calculated to be over 3,900 t yr⁻¹, concomitant with estimated contribution rates for total nitrogen (9,919 kg yr⁻¹) and total phosphorus (662 kg yr⁻¹). Nitrogen loading may be related to loading of organic carbon, which may be the result sediment transport with organic-rich sediments.

REFERENCES

- Bennett SJ, Rhoton FE (2003) Physical and Chemical Characteristics of Sediment Impoundment within Grenada Lake, MS. US Department of Agriculture Research Report no. 36. National Sedimentation Laboratory, Oxford, Mississippi. Pp. 161.
- Carnelo LGL, Ratto de Miguez S, Marbán L (1997) Heavy metals input with phosphate fertilizers used in Argentina. Science of The Total Environment, 204 (3): 245-250. [https://doi.org/10.1016/S0048-9697\(97\)00187-3](https://doi.org/10.1016/S0048-9697(97)00187-3).
- Christensen VG (1999) Deposition of Selenium and Other Constituents in Reservoir Bottom Sediment of the Solomon River Basin, North-Central Kansas. Water-Resources Investigations Report 99-4230. Bureau of Reclamation, Lawrence, Kansas.
- Crane JL, Hennes S (2007) Guidance for the Use and Application of Sediment Quality Targets for the Protection of Sediment-Dwelling Organisms in Minnesota. Environmental Analysis and Outcomes Division, Minnesota Pollution Control Agency, St. Paul. MN.

- Dendy FE, Champion WA (1978) Sediment Deposition in US Reservoirs, Summary of data Reported Through 1975. US Department of Agriculture Miscellaneous Publication No. 1362. Agricultural Research Service, Washington DC.
- Houston Engineering, Inc. (2021) Dam Existing Conditions Assessment Report.
- Ingersoll CG, MacDonald DD, Wang N, Crane JL, Field J, Haverland PS, Kemble NE, Lindskoog RA, Severn C, Smorong DE (2000) Prediction of sediment toxicity using consensus-based freshwater sediment quality guidelines. US EPA, Chicago, IL.
- Khaledian Y, Pereira P, Brevik EC, Pundt N, Paliulis D (2017) The influence of organic carbon and pH on heavy metals, potassium, and magnesium levels in Lithuanian podzols. Land degradation and Development 28: 345-354.
- MacDonald DD, Ingersoll CG, Berger T (2000) Development and evaluation of consensus-based sediment quality guidelines for freshwater ecosystems. Archives of Environmental Contamination and Toxicology. 39:20-31.
- Miner JT, Kondolf GM (2009) Estimating reservoir sedimentation rates at large spatial and temporal scales: A case study of California. Water Resources Research 45:W12502.
- Mortvedt JJ (1995) Heavy metal contaminants in inorganic and organic fertilizers. Fertilizer Research, 43 (1-3): 55–61.
- Schellick AJ, Banks WSL, Myers, Jr MK. (2013) Water Volume and Sediment Volume and Density in Lake Linganore between Boyers Mill Road Bridge and Bens Branch, Frederick County, Maryland, 2012. Scientific Investigations Report 2013-5082. US Geological Survey, Reston, Virginia.
- Strand RI, Pemberton EL (1982) Reservoir Sedimentation. Technical Guideline for Bureau of Reclamation, Sedimentation and River Hydraulics Section, Hydrology Branch, Division of Planning Technical Services, Engineering and Research Center, Denver, Colorado.

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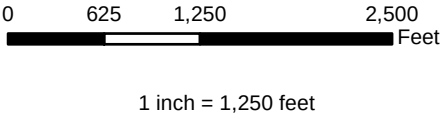


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Sheet: 1 of 1

HOUSTON
engineering, inc.

Exhibit D-7-1: Bylin Dam Sediment Sampling Locations

North Branch Forest River Dam No. 1 (Bylin Dam)
Sediment Analysis for Bylin Dam Memorandum
Walsh County Water Resources District





APPENDIX D-7-A

Analysis Methods and Results



December 03, 2020

Donna Jacob
Houston Engineering, Inc.
11502 240th St. N.
Hawley, MN 56549

RE: Project: 7135-0037 Bylin Dam-Revised Report
Pace Project No.: 10523306

Dear Donna Jacob:

Enclosed are the analytical results for sample(s) received by the laboratory on June 30, 2020. The results relate only to the samples included in this report. Results reported herein conform to the applicable TNI/NELAC Standards and the laboratory's Quality Manual, where applicable, unless otherwise noted in the body of the report.

The test results provided in this final report were generated by each of the following laboratories within the Pace Network:

- Pace Analytical Services - Minneapolis
- Pace Analytical Services - Montana
- Pace Analytical Services - Virginia

This report was revised December 3, 2020, to correct the total nitrogen calculation error.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Kang Khang
kang.khang@pacelabs.com
(406)254-7226
Project Manager

Enclosures

cc: Moriya Rufer, Houston Engineering, Inc.



REPORT OF LABORATORY ANALYSIS

This report shall not be reproduced, except in full,
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CERTIFICATIONS

Project: 7135-0037 Bylin Dam-Revised Report

Pace Project No.: 10523306

Pace Analytical Services - Minneapolis MN

1700 Elm Street SE, Minneapolis, MN 55414

1800 Elm Street SE, Minneapolis, MN 55414--Satellite Air Lab

A2LA Certification #: 2926.01*

Alabama Certification #: 40770

Alaska Contaminated Sites Certification #: 17-009*

Alaska DW Certification #: MN00064

Arizona Certification #: AZ0014*

Arkansas DW Certification #: MN00064

Arkansas WW Certification #: 88-0680

California Certification #: 2929

Colorado Certification #: MN00064

Connecticut Certification #: PH-0256

EPA Region 8+Wyoming DW Certification #: via MN 027-053-137

Florida Certification #: E87605*

Georgia Certification #: 959

Hawaii Certification #: MN00064

Idaho Certification #: MN00064

Illinois Certification #: 200011

Indiana Certification #: C-MN-01

Iowa Certification #: 368

Kansas Certification #: E-10167

Kentucky DW Certification #: 90062

Kentucky WW Certification #: 90062

Louisiana DEQ Certification #: AI-03086*

Louisiana DW Certification #: MN00064

Maine Certification #: MN00064*

Maryland Certification #: 322

Massachusetts DWP Certification #: via MN 027-053-137

Michigan Certification #: 9909

Minnesota Certification #: 027-053-137*

Minnesota Dept of Ag Certification #: via MN 027-053-137

Minnesota Petrofund Certification #: 1240*

Mississippi Certification #: MN00064

Missouri Certification #: 10100

Montana Certification #: CERT0092

Nebraska Certification #: NE-OS-18-06

Nevada Certification #: MN00064

New Hampshire Certification #: 2081*

New Jersey Certification #: MN002

New York Certification #: 11647*

North Carolina DW Certification #: 27700

North Carolina WW Certification #: 530

North Dakota Certification #: R-036

Ohio DW Certification #: 41244

Ohio VAP Certification #: CL101

Oklahoma Certification #: 9507*

Oregon Primary Certification #: MN300001

Oregon Secondary Certification #: MN200001*

Pennsylvania Certification #: 68-00563*

Puerto Rico Certification #: MN00064

South Carolina Certification #: 74003001

Tennessee Certification #: TN02818

Texas Certification #: T104704192*

Utah Certification #: MN00064*

Vermont Certification #: VT-027053137

Virginia Certification #: 460163*

Washington Certification #: C486*

West Virginia DEP Certification #: 382

West Virginia DW Certification #: 9952 C

Wisconsin Certification #: 999407970

Wyoming UST Certification #: via A2LA 2926.01

USDA Permit #: P330-19-00208

Please Note: Applicable air certifications are denoted with an asterisk ().

Pace Analytical Services Montana

150 N. 9th Street, Billings, MT 59101

A2LA Certification: # 3590.01

EPA Region 8 Certification #: 8TMS-L

Idaho Certification #: MT00012

Minnesota Dept of Health Certification #: 030-999-442

Montana Certification #: MT CERT0040

North Dakota Dept. Of Health #: R-209

Washington Department of Ecology #: C993

Nevada Certificate #: MT00012

Pace Analytical Services Virginia Minnesota

315 Chestnut Street, Virginia, MN 55792

Alaska Certification UST-107

Montana Certificate #CERT0103

Minnesota Dept of Health Certification #: 027-137-445

North Dakota Certification: # R-203

Wisconsin DNR Certification #: 998027470

WA Department of Ecology Lab ID# C1007

REPORT OF LABORATORY ANALYSIS

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SAMPLE SUMMARY

Project: 7135-0037 Bylin Dam-Revised Report

Pace Project No.: 10523306

Lab ID	Sample ID	Matrix	Date Collected	Date Received
10523306001	Bylin Core4 Pre Impound	Solid	06/23/20 12:30	06/30/20 09:50
10523306002	Bylin Core4 Post Impound	Solid	06/23/20 12:30	06/30/20 09:50
10523306003	Bylin Core5 Pre Impound	Solid	06/23/20 17:30	06/30/20 09:50
10523306004	Bylin Core5 Post Impound	Solid	06/23/20 17:30	06/30/20 09:50
10523306005	Trip Blank	Solid	06/23/20 00:00	06/30/20 09:50

