June 11, 2010

RE: Town of Kabetogama
Puck's Point PER Amendment
SEH No. KABET 112571

Brett Ballavance
Senior Engineer
Minnesota Pollution Control Agency
525 Lake Ave. S., Suite 400
Duluth, MN 55802

Dear Mr. Ballavance:

This letter serves as an Addendum to the Preliminary Engineering Report (PER) for the Puck's Point Subordinate Service District dated October 22, 2007 and prepared by North American Wetland Engineering, LLC (NAWE). The purpose of this addendum is to provide an update to the treatment system section with respect to the Minnesota Pollution Control Agency (MPCA) nitrogen policy and treatment system suitability and to further evaluate an alternative for seasonal woodland irrigation. This addendum includes the following updates to the PER;

- Design Basis Update
- Nitrogen Removal Policy
- Treatment System Suitability
- Seasonal Woodland Irrigation/Infiltration Bed System
- Recommendations

Design Basis Update

In *Section 4.3 Wastewater Design Loadings* of the PER, mass loadings were provided in Table 4.4 based on an equivalent design population of 253 and typical per capita loading factors. In Appendix F of the Amended PER dated May 2007, a revised flow of 22,000 gpd was provided. The following table 4.4A provides an update to the design loads based on the increase in the projected wastewater flow from 20,000 gpd to 22,000 gpd (a 10% increase). Design flow and loading assumes the inclusion of the Wooden Frog Campground.

Table 4.4A – Maximum Design Loadings

Parameter	*Mass Loading (lb/day)*
BOD5	61.3
TSS	69.6
NH3-N	2.0
TN	8.9
TP	2.2

Nitrogen Removal Component

The Minnesota Pollution Control Agency (MPCA) has a Large Subsurface Treatment System (LSTS) ground water nitrate nitrogen policy. This policy requires every new LSTS to achieve a 10 milligram per liter (mg/L) or less nitrate nitrogen concentration in ground water at the property boundary or nearest receptor. The policy includes two permitting options. Permitting option No.1 includes an end of pipe (EOP) limit of 10 mg/L for total nitrogen after the treatment system and before discharge to the soil treatment and generally does not require long-term ground water monitoring. Permitting option No.2 requires a complete hydrogeologic assessment and a ground water monitoring well network. The hydrogeologic assessment is used to set the EOP rolling annual average limit above 10 mg/L total nitrogen based on a treatment system that utilizes ground water and precipitation dilution to meet the 10 mg/L limit at the property boundary or nearest receptor.

This project has a projected design flow that is above 10,000 gpd and therefore the system is classified as an LSTS. As an LSTS, the treatment system will need to be designed to meet the MPCA nitrate nitrogen removal policy. The PER selected permitting option No. 2. However, for this project, it is recommended that a pretreatment treatment system be provided to meet an EOP limit of 10 mg/L total nitrogen under permitting option No. 1. Permitting option No. 1 is a guaranteed method of complying with the nitrogen policy. Choosing to comply with the nitrogen policy through option No. 2 does not exclude the necessity of a nitrogen treatment system. Under permitting option No. 2, the addition of a nitrogen removal system may be necessary to comply with the policy if groundwater monitoring shows that natural attenuation is inadequate. The location of the south infiltration bed area is adjacent to the State DNR property line limiting the amount of area where groundwater and rainwater can dilute the effluent. In the event a nitrogen treatment system needs to be added, the overall treatment system would be more expensive because of the initial expense of an extensive hydrogeologic assessment and monitoring regime. An abridged hydrogeologic assessment will be required with permitting option No.1 as part of the requirement for an LSTS design. If the assessment shows a high potential for natural attenuation, permitting option No. 2 should be re-evaluated.

Treatment System Suitability

The PER recommended the use of a constructed subsurface horizontal flow wetland. However, the seasonality of the users in the project area better suits the use of an aerobic treatment system. Aerobic treatment systems are modular. During low flow periods, flow can be diverted to one treatment train to concentrate loading while the other trains in the system sit idle. Aeration to the active treatment train can cycle on and off to conserve energy if loading is less than the design condition. During winter when flows are minimal, the concern is that wetlands will freeze. Wetlands are an above grade treatment system that would require constant dosing of warm wastewater to prevent freezing. Periods will be experienced where no flow is occurring and the wetlands would freeze providing no treatment. Cold weather also slows or stops microbial activity that is required for treatment. Aerobic treatment units are located below grade and insulated by the ground to minimize the possibility of freezing. Air is heated as it is compressed in a blower and will provide additional warmth to the system. Because of the reliability of the aerobic treatment units to provide treatment throughout the year, the aerobic treatment unit is recommended over the constructed wetland.

Seasonal Woodland Irrigation

A seasonal system with woodland irrigation during the summer and infiltration beds during the offseason was the low cost alternative in the PER, but the availability of land was not certain. The proposed location is