REPORT OF LABORATORY ANALYSIS

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SAMPLE ANALYTE COUNT

Project: 7135-0037 Bylin Dam-Revised Report

Pace Project No.: 10523306

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
10523306001	Bylin Core4 Pre Impound	EPA 8082A	RAG	12	PASI-M
		EPA 6010D	IP	7	PASI-M
		EPA 8270D by SIM	JNG	18	PASI-M
		EPA 8015C	NMB	2	PASI-MT
		EPA 8015C	NH1	2	PASI-MT
		ASTM D2974	MAM	1	PASI-MT
		TKN+NO3+NO2 Calculation	LM2	1	PASI-V
		EPA 351.2	DMB	1	PASI-V
		EPA 353.2	DMB	1	PASI-V
		EPA 365.1	DMB	1	PASI-V
		EPA 9060A	BE1	4	PASI-V
10523306002	Bylin Core4 Post Impound	EPA 8082A	RAG	12	PASI-M
		EPA 6010D	IP	7	PASI-M
		EPA 8270D by SIM	ZT	18	PASI-M
		EPA 8015C	NMB	2	PASI-MT
		EPA 8015C	NH1	2	PASI-MT
		ASTM D2974	MAM	1	PASI-MT
		TKN+NO3+NO2 Calculation	LM2	1	PASI-V
		EPA 351.2	DMB	1	PASI-V
		EPA 353.2	DMB	1	PASI-V
		EPA 365.1	DMB	1	PASI-V
		EPA 9060A	BE1	4	PASI-V
10523306003	Bylin Core5 Pre Impound	EPA 8082A	RAG	12	PASI-M
		EPA 6010D	IP	7	PASI-M
		EPA 8270D by SIM	ZT	18	PASI-M
		EPA 8015C	NMB	2	PASI-MT
		EPA 8015C	NH1	2	PASI-MT
		ASTM D2974	MAM	1	PASI-MT
		TKN+NO3+NO2 Calculation	LM2	1	PASI-V
		EPA 351.2	DMB	1	PASI-V
		EPA 353.2	DMB	1	PASI-V
		EPA 365.1	DMB	1	PASI-V
		EPA 9060A	BE1	4	PASI-V
10523306004	Bylin Core5 Post Impound	EPA 8082A	RAG	12	PASI-M
		EPA 6010D	IP	7	PASI-M
		EPA 8270D by SIM	ZT	18	PASI-M
		EPA 8015C	NMB	2	PASI-MT

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SAMPLE ANALYTE COUNT

Project: 7135-0037 Bylin Dam-Revised Report

Pace Project No.: 10523306

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
		EPA 8015C	NH1	2	PASI-MT
		ASTM D2974	MAM	1	PASI-MT
		TKN+NO3+NO2 Calculation	LM2	1	PASI-V
		EPA 351.2	DMB	1	PASI-V
		EPA 353.2	DMB	1	PASI-V
		EPA 365.1	DMB	1	PASI-V
		EPA 9060A	BE1	4	PASI-V
10523306005	Trip Blank	EPA 8015C	NH1	2	PASI-MT

PASI-M = Pace Analytical Services - Minneapolis

PASI-MT = Pace Analytical Services - Montana

PASI-V = Pace Analytical Services - Virginia

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: 7135-0037 Bylin Dam-Revised Report

Pace Project No.: 10523306

Sample: Bylin Core4 Pre Impound Lab ID: 10523306001 Collected: 06/23/20 12:30 Received: 06/30/20 09:50 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
8082A GCS PCB								
Analytical Method: EPA 8082A Preparation Method: EPA 3550								
Pace Analytical Services - Minneapolis								
PCB-1016 (Aroclor 1016)	ND	ug/kg	52.4	1	07/01/20 14:33	07/06/20 13:20	12674-11-2	
PCB-1221 (Aroclor 1221)	ND	ug/kg	52.4	1	07/01/20 14:33	07/06/20 13:20	11104-28-2	
PCB-1232 (Aroclor 1232)	ND	ug/kg	52.4	1	07/01/20 14:33	07/06/20 13:20	11141-16-5	
PCB-1242 (Aroclor 1242)	ND	ug/kg	52.4	1	07/01/20 14:33	07/06/20 13:20	53469-21-9	
PCB-1248 (Aroclor 1248)	ND	ug/kg	52.4	1	07/01/20 14:33	07/06/20 13:20	12672-29-6	
PCB-1254 (Aroclor 1254)	ND	ug/kg	52.4	1	07/01/20 14:33	07/06/20 13:20	11097-69-1	
PCB-1260 (Aroclor 1260)	ND	ug/kg	52.4	1	07/01/20 14:33	07/06/20 13:20	11096-82-5	
PCB-1262 (Aroclor 1262)	ND	ug/kg	52.4	1	07/01/20 14:33	07/06/20 13:20	37324-23-5	
PCB-1268 (Aroclor 1268)	ND	ug/kg	52.4	1	07/01/20 14:33	07/06/20 13:20	11100-14-4	
PCB, Total	ND	ug/kg	52.4	1	07/01/20 14:33	07/06/20 13:20	1336-36-3	
Surrogates								
Tetrachloro-m-xylene (S)	79	%.	46-146	1	07/01/20 14:33	07/06/20 13:20	877-09-8	
Decachlorobiphenyl (S)	74	%.	48-139	1	07/01/20 14:33	07/06/20 13:20	2051-24-3	
6010D MET ICP								
Analytical Method: EPA 6010D Preparation Method: EPA 3050B								
Pace Analytical Services - Minneapolis								
Arsenic	3.8	mg/kg	1.5	1	07/07/20 16:26	07/08/20 17:00	7440-38-2	
Cadmium	ND	mg/kg	0.23	1	07/07/20 16:26	07/08/20 17:00	7440-43-9	
Chromium	15.4	mg/kg	0.77	1	07/07/20 16:26	07/08/20 17:00	7440-47-3	
Copper	14.2	mg/kg	0.77	1	07/07/20 16:26	07/08/20 17:00	7440-50-8	
Lead	11.3	mg/kg	0.77	1	07/07/20 16:26	07/08/20 17:00	7439-92-1	
Nickel	35.0	mg/kg	1.5	1	07/07/20 16:26	07/08/20 17:00	7440-02-0	
Zinc	69.9	mg/kg	3.1	1	07/07/20 16:26	07/09/20 13:17	7440-66-6	
8270D MSSV PAH by SIM								
Analytical Method: EPA 8270D by SIM Preparation Method: EPA 3550C								
Pace Analytical Services - Minneapolis								
Acenaphthene	ND	ug/kg	16.0	1	07/01/20 13:13	07/09/20 16:00	83-32-9	
Acenaphthylene	ND	ug/kg	16.0	1	07/01/20 13:13	07/09/20 16:00	208-96-8	
Anthracene	ND	ug/kg	16.0	1	07/01/20 13:13	07/09/20 16:00	120-12-7	
Benzo(a)anthracene	ND	ug/kg	16.0	1	07/01/20 13:13	07/09/20 16:00	56-55-3	
Benzo(a)pyrene	ND	ug/kg	16.0	1	07/01/20 13:13	07/09/20 16:00	50-32-8	
Benzo(b)fluoranthene	ND	ug/kg	16.0	1	07/01/20 13:13	07/09/20 16:00	205-99-2	
Benzo(g,h,i)perylene	ND	ug/kg	16.0	1	07/01/20 13:13	07/09/20 16:00	191-24-2	
Benzo(k)fluoranthene	ND	ug/kg	16.0	1	07/01/20 13:13	07/09/20 16:00	207-08-9	
Chrysene	ND	ug/kg	16.0	1	07/01/20 13:13	07/09/20 16:00	218-01-9	
Dibenz(a,h)anthracene	ND	ug/kg	16.0	1	07/01/20 13:13	07/09/20 16:00	53-70-3	
Fluoranthene	ND	ug/kg	16.0	1	07/01/20 13:13	07/09/20 16:00	206-44-0	
Fluorene	ND	ug/kg	16.0	1	07/01/20 13:13	07/09/20 16:00	86-73-7	
Indeno(1,2,3-cd)pyrene	ND	ug/kg	16.0	1	07/01/20 13:13	07/09/20 16:00	193-39-5	
Naphthalene	ND	ug/kg	16.0	1	07/01/20 13:13	07/09/20 16:00	91-20-3	
Phenanthrene	ND	ug/kg	16.0	1	07/01/20 13:13	07/09/20 16:00	85-01-8	
Pyrene	ND	ug/kg	16.0	1	07/01/20 13:13	07/09/20 16:00	129-00-0	
Surrogates								
2-Fluorobiphenyl (S)	32	%.	30-138	1	07/01/20 13:13	07/09/20 16:00	321-60-8	
p-Terphenyl-d14 (S)	41	%.	30-143	1	07/01/20 13:13	07/09/20 16:00	1718-51-0	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: 7135-0037 Bylin Dam-Revised Report

Pace Project No.: 10523306

Sample: Bylin Core4 Pre Impound Lab ID: 10523306001 Collected: 06/23/20 12:30 Received: 06/30/20 09:50 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
8015 C GCS THC-Diesel Analytical Method: EPA 8015C Preparation Method: EPA 3550C Sonication Pace Analytical Services - Montana								
Diesel Range Organics	ND	mg/kg	15.9	1	07/03/20 14:18	07/09/20 04:54		
Surrogates								
n-Pentacosane (S)	83	%	60-125	1	07/03/20 14:18	07/09/20 04:54	629-99-2	
8015 C GCV TPHGAS Analytical Method: EPA 8015C Preparation Method: EPA 5030 MT Pace Analytical Services - Montana								
Gasoline Range Organics	ND	mg/kg	18.0	1	07/01/20 11:12	07/07/20 08:03		
Surrogates								
a,a,a-Trifluorotoluene (S)	90	%	70-130	1	07/01/20 11:12	07/07/20 08:03	98-08-8	
Dry Weight, MT Analytical Method: ASTM D2974 Pace Analytical Services - Montana								
Percent Moisture	37.8	%	0.10	1		07/06/20 11:45		AL,N2
Total Nitrogen Calculation Analytical Method: TKN+NO3+NO2 Calculation Pace Analytical Services - Virginia								
Nitrogen	2810	mg/kg	0.55	1		11/24/20 08:18	7727-37-9	
351.2 Total Kjeldahl Nitrogen Analytical Method: EPA 351.2 Preparation Method: EPA 351.2 Pace Analytical Services - Virginia								
Nitrogen, Kjeldahl, Total	2810	mg/kg	96.5	1	07/10/20 09:24	07/13/20 13:26	7727-37-9	
353.2 Nitrogen, NO2/NO3 Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Virginia								
Nitrogen, NO2 plus NO3	0.93	mg/kg	0.80	1	07/13/20 08:14	07/15/20 08:53		N3
365.1 Phosphorus, Total Analytical Method: EPA 365.1 Preparation Method: SM 4500P B Pace Analytical Services - Virginia								
Phosphorus	274	mg/kg	4.0	1	07/08/20 12:48	07/09/20 11:58	7723-14-0	
Total Organic Carbon Analytical Method: EPA 9060A Pace Analytical Services - Virginia								
RPD%	0.94	%		1		07/14/20 15:14		
Total Organic Carbon	30400	mg/kg	9490	1		07/14/20 15:06	7440-44-0	
Total Organic Carbon	30100	mg/kg	9490	1		07/14/20 15:14	7440-44-0	
Mean Total Organic Carbon	30300	mg/kg	9490	1		07/14/20 15:14	7440-44-0	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: 7135-0037 Bylin Dam-Revised Report

Pace Project No.: 10523306

Sample: Bylin Core4 Post Impound Lab ID: 10523306002 Collected: 06/23/20 12:30 Received: 06/30/20 09:50 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
8082A GCS PCB								
Analytical Method: EPA 8082A Preparation Method: EPA 3550								
Pace Analytical Services - Minneapolis								
PCB-1016 (Aroclor 1016)	ND	ug/kg	91.3	1	07/01/20 14:33	07/06/20 13:36	12674-11-2	
PCB-1221 (Aroclor 1221)	ND	ug/kg	91.3	1	07/01/20 14:33	07/06/20 13:36	11104-28-2	
PCB-1232 (Aroclor 1232)	ND	ug/kg	91.3	1	07/01/20 14:33	07/06/20 13:36	11141-16-5	
PCB-1242 (Aroclor 1242)	ND	ug/kg	91.3	1	07/01/20 14:33	07/06/20 13:36	53469-21-9	
PCB-1248 (Aroclor 1248)	ND	ug/kg	91.3	1	07/01/20 14:33	07/06/20 13:36	12672-29-6	
PCB-1254 (Aroclor 1254)	ND	ug/kg	91.3	1	07/01/20 14:33	07/06/20 13:36	11097-69-1	
PCB-1260 (Aroclor 1260)	ND	ug/kg	91.3	1	07/01/20 14:33	07/06/20 13:36	11096-82-5	
PCB-1262 (Aroclor 1262)	ND	ug/kg	91.3	1	07/01/20 14:33	07/06/20 13:36	37324-23-5	
PCB-1268 (Aroclor 1268)	ND	ug/kg	91.3	1	07/01/20 14:33	07/06/20 13:36	11100-14-4	
PCB, Total	ND	ug/kg	91.3	1	07/01/20 14:33	07/06/20 13:36	1336-36-3	
Surrogates								
Tetrachloro-m-xylene (S)	87	%.	46-146	1	07/01/20 14:33	07/06/20 13:36	877-09-8	
Decachlorobiphenyl (S)	83	%.	48-139	1	07/01/20 14:33	07/06/20 13:36	2051-24-3	
6010D MET ICP								
Analytical Method: EPA 6010D Preparation Method: EPA 3050B								
Pace Analytical Services - Minneapolis								
Arsenic	6.8	mg/kg	2.7	1	07/07/20 16:26	07/08/20 17:03	7440-38-2	
Cadmium	ND	mg/kg	0.41	1	07/07/20 16:26	07/08/20 17:03	7440-43-9	
Chromium	18.6	mg/kg	1.4	1	07/07/20 16:26	07/08/20 17:03	7440-47-3	
Copper	19.6	mg/kg	1.4	1	07/07/20 16:26	07/08/20 17:03	7440-50-8	
Lead	16.6	mg/kg	1.4	1	07/07/20 16:26	07/08/20 17:03	7439-92-1	
Nickel	28.7	mg/kg	2.7	1	07/07/20 16:26	07/08/20 17:03	7440-02-0	
Zinc	77.1	mg/kg	5.5	1	07/07/20 16:26	07/09/20 13:20	7440-66-6	
8270D MSSV PAH by SIM								
Analytical Method: EPA 8270D by SIM Preparation Method: EPA 3550C								
Pace Analytical Services - Minneapolis								
Acenaphthene	ND	ug/kg	27.8	1	07/01/20 13:13	07/08/20 17:24	83-32-9	
Acenaphthylene	ND	ug/kg	27.8	1	07/01/20 13:13	07/08/20 17:24	208-96-8	
Anthracene	ND	ug/kg	27.8	1	07/01/20 13:13	07/08/20 17:24	120-12-7	
Benzo(a)anthracene	ND	ug/kg	27.8	1	07/01/20 13:13	07/08/20 17:24	56-55-3	
Benzo(a)pyrene	ND	ug/kg	27.8	1	07/01/20 13:13	07/08/20 17:24	50-32-8	
Benzo(b)fluoranthene	ND	ug/kg	27.8	1	07/01/20 13:13	07/08/20 17:24	205-99-2	
Benzo(g,h,i)perylene	ND	ug/kg	27.8	1	07/01/20 13:13	07/08/20 17:24	191-24-2	
Benzo(k)fluoranthene	ND	ug/kg	27.8	1	07/01/20 13:13	07/08/20 17:24	207-08-9	
Chrysene	ND	ug/kg	27.8	1	07/01/20 13:13	07/08/20 17:24	218-01-9	
Dibenz(a,h)anthracene	ND	ug/kg	27.8	1	07/01/20 13:13	07/08/20 17:24	53-70-3	
Fluoranthene	ND	ug/kg	27.8	1	07/01/20 13:13	07/08/20 17:24	206-44-0	
Fluorene	ND	ug/kg	27.8	1	07/01/20 13:13	07/08/20 17:24	86-73-7	
Indeno(1,2,3-cd)pyrene	ND	ug/kg	27.8	1	07/01/20 13:13	07/08/20 17:24	193-39-5	
Naphthalene	ND	ug/kg	27.8	1	07/01/20 13:13	07/08/20 17:24	91-20-3	
Phenanthrene	ND	ug/kg	27.8	1	07/01/20 13:13	07/08/20 17:24	85-01-8	
Pyrene	ND	ug/kg	27.8	1	07/01/20 13:13	07/08/20 17:24	129-00-0	
Surrogates								
2-Fluorobiphenyl (S)	67	%.	30-138	1	07/01/20 13:13	07/08/20 17:24	321-60-8	
p-Terphenyl-d14 (S)	80	%.	30-143	1	07/01/20 13:13	07/08/20 17:24	1718-51-0	

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ANALYTICAL RESULTS

Project: 7135-0037 Bylin Dam-Revised Report

Pace Project No.: 10523306

Sample: Bylin Core4 Post Impound Lab ID: 10523306002 Collected: 06/23/20 12:30 Received: 06/30/20 09:50 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
8015 C GCS THC-Diesel								
Analytical Method: EPA 8015C Preparation Method: EPA 3550C Sonication								
Pace Analytical Services - Montana								
Diesel Range Organics	54.0	mg/kg	26.9	1	07/03/20 14:18	07/09/20 07:12		
Surrogates								
n-Pentacosane (S)	90	%	60-125	1	07/03/20 14:18	07/09/20 07:12	629-99-2	
8015 C GCV TPHGAS								
Analytical Method: EPA 8015C Preparation Method: EPA 5030 MT								
Pace Analytical Services - Montana								
Gasoline Range Organics	ND	mg/kg	30.4	1	07/01/20 11:12	07/07/20 08:31		
Surrogates								
a,a,a-Trifluorotoluene (S)	92	%	70-130	1	07/01/20 11:12	07/07/20 08:31	98-08-8	
Dry Weight, MT								
Analytical Method: ASTM D2974								
Pace Analytical Services - Montana								
Percent Moisture	64.2	%	0.10	1		07/06/20 11:45		AL,N2
Total Nitrogen Calculation								
Analytical Method: TKN+NO3+NO2 Calculation								
Pace Analytical Services - Virginia								
Nitrogen	3350	mg/kg	0.55	1		11/24/20 08:22	7727-37-9	
351.2 Total Kjeldahl Nitrogen								
Analytical Method: EPA 351.2 Preparation Method: EPA 351.2								
Pace Analytical Services - Virginia								
Nitrogen, Kjeldahl, Total	3350	mg/kg	160	1	07/10/20 09:24	07/13/20 13:28	7727-37-9	
353.2 Nitrogen, NO2/NO3								
Analytical Method: EPA 353.2 Preparation Method: EPA 353.2								
Pace Analytical Services - Virginia								
Nitrogen, NO2 plus NO3	ND	mg/kg	1.4	1	07/13/20 08:14	07/15/20 08:55		N3
365.1 Phosphorus, Total								
Analytical Method: EPA 365.1 Preparation Method: SM 4500P B								
Pace Analytical Services - Virginia								
Phosphorus	245	mg/kg	7.0	1	07/08/20 12:48	07/09/20 11:59	7723-14-0	
Total Organic Carbon								
Analytical Method: EPA 9060A								
Pace Analytical Services - Virginia								
RPD%	0.70	%		1		07/14/20 15:29		
Total Organic Carbon	39600	mg/kg	9840	1		07/14/20 15:21	7440-44-0	
Total Organic Carbon	39800	mg/kg	9850	1		07/14/20 15:29	7440-44-0	
Mean Total Organic Carbon	39700	mg/kg	9840	1		07/14/20 15:29	7440-44-0	

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ANALYTICAL RESULTS

Project: 7135-0037 Bylin Dam-Revised Report

Pace Project No.: 10523306

Sample: Bylin Core5 Pre Impound Lab ID: 10523306003 Collected: 06/23/20 17:30 Received: 06/30/20 09:50 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
8082A GCS PCB								
Analytical Method: EPA 8082A Preparation Method: EPA 3550								
Pace Analytical Services - Minneapolis								
PCB-1016 (Aroclor 1016)	ND	ug/kg	62.9	1	07/01/20 14:33	07/06/20 13:52	12674-11-2	
PCB-1221 (Aroclor 1221)	ND	ug/kg	62.9	1	07/01/20 14:33	07/06/20 13:52	11104-28-2	
PCB-1232 (Aroclor 1232)	ND	ug/kg	62.9	1	07/01/20 14:33	07/06/20 13:52	11141-16-5	
PCB-1242 (Aroclor 1242)	ND	ug/kg	62.9	1	07/01/20 14:33	07/06/20 13:52	53469-21-9	
PCB-1248 (Aroclor 1248)	ND	ug/kg	62.9	1	07/01/20 14:33	07/06/20 13:52	12672-29-6	
PCB-1254 (Aroclor 1254)	ND	ug/kg	62.9	1	07/01/20 14:33	07/06/20 13:52	11097-69-1	
PCB-1260 (Aroclor 1260)	ND	ug/kg	62.9	1	07/01/20 14:33	07/06/20 13:52	11096-82-5	
PCB-1262 (Aroclor 1262)	ND	ug/kg	62.9	1	07/01/20 14:33	07/06/20 13:52	37324-23-5	
PCB-1268 (Aroclor 1268)	ND	ug/kg	62.9	1	07/01/20 14:33	07/06/20 13:52	11100-14-4	
PCB, Total	ND	ug/kg	62.9	1	07/01/20 14:33	07/06/20 13:52	1336-36-3	
Surrogates								
Tetrachloro-m-xylene (S)	88	%.	46-146	1	07/01/20 14:33	07/06/20 13:52	877-09-8	
Decachlorobiphenyl (S)	77	%.	48-139	1	07/01/20 14:33	07/06/20 13:52	2051-24-3	
6010D MET ICP								
Analytical Method: EPA 6010D Preparation Method: EPA 3050B								
Pace Analytical Services - Minneapolis								
Arsenic	4.1	mg/kg	1.8	1	07/07/20 16:26	07/08/20 17:06	7440-38-2	
Cadmium	0.29	mg/kg	0.27	1	07/07/20 16:26	07/08/20 17:06	7440-43-9	
Chromium	24.1	mg/kg	0.91	1	07/07/20 16:26	07/08/20 17:06	7440-47-3	
Copper	36.7	mg/kg	0.91	1	07/07/20 16:26	07/08/20 17:06	7440-50-8	
Lead	11.4	mg/kg	0.91	1	07/07/20 16:26	07/08/20 17:06	7439-92-1	
Nickel	22.3	mg/kg	1.8	1	07/07/20 16:26	07/08/20 17:06	7440-02-0	
Zinc	71.4	mg/kg	3.6	1	07/07/20 16:26	07/09/20 13:23	7440-66-6	
8270D MSSV PAH by SIM								
Analytical Method: EPA 8270D by SIM Preparation Method: EPA 3550C								
Pace Analytical Services - Minneapolis								
Acenaphthene	ND	ug/kg	19.1	1	07/01/20 13:13	07/08/20 18:29	83-32-9	
Acenaphthylene	ND	ug/kg	19.1	1	07/01/20 13:13	07/08/20 18:29	208-96-8	
Anthracene	ND	ug/kg	19.1	1	07/01/20 13:13	07/08/20 18:29	120-12-7	
Benzo(a)anthracene	ND	ug/kg	19.1	1	07/01/20 13:13	07/08/20 18:29	56-55-3	
Benzo(a)pyrene	ND	ug/kg	19.1	1	07/01/20 13:13	07/08/20 18:29	50-32-8	
Benzo(b)fluoranthene	ND	ug/kg	19.1	1	07/01/20 13:13	07/08/20 18:29	205-99-2	
Benzo(g,h,i)perylene	ND	ug/kg	19.1	1	07/01/20 13:13	07/08/20 18:29	191-24-2	
Benzo(k)fluoranthene	ND	ug/kg	19.1	1	07/01/20 13:13	07/08/20 18:29	207-08-9	
Chrysene	ND	ug/kg	19.1	1	07/01/20 13:13	07/08/20 18:29	218-01-9	
Dibenz(a,h)anthracene	ND	ug/kg	19.1	1	07/01/20 13:13	07/08/20 18:29	53-70-3	
Fluoranthene	ND	ug/kg	19.1	1	07/01/20 13:13	07/08/20 18:29	206-44-0	
Fluorene	ND	ug/kg	19.1	1	07/01/20 13:13	07/08/20 18:29	86-73-7	
Indeno(1,2,3-cd)pyrene	ND	ug/kg	19.1	1	07/01/20 13:13	07/08/20 18:29	193-39-5	
Naphthalene	ND	ug/kg	19.1	1	07/01/20 13:13	07/08/20 18:29	91-20-3	
Phenanthrene	ND	ug/kg	19.1	1	07/01/20 13:13	07/08/20 18:29	85-01-8	
Pyrene	ND	ug/kg	19.1	1	07/01/20 13:13	07/08/20 18:29	129-00-0	
Surrogates								
2-Fluorobiphenyl (S)	71	%.	30-138	1	07/01/20 13:13	07/08/20 18:29	321-60-8	
p-Terphenyl-d14 (S)	79	%.	30-143	1	07/01/20 13:13	07/08/20 18:29	1718-51-0	

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ANALYTICAL RESULTS

Project: 7135-0037 Bylin Dam-Revised Report

Pace Project No.: 10523306

Sample: Bylin Core5 Pre Impound Lab ID: 10523306003 Collected: 06/23/20 17:30 Received: 06/30/20 09:50 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
8015 C GCS THC-Diesel								
Analytical Method: EPA 8015C Preparation Method: EPA 3550C Sonication								
Pace Analytical Services - Montana								
Diesel Range Organics	20.7	mg/kg	18.2	1	07/03/20 14:18	07/09/20 06:02		
Surrogates								
n-Pentacosane (S)	87	%	60-125	1	07/03/20 14:18	07/09/20 06:02	629-99-2	
8015 C GCV TPHGAS								
Analytical Method: EPA 8015C Preparation Method: EPA 5030 MT								
Pace Analytical Services - Montana								
Gasoline Range Organics	ND	mg/kg	25.7	1	07/01/20 11:12	07/07/20 08:58		
Surrogates								
a,a,a-Trifluorotoluene (S)	92	%	70-130	1	07/01/20 11:12	07/07/20 08:58	98-08-8	
Dry Weight, MT								
Analytical Method: ASTM D2974								
Pace Analytical Services - Montana								
Percent Moisture	47.6	%	0.10	1		07/06/20 11:45		AL,N2
Total Nitrogen Calculation								
Analytical Method: TKN+NO3+NO2 Calculation								
Pace Analytical Services - Virginia								
Nitrogen	4500	mg/kg	0.55	1		11/24/20 08:24	7727-37-9	
351.2 Total Kjeldahl Nitrogen								
Analytical Method: EPA 351.2 Preparation Method: EPA 351.2								
Pace Analytical Services - Virginia								
Nitrogen, Kjeldahl, Total	4500	mg/kg	521	5	07/10/20 09:24	07/13/20 14:12	7727-37-9	
353.2 Nitrogen, NO2/NO3								
Analytical Method: EPA 353.2 Preparation Method: EPA 353.2								
Pace Analytical Services - Virginia								
Nitrogen, NO2 plus NO3	ND	mg/kg	0.94	1	07/13/20 08:14	07/15/20 08:56		N3
365.1 Phosphorus, Total								
Analytical Method: EPA 365.1 Preparation Method: SM 4500P B								
Pace Analytical Services - Virginia								
Phosphorus	234	mg/kg	4.7	1	07/08/20 12:48	07/09/20 12:00	7723-14-0	
Total Organic Carbon								
Analytical Method: EPA 9060A								
Pace Analytical Services - Virginia								
RPD%	1.8	%		1		07/14/20 15:45		
Total Organic Carbon	43300	mg/kg	9460	1		07/14/20 15:37	7440-44-0	
Total Organic Carbon	42500	mg/kg	9580	1		07/14/20 15:45	7440-44-0	
Mean Total Organic Carbon	42900	mg/kg	9520	1		07/14/20 15:45	7440-44-0	

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ANALYTICAL RESULTS

Project: 7135-0037 Bylin Dam-Revised Report

Pace Project No.: 10523306

Sample: Bylin Core5 Post Impound Lab ID: 10523306004 Collected: 06/23/20 17:30 Received: 06/30/20 09:50 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
8082A GCS PCB								
Analytical Method: EPA 8082A Preparation Method: EPA 3550								
Pace Analytical Services - Minneapolis								
PCB-1016 (Aroclor 1016)	ND	ug/kg	52.2	1	07/01/20 14:33	07/06/20 14:08	12674-11-2	
PCB-1221 (Aroclor 1221)	ND	ug/kg	52.2	1	07/01/20 14:33	07/06/20 14:08	11104-28-2	
PCB-1232 (Aroclor 1232)	ND	ug/kg	52.2	1	07/01/20 14:33	07/06/20 14:08	11141-16-5	
PCB-1242 (Aroclor 1242)	ND	ug/kg	52.2	1	07/01/20 14:33	07/06/20 14:08	53469-21-9	
PCB-1248 (Aroclor 1248)	ND	ug/kg	52.2	1	07/01/20 14:33	07/06/20 14:08	12672-29-6	
PCB-1254 (Aroclor 1254)	ND	ug/kg	52.2	1	07/01/20 14:33	07/06/20 14:08	11097-69-1	
PCB-1260 (Aroclor 1260)	ND	ug/kg	52.2	1	07/01/20 14:33	07/06/20 14:08	11096-82-5	
PCB-1262 (Aroclor 1262)	ND	ug/kg	52.2	1	07/01/20 14:33	07/06/20 14:08	37324-23-5	
PCB-1268 (Aroclor 1268)	ND	ug/kg	52.2	1	07/01/20 14:33	07/06/20 14:08	11100-14-4	
PCB, Total	ND	ug/kg	52.2	1	07/01/20 14:33	07/06/20 14:08	1336-36-3	
Surrogates								
Tetrachloro-m-xylene (S)	83	%.	46-146	1	07/01/20 14:33	07/06/20 14:08	877-09-8	
Decachlorobiphenyl (S)	77	%.	48-139	1	07/01/20 14:33	07/06/20 14:08	2051-24-3	
6010D MET ICP								
Analytical Method: EPA 6010D Preparation Method: EPA 3050B								
Pace Analytical Services - Minneapolis								
Arsenic	3.6	mg/kg	1.5	1	07/07/20 16:26	07/08/20 17:09	7440-38-2	
Cadmium	ND	mg/kg	0.23	1	07/07/20 16:26	07/08/20 17:09	7440-43-9	
Chromium	15.1	mg/kg	0.75	1	07/07/20 16:26	07/08/20 17:09	7440-47-3	
Copper	9.3	mg/kg	0.75	1	07/07/20 16:26	07/08/20 17:09	7440-50-8	
Lead	7.0	mg/kg	0.75	1	07/07/20 16:26	07/08/20 17:09	7439-92-1	
Nickel	18.5	mg/kg	1.5	1	07/07/20 16:26	07/08/20 17:09	7440-02-0	
Zinc	39.2	mg/kg	3.0	1	07/07/20 16:26	07/09/20 13:26	7440-66-6	
8270D MSSV PAH by SIM								
Analytical Method: EPA 8270D by SIM Preparation Method: EPA 3550C								
Pace Analytical Services - Minneapolis								
Acenaphthene	ND	ug/kg	16.0	1	07/01/20 13:13	07/08/20 18:51	83-32-9	
Acenaphthylene	ND	ug/kg	16.0	1	07/01/20 13:13	07/08/20 18:51	208-96-8	
Anthracene	ND	ug/kg	16.0	1	07/01/20 13:13	07/08/20 18:51	120-12-7	
Benzo(a)anthracene	ND	ug/kg	16.0	1	07/01/20 13:13	07/08/20 18:51	56-55-3	
Benzo(a)pyrene	ND	ug/kg	16.0	1	07/01/20 13:13	07/08/20 18:51	50-32-8	
Benzo(b)fluoranthene	ND	ug/kg	16.0	1	07/01/20 13:13	07/08/20 18:51	205-99-2	
Benzo(g,h,i)perylene	ND	ug/kg	16.0	1	07/01/20 13:13	07/08/20 18:51	191-24-2	
Benzo(k)fluoranthene	ND	ug/kg	16.0	1	07/01/20 13:13	07/08/20 18:51	207-08-9	
Chrysene	ND	ug/kg	16.0	1	07/01/20 13:13	07/08/20 18:51	218-01-9	
Dibenz(a,h)anthracene	ND	ug/kg	16.0	1	07/01/20 13:13	07/08/20 18:51	53-70-3	
Fluoranthene	ND	ug/kg	16.0	1	07/01/20 13:13	07/08/20 18:51	206-44-0	
Fluorene	ND	ug/kg	16.0	1	07/01/20 13:13	07/08/20 18:51	86-73-7	
Indeno(1,2,3-cd)pyrene	ND	ug/kg	16.0	1	07/01/20 13:13	07/08/20 18:51	193-39-5	
Naphthalene	ND	ug/kg	16.0	1	07/01/20 13:13	07/08/20 18:51	91-20-3	
Phenanthrene	ND	ug/kg	16.0	1	07/01/20 13:13	07/08/20 18:51	85-01-8	
Pyrene	ND	ug/kg	16.0	1	07/01/20 13:13	07/08/20 18:51	129-00-0	
Surrogates								
2-Fluorobiphenyl (S)	72	%.	30-138	1	07/01/20 13:13	07/08/20 18:51	321-60-8	
p-Terphenyl-d14 (S)	79	%.	30-143	1	07/01/20 13:13	07/08/20 18:51	1718-51-0	

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ANALYTICAL RESULTS

Project: 7135-0037 Bylin Dam-Revised Report

Pace Project No.: 10523306

Sample: Bylin Core5 Post Impound Lab ID: 10523306004 Collected: 06/23/20 17:30 Received: 06/30/20 09:50 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
8015 C GCS THC-Diesel Analytical Method: EPA 8015C Preparation Method: EPA 3550C Sonication Pace Analytical Services - Montana								
Diesel Range Organics	18.4	mg/kg	15.9	1	07/03/20 14:18	07/09/20 05:28		
Surrogates								
n-Pentacosane (S)	83	%	60-125	1	07/03/20 14:18	07/09/20 05:28	629-99-2	
8015 C GCV TPHGAS Analytical Method: EPA 8015C Preparation Method: EPA 5030 MT Pace Analytical Services - Montana								
Gasoline Range Organics	ND	mg/kg	17.3	1	07/01/20 11:12	07/07/20 09:25		
Surrogates								
a,a,a-Trifluorotoluene (S)	93	%	70-130	1	07/01/20 11:12	07/07/20 09:25	98-08-8	
Dry Weight, MT Analytical Method: ASTM D2974 Pace Analytical Services - Montana								
Percent Moisture	37.5	%	0.10	1		07/06/20 11:45		AL,N2
Total Nitrogen Calculation Analytical Method: TKN+NO3+NO2 Calculation Pace Analytical Services - Virginia								
Nitrogen	1890	mg/kg	0.55	1		11/24/20 08:25	7727-37-9	
351.2 Total Kjeldahl Nitrogen Analytical Method: EPA 351.2 Preparation Method: EPA 351.2 Pace Analytical Services - Virginia								
Nitrogen, Kjeldahl, Total	1890	mg/kg	101	1	07/10/20 09:24	07/13/20 13:34	7727-37-9	
353.2 Nitrogen, NO2/NO3 Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Virginia								
Nitrogen, NO2 plus NO3	ND	mg/kg	0.79	1	07/13/20 08:14	07/15/20 09:03		N3
365.1 Phosphorus, Total Analytical Method: EPA 365.1 Preparation Method: SM 4500P B Pace Analytical Services - Virginia								
Phosphorus	105	mg/kg	4.0	1	07/08/20 12:48	07/09/20 12:02	7723-14-0	
Total Organic Carbon Analytical Method: EPA 9060A Pace Analytical Services - Virginia								
RPD%	4.5	%		1		07/14/20 16:00		
Total Organic Carbon	24500	mg/kg	10000	1		07/14/20 15:52	7440-44-0	
Total Organic Carbon	25700	mg/kg	9620	1		07/14/20 16:00	7440-44-0	
Mean Total Organic Carbon	25100	mg/kg	9820	1		07/14/20 16:00	7440-44-0	

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ANALYTICAL RESULTS

Project: 7135-0037 Bylin Dam-Revised Report

Pace Project No.: 10523306

Sample: Trip Blank **Lab ID: 10523306005** Collected: 06/23/20 00:00 Received: 06/30/20 09:50 Matrix: Solid
Results reported on a "wet-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
8015 C GCV TPHGAS	Analytical Method: EPA 8015C Preparation Method: EPA 5030 MT Pace Analytical Services - Montana							
Gasoline Range Organics	ND	mg/kg	10.0	1	07/01/20 11:12	07/07/20 02:09		
Surrogates								
a,a,a-Trifluorotoluene (S)	91	%.	70-130	1	07/01/20 11:12	07/07/20 02:09	98-08-8	

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QUALITY CONTROL DATA

Project: 7135-0037 Bylin Dam-Revised Report

Pace Project No.: 10523306

QC Batch: 685123

Analysis Method: EPA 6010D

QC Batch Method: EPA 3050B

Analysis Description: 6010D Solids

Laboratory: Pace Analytical Services - Minneapolis

Associated Lab Samples: 10523306001, 10523306002, 10523306003, 10523306004

METHOD BLANK: 3664567

Matrix: Solid

Associated Lab Samples: 10523306001, 10523306002, 10523306003, 10523306004

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Arsenic	mg/kg	ND	0.99	07/08/20 15:56	
Cadmium	mg/kg	ND	0.15	07/08/20 15:56	
Chromium	mg/kg	ND	0.50	07/08/20 15:56	
Copper	mg/kg	ND	0.50	07/08/20 15:56	
Lead	mg/kg	ND	0.50	07/08/20 15:56	
Nickel	mg/kg	ND	0.99	07/08/20 15:56	
Zinc	mg/kg	ND	2.0	07/08/20 15:56	

LABORATORY CONTROL SAMPLE: 3664568

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Arsenic	mg/kg	45.9	47.7	104	80-120	
Cadmium	mg/kg	45.9	48.0	105	80-120	
Chromium	mg/kg	45.9	47.5	104	80-120	
Copper	mg/kg	45.9	44.5	97	80-120	
Lead	mg/kg	45.9	47.5	104	80-120	
Nickel	mg/kg	45.9	47.6	104	80-120	
Zinc	mg/kg	45.9	48.4	105	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 3664569 3664570

Parameter	Units	10523281001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Arsenic	mg/kg	5.1	73.1	75.9	76.5	79.5	98	98	75-125	4	20	
Cadmium	mg/kg	ND	73.1	75.9	66.4	72.3	91	95	75-125	8	20	
Chromium	mg/kg	15.1	73.1	75.9	84.2	87.7	95	96	75-125	4	20	
Copper	mg/kg	10.3	73.1	75.9	78.6	80.3	93	92	75-125	2	20	
Lead	mg/kg	13.3	73.1	75.9	81.4	83.2	93	92	75-125	2	20	
Nickel	mg/kg	22.7	73.1	75.9	102	97.0	109	98	75-125	5	20	
Zinc	mg/kg	53.2	73.1	75.9	144	136	124	109	75-125	6	20	

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QUALITY CONTROL DATA

Project: 7135-0037 Bylin Dam-Revised Report

Pace Project No.: 10523306

QC Batch: 684534 Analysis Method: EPA 8015C
 QC Batch Method: EPA 5030 MT Analysis Description: 8015 C TPH-Gas MT
 Laboratory: Pace Analytical Services - Montana
 Associated Lab Samples: 10523306001, 10523306002, 10523306003, 10523306004, 10523306005

METHOD BLANK: 3661586 Matrix: Solid
 Associated Lab Samples: 10523306001, 10523306002, 10523306003, 10523306004, 10523306005

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Gasoline Range Organics	mg/kg	ND	9.8	07/07/20 01:14	
a,a,a-Trifluorotoluene (S)	%.	93	70-130	07/07/20 01:14	

LABORATORY CONTROL SAMPLE: 3661587

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Gasoline Range Organics	mg/kg	47.5	42.5	89	68-127	
a,a,a-Trifluorotoluene (S)	%.			102	70-130	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 3661588 3661589

Parameter	Units	10523306001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Gasoline Range Organics	mg/kg	ND	92.8	92.8	76.1	70.5	82	76	30-150	8	20	
a,a,a-Trifluorotoluene (S)	%.						101	101	70-130			

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QUALITY CONTROL DATA

Project: 7135-0037 Bylin Dam-Revised Report

Pace Project No.: 10523306

QC Batch: 685000

Analysis Method: ASTM D2974

QC Batch Method: ASTM D2974

Analysis Description: Dry Weight/Percent Moisture

Laboratory: Pace Analytical Services - Montana

Associated Lab Samples: 10523306001, 10523306002, 10523306003, 10523306004

SAMPLE DUPLICATE: 3664072

Parameter	Units	10524712001 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	23.0	22.7	1	30	AL,N2

SAMPLE DUPLICATE: 3664073

Parameter	Units	10524712002 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	22.6	22.5	1	30	AL,N2

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QUALITY CONTROL DATA

Project: 7135-0037 Bylin Dam-Revised Report

Pace Project No.: 10523306

QC Batch: 684825 Analysis Method: EPA 8015C
 QC Batch Method: EPA 3550C Sonication Analysis Description: 8015 C THC-Diesel MT
 Laboratory: Pace Analytical Services - Montana
 Associated Lab Samples: 10523306001, 10523306002, 10523306003, 10523306004

METHOD BLANK: 3663455 Matrix: Solid
 Associated Lab Samples: 10523306001, 10523306002, 10523306003, 10523306004

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Diesel Range Organics	mg/kg	ND	9.4	07/08/20 12:53	
n-Pentacosane (S)	%.	84	60-125	07/08/20 12:53	

LABORATORY CONTROL SAMPLE & LCSD: 3663456		3663457								
Parameter	Units	Spike Conc.	LCS Result	LCSD Result	LCS % Rec	LCSD % Rec	% Rec Limits	RPD	Max RPD	Qualifiers
Diesel Range Organics	mg/kg	140	121	132	87	90	50-125	9	20	
n-Pentacosane (S)	%.				93	93	60-125			

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 3663458				3663459								
Parameter	Units	10523571001	MS	MSD	MS	MSD	MS	MSD	% Rec	Max	Qual	
		Result	Spike Conc.	Spike Conc.								Result
Diesel Range Organics	mg/kg	ND	421	421	391	387	92	91	30-137	1	20	
n-Pentacosane (S)	%.						95	93	60-125			

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QUALITY CONTROL DATA

Project: 7135-0037 Bylin Dam-Revised Report

Pace Project No.: 10523306

QC Batch: 684526

Analysis Method: EPA 8082A

QC Batch Method: EPA 3550

Analysis Description: 8082A GCS PCB

Laboratory: Pace Analytical Services - Minneapolis

Associated Lab Samples: 10523306001, 10523306002, 10523306003, 10523306004

METHOD BLANK: 3661544

Matrix: Solid

Associated Lab Samples: 10523306001, 10523306002, 10523306003, 10523306004

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
PCB-1016 (Aroclor 1016)	ug/kg	ND	33.0	07/06/20 12:01	
PCB-1221 (Aroclor 1221)	ug/kg	ND	33.0	07/06/20 12:01	
PCB-1232 (Aroclor 1232)	ug/kg	ND	33.0	07/06/20 12:01	
PCB-1242 (Aroclor 1242)	ug/kg	ND	33.0	07/06/20 12:01	
PCB-1248 (Aroclor 1248)	ug/kg	ND	33.0	07/06/20 12:01	
PCB-1254 (Aroclor 1254)	ug/kg	ND	33.0	07/06/20 12:01	
PCB-1260 (Aroclor 1260)	ug/kg	ND	33.0	07/06/20 12:01	
PCB-1262 (Aroclor 1262)	ug/kg	ND	33.0	07/06/20 12:01	
PCB-1268 (Aroclor 1268)	ug/kg	ND	33.0	07/06/20 12:01	
Decachlorobiphenyl (S)	%.	90	48-139	07/06/20 12:01	
Tetrachloro-m-xylene (S)	%.	94	46-146	07/06/20 12:01	

LABORATORY CONTROL SAMPLE: 3661545

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
PCB-1016 (Aroclor 1016)	ug/kg	667	588	88	68-125	
PCB-1260 (Aroclor 1260)	ug/kg	667	591	89	69-125	
Decachlorobiphenyl (S)	%.			89	48-139	
Tetrachloro-m-xylene (S)	%.			94	46-146	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 3661810 3661811

Parameter	Units	10523302004 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
PCB-1016 (Aroclor 1016)	ug/kg	ND	1390	1380	1220	1220	88	88	49-125	0	30	
PCB-1260 (Aroclor 1260)	ug/kg	ND	1390	1380	1210	1210	87	88	43-125	1	30	
Decachlorobiphenyl (S)	%.						81	83	48-139			
Tetrachloro-m-xylene (S)	%.						89	90	46-146			

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QUALITY CONTROL DATA

Project: 7135-0037 Bylin Dam-Revised Report

Pace Project No.: 10523306

QC Batch: 684525

Analysis Method: EPA 8270D by SIM

QC Batch Method: EPA 3550C

Analysis Description: 8270D Solid PAH by SIM MSSV

Laboratory: Pace Analytical Services - Minneapolis

Associated Lab Samples: 10523306001, 10523306002, 10523306003, 10523306004

METHOD BLANK: 3661540

Matrix: Solid

Associated Lab Samples: 10523306001, 10523306002, 10523306003, 10523306004

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Acenaphthene	ug/kg	ND	10.0	07/08/20 15:58	
Acenaphthylene	ug/kg	ND	10.0	07/08/20 15:58	
Anthracene	ug/kg	ND	10.0	07/08/20 15:58	
Benzo(a)anthracene	ug/kg	ND	10.0	07/08/20 15:58	
Benzo(a)pyrene	ug/kg	ND	10.0	07/08/20 15:58	
Benzo(b)fluoranthene	ug/kg	ND	10.0	07/08/20 15:58	
Benzo(g,h,i)perylene	ug/kg	ND	10.0	07/08/20 15:58	
Benzo(k)fluoranthene	ug/kg	ND	10.0	07/08/20 15:58	
Chrysene	ug/kg	ND	10.0	07/08/20 15:58	
Dibenz(a,h)anthracene	ug/kg	ND	10.0	07/08/20 15:58	
Fluoranthene	ug/kg	ND	10.0	07/08/20 15:58	
Fluorene	ug/kg	ND	10.0	07/08/20 15:58	
Indeno(1,2,3-cd)pyrene	ug/kg	ND	10.0	07/08/20 15:58	
Naphthalene	ug/kg	ND	10.0	07/08/20 15:58	
Phenanthrene	ug/kg	ND	10.0	07/08/20 15:58	
Pyrene	ug/kg	ND	10.0	07/08/20 15:58	
2-Fluorobiphenyl (S)	%	72	30-138	07/08/20 15:58	
p-Terphenyl-d14 (S)	%	91	30-143	07/08/20 15:58	

LABORATORY CONTROL SAMPLE: 3661541

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Acenaphthene	ug/kg	33.3	25.2	75	49-125	
Acenaphthylene	ug/kg	33.3	22.5	68	53-125	
Anthracene	ug/kg	33.3	28.9	87	59-125	
Benzo(a)anthracene	ug/kg	33.3	26.2	78	58-125	
Benzo(a)pyrene	ug/kg	33.3	27.0	81	64-125	
Benzo(b)fluoranthene	ug/kg	33.3	31.6	95	61-125	
Benzo(g,h,i)perylene	ug/kg	33.3	32.1	96	64-125	
Benzo(k)fluoranthene	ug/kg	33.3	33.5	101	62-125	
Chrysene	ug/kg	33.3	29.6	89	65-125	
Dibenz(a,h)anthracene	ug/kg	33.3	31.8	95	63-125	
Fluoranthene	ug/kg	33.3	31.1	93	68-125	
Fluorene	ug/kg	33.3	25.3	76	54-125	
Indeno(1,2,3-cd)pyrene	ug/kg	33.3	31.2	94	63-125	
Naphthalene	ug/kg	33.3	23.9	72	45-125	
Phenanthrene	ug/kg	33.3	27.4	82	63-125	
Pyrene	ug/kg	33.3	30.8	92	65-125	
2-Fluorobiphenyl (S)	%			75	30-138	

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QUALITY CONTROL DATA

Project: 7135-0037 Bylin Dam-Revised Report

Pace Project No.: 10523306

LABORATORY CONTROL SAMPLE: 3661541

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
p-Terphenyl-d14 (S)	%.			92	30-143	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 3661691 3661692

Parameter	Units	10523306002	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	Max RPD	Qual
		Result	Conc.	Conc.	Result	Result	% Rec	% Rec	Limits	RPD	
Acenaphthene	ug/kg	ND	92.5	92.8	65.9	65.7	71	71	30-125	0	30
Acenaphthylene	ug/kg	ND	92.5	92.8	65.2	68.6	71	74	30-150	5	30
Anthracene	ug/kg	ND	92.5	92.8	77.0	94.7	83	102	30-150	21	30
Benzo(a)anthracene	ug/kg	ND	92.5	92.8	71.4	83.3	77	90	30-150	15	30
Benzo(a)pyrene	ug/kg	ND	92.5	92.8	74.5	79.6	81	86	30-150	7	30
Benzo(b)fluoranthene	ug/kg	ND	92.5	92.8	67.5	75.8	73	82	30-150	12	30
Benzo(g,h,i)perylene	ug/kg	ND	92.5	92.8	73.2	78.2	79	84	30-150	7	30
Benzo(k)fluoranthene	ug/kg	ND	92.5	92.8	71.4	77.7	77	84	30-150	8	30
Chrysene	ug/kg	ND	92.5	92.8	68.9	75.4	74	81	30-150	9	30
Dibenz(a,h)anthracene	ug/kg	ND	92.5	92.8	69.2	75.6	75	81	30-147	9	30
Fluoranthene	ug/kg	ND	92.5	92.8	79.1	95.6	86	103	30-150	19	30
Fluorene	ug/kg	ND	92.5	92.8	68.5	74.6	74	80	30-150	9	30
Indeno(1,2,3-cd)pyrene	ug/kg	ND	92.5	92.8	70.8	74.4	77	80	30-150	5	30
Naphthalene	ug/kg	ND	92.5	92.8	58.4	54.5	63	59	30-141	7	30
Phenanthrene	ug/kg	ND	92.5	92.8	69.1	83.0	75	89	30-150	18	30
Pyrene	ug/kg	ND	92.5	92.8	76.9	90.2	83	97	30-150	16	30
2-Fluorobiphenyl (S)	%.						64	63	30-138		
p-Terphenyl-d14 (S)	%.						68	78	30-143		

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QUALITY CONTROL DATA

Project: 7135-0037 Bylin Dam-Revised Report

Pace Project No.: 10523306

QC Batch: 193277 Analysis Method: EPA 351.2
 QC Batch Method: EPA 351.2 Analysis Description: 351.2 TKN
 Laboratory: Pace Analytical Services - Virginia
 Associated Lab Samples: 10523306001, 10523306002, 10523306003, 10523306004

METHOD BLANK: 762133 Matrix: Solid
 Associated Lab Samples: 10523306001, 10523306002, 10523306003, 10523306004

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Nitrogen, Kjeldahl, Total	mg/kg	ND	60.0	07/13/20 13:00	

LABORATORY CONTROL SAMPLE: 762132

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, Kjeldahl, Total	mg/kg	1000	1020	102	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 762134 762135

Parameter	Units	10523281001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Nitrogen, Kjeldahl, Total	mg/kg	1660	1550	1470	3450	3290	116	111	90-110	5	15	E,M1

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 762136 762137

Parameter	Units	10523302003 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Nitrogen, Kjeldahl, Total	mg/kg	1880	1640	1720	3830	4010	119	124	90-110	5	15	E,M1

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QUALITY CONTROL DATA

Project: 7135-0037 Bylin Dam-Revised Report

Pace Project No.: 10523306

QC Batch: 193383

Analysis Method: EPA 353.2

QC Batch Method: EPA 353.2

Analysis Description: 353.2 Nitrate + Nitrite

Laboratory: Pace Analytical Services - Virginia

Associated Lab Samples: 10523306001, 10523306002, 10523306003, 10523306004

METHOD BLANK: 762585

Matrix: Solid

Associated Lab Samples: 10523306001, 10523306002, 10523306003, 10523306004

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Nitrogen, NO2 plus NO3	mg/kg	ND	0.50	07/15/20 08:23	N3

LABORATORY CONTROL SAMPLE: 762584

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, NO2 plus NO3	mg/kg	9.9	9.6	96	90-110	N3

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 762586 762587

Parameter	Units	10523281001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Nitrogen, NO2 plus NO3	mg/kg	ND	15.5	15.5	14.8	14.9	91	92	80-120	1	10	N3

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 762588 762589

Parameter	Units	10523302004 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Nitrogen, NO2 plus NO3	mg/kg	ND	20.7	20.7	18.3	18.4	85	86	80-120	0	10	N3

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QUALITY CONTROL DATA

Project: 7135-0037 Bylin Dam-Revised Report

Pace Project No.: 10523306

QC Batch: 193045 Analysis Method: EPA 365.1
 QC Batch Method: SM 4500P B Analysis Description: 365.1 Phosphorus, Total
 Laboratory: Pace Analytical Services - Virginia
 Associated Lab Samples: 10523306001, 10523306002, 10523306003, 10523306004

METHOD BLANK: 761245 Matrix: Solid
 Associated Lab Samples: 10523306001, 10523306002, 10523306003, 10523306004

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Phosphorus	mg/kg	ND	2.5	07/09/20 11:31	

LABORATORY CONTROL SAMPLE: 761244

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Phosphorus	mg/kg	24.3	23.8	98	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 761246 761247

Parameter	Units	10523281001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Phosphorus	mg/kg	106	37.2	37.2	119	109	34	9	80-120	8	20	M1

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 761248 761249

Parameter	Units	10523302003 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Phosphorus	mg/kg	265	38.9	39.3	158	223	-274	-106	80-120	34	20	M1,R1

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QUALITY CONTROL DATA

Project: 7135-0037 Bylin Dam-Revised Report

Pace Project No.: 10523306

QC Batch: 192900

Analysis Method: EPA 9060A

QC Batch Method: EPA 9060A

Analysis Description: 9060 TOC Average

Laboratory: Pace Analytical Services - Virginia

Associated Lab Samples: 10523306001, 10523306002, 10523306003, 10523306004

METHOD BLANK: 760572

Matrix: Solid

Associated Lab Samples: 10523306001, 10523306002, 10523306003, 10523306004

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Mean Total Organic Carbon	mg/kg	ND	603	07/13/20 14:03	

LABORATORY CONTROL SAMPLE: 760573

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Mean Total Organic Carbon	mg/kg	3270	3220	99	49-151	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 760574 760575

Parameter	Units	10523281001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Mean Total Organic Carbon	mg/kg	22800	118000	117000	136000	136000	96	97	70-130	0	25	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 760576 760577

Parameter	Units	10523281002 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Mean Total Organic Carbon	mg/kg	17000	108000	108000	120000	121000	95	97	70-130	1	25	

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QUALIFIERS

Project: 7135-0037 Bylin Dam-Revised Report

Pace Project No.: 10523306

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit - The lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

ANALYTE QUALIFIERS

AL	The lab does not hold A2LA accreditation for this parameter.
E	Analyte concentration exceeded the calibration range. The reported result is estimated.
M1	Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.
N2	The lab does not hold NELAC/TNI accreditation for this parameter but other accreditations/certifications may apply. A complete list of accreditations/certifications is available upon request.
N3	Accreditation is not offered by the relevant laboratory accrediting body for this parameter.
R1	RPD value was outside control limits.

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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: 7135-0037 Bylin Dam-Revised Report

Pace Project No.: 10523306

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
10523306001	Bylin Core4 Pre Impound	EPA 3550	684526	EPA 8082A	684914
10523306002	Bylin Core4 Post Impound	EPA 3550	684526	EPA 8082A	684914
10523306003	Bylin Core5 Pre Impound	EPA 3550	684526	EPA 8082A	684914
10523306004	Bylin Core5 Post Impound	EPA 3550	684526	EPA 8082A	684914
10523306001	Bylin Core4 Pre Impound	EPA 3050B	685123	EPA 6010D	685373
10523306002	Bylin Core4 Post Impound	EPA 3050B	685123	EPA 6010D	685373
10523306003	Bylin Core5 Pre Impound	EPA 3050B	685123	EPA 6010D	685373
10523306004	Bylin Core5 Post Impound	EPA 3050B	685123	EPA 6010D	685373
10523306001	Bylin Core4 Pre Impound	EPA 3550C	684525	EPA 8270D by SIM	684769
10523306002	Bylin Core4 Post Impound	EPA 3550C	684525	EPA 8270D by SIM	684769
10523306003	Bylin Core5 Pre Impound	EPA 3550C	684525	EPA 8270D by SIM	684769
10523306004	Bylin Core5 Post Impound	EPA 3550C	684525	EPA 8270D by SIM	684769
10523306001	Bylin Core4 Pre Impound	EPA 3550C Sonication	684825	EPA 8015C	685324
10523306002	Bylin Core4 Post Impound	EPA 3550C Sonication	684825	EPA 8015C	685324
10523306003	Bylin Core5 Pre Impound	EPA 3550C Sonication	684825	EPA 8015C	685324
10523306004	Bylin Core5 Post Impound	EPA 3550C Sonication	684825	EPA 8015C	685324
10523306001	Bylin Core4 Pre Impound	EPA 5030 MT	684534	EPA 8015C	684602
10523306002	Bylin Core4 Post Impound	EPA 5030 MT	684534	EPA 8015C	684602
10523306003	Bylin Core5 Pre Impound	EPA 5030 MT	684534	EPA 8015C	684602
10523306004	Bylin Core5 Post Impound	EPA 5030 MT	684534	EPA 8015C	684602
10523306005	Trip Blank	EPA 5030 MT	684534	EPA 8015C	684602
10523306001	Bylin Core4 Pre Impound	ASTM D2974	685000		
10523306002	Bylin Core4 Post Impound	ASTM D2974	685000		
10523306003	Bylin Core5 Pre Impound	ASTM D2974	685000		
10523306004	Bylin Core5 Post Impound	ASTM D2974	685000		
10523306001	Bylin Core4 Pre Impound	TKN+NO3+NO2 Calculation			
10523306002	Bylin Core4 Post Impound	TKN+NO3+NO2 Calculation			
10523306003	Bylin Core5 Pre Impound	TKN+NO3+NO2 Calculation			
10523306004	Bylin Core5 Post Impound	TKN+NO3+NO2 Calculation			
10523306001	Bylin Core4 Pre Impound	EPA 351.2	193277	EPA 351.2	193318
10523306002	Bylin Core4 Post Impound	EPA 351.2	193277	EPA 351.2	193318
10523306003	Bylin Core5 Pre Impound	EPA 351.2	193277	EPA 351.2	193318
10523306004	Bylin Core5 Post Impound	EPA 351.2	193277	EPA 351.2	193318
10523306001	Bylin Core4 Pre Impound	EPA 353.2	193383	EPA 353.2	193397
10523306002	Bylin Core4 Post Impound	EPA 353.2	193383	EPA 353.2	193397
10523306003	Bylin Core5 Pre Impound	EPA 353.2	193383	EPA 353.2	193397
10523306004	Bylin Core5 Post Impound	EPA 353.2	193383	EPA 353.2	193397
10523306001	Bylin Core4 Pre Impound	SM 4500P B	193045	EPA 365.1	193154
10523306002	Bylin Core4 Post Impound	SM 4500P B	193045	EPA 365.1	193154
10523306003	Bylin Core5 Pre Impound	SM 4500P B	193045	EPA 365.1	193154
10523306004	Bylin Core5 Post Impound	SM 4500P B	193045	EPA 365.1	193154

REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: 7135-0037 Bylin Dam-Revised Report

Pace Project No.: 10523306

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
10523306001	Bylin Core4 Pre Impound	EPA 9060A	192900		
10523306001	Bylin Core4 Pre Impound	EPA 9060A	192901		
10523306002	Bylin Core4 Post Impound	EPA 9060A	192900		
10523306002	Bylin Core4 Post Impound	EPA 9060A	192901		
10523306003	Bylin Core5 Pre Impound	EPA 9060A	192900		
10523306003	Bylin Core5 Pre Impound	EPA 9060A	192901		
10523306004	Bylin Core5 Post Impound	EPA 9060A	192900		
10523306004	Bylin Core5 Post Impound	EPA 9060A	192901		

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APPENDIX D-7-B

PTMApp Results

Technical Memorandum

To: Christi Fisher, PE
State Conservation Engineer (ND)

From: Paul LeClaire, PE
Houston Engineering, Inc.

Subject: Bylin Dam Feasibility Report and Plan of Work: Sediment Delivery

Date: January 24, 2020

Project: HEI 7135-0037 Bylin Dam

BACKGROUND

Bylin Dam is located on the North Branch Forest River in Walsh County, North Dakota. It was constructed in 1964 and has exceeded its design life. The Dam is now in need of a rehabilitation. As part of the rehabilitation effort, a summary of sediment delivery to the dam is required.

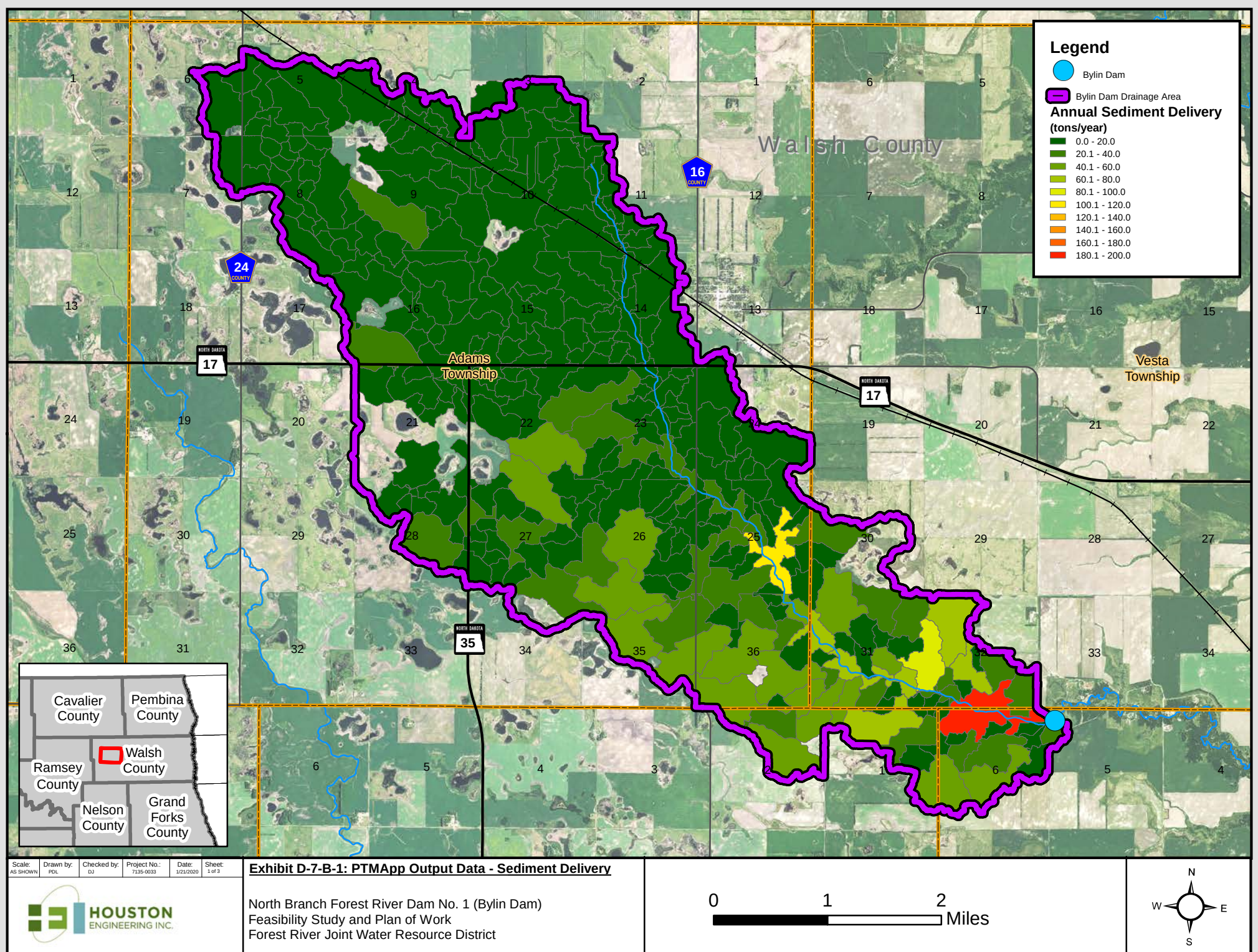
DATA ANALYSIS

The Prioritize, Target, and Measure Application (PTMApp) data for the Forest River Watershed were provided in November of 2019 from the International Water Institute. The PTMApp data shows major nutrient or sediment sources within the watershed upstream of Bylin Dam. The data was used to gain a better understanding of sediment delivery into the project area and sediment storage for the design of the dam moving forward.

The areas contributing overland sediment, total nitrogen, and total phosphorus are shown in Figure D-7-B-1, Figure D-7-B-2, and Figure D-7-B-3, respectively. The blank areas within the Bylin Dam drainage area represent the non-contributing areas. Areas shown as red indicate high contributions for sediment and nutrient delivery to Bylin Dam. For overland sediment delivery, areas near the reservoir seem to be the largest contributors of sediment deposits. Based on the data provided by PTMApp the large red area in Figure D-7-B-1 would produce more than 180 tons of sediment to the reservoir annually. Areas with high contributions for total phosphorus and nitrogen are more sporadic, with higher contributing areas generally located in the southern part of the drainage area to Bylin Dam. In Figure D-7-B-2, the red areas represent total nitrogen amounts in excess of 600 pounds annually. In Figure D-7-B-3, the red and dark orange areas represent total phosphorus amounts in excess of 30 pounds annually. A summation of the predicted total overland sediment, total nitrogen, and total phosphorus delivered to Bylin Dam annually is displayed in Table D-7-B-1.

Table D-7-B-1: Overland Sediment and Nutrient Totals to Bylin Dam

Parameter	Total Load
Overland sediment (tons/yr)	4,285
Overland total nitrogen (lb/yr)	51,450
Overland total phosphorus (lb/yr)	2,498



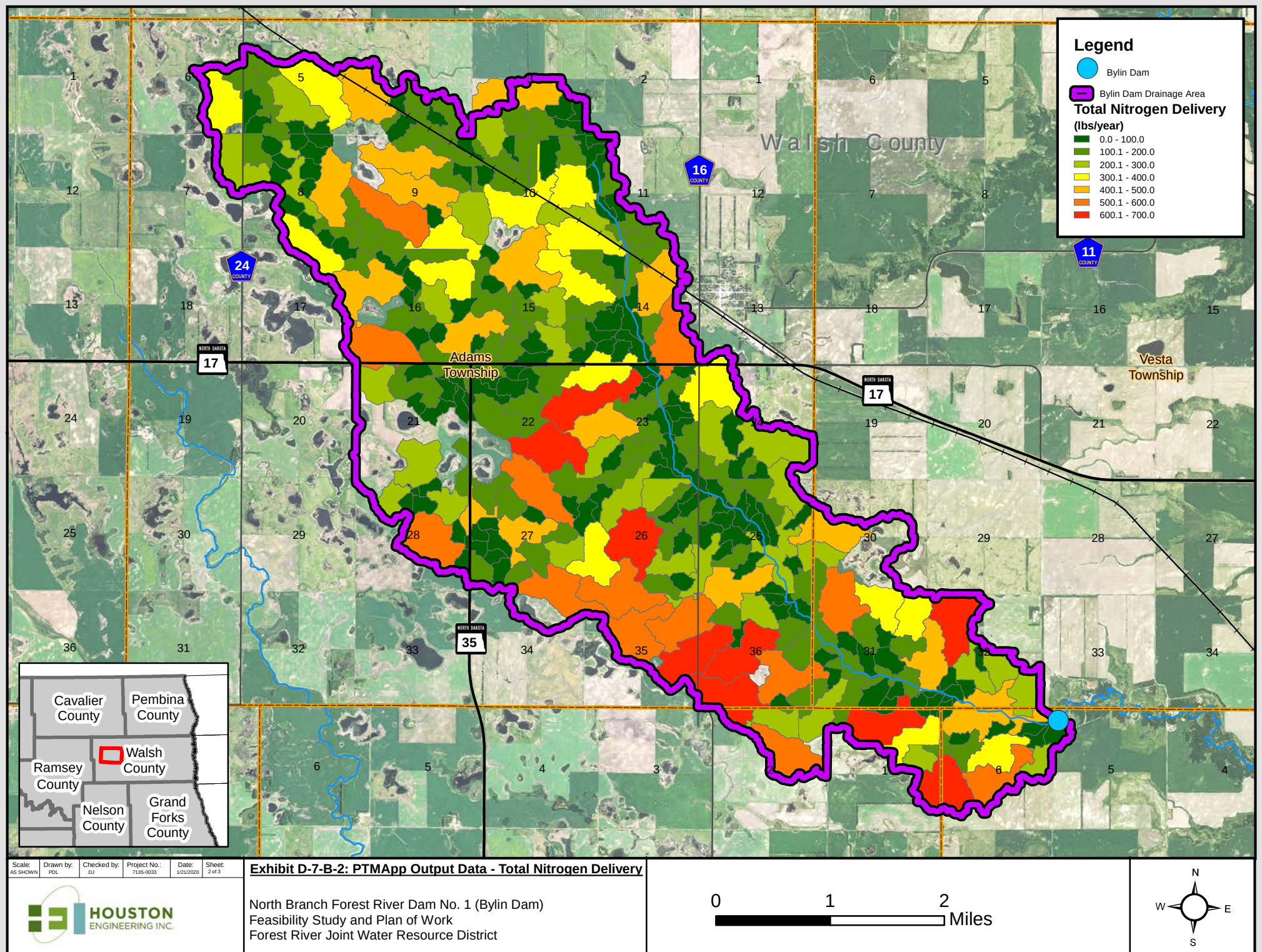


Exhibit D-7-B-2: PTMAApp Output Data - Total Nitrogen Delivery

North Branch Forest River Dam No. 1 (Bylin Dam)
 Feasibility Study and Plan of Work
 Forest River Joint Water Resource District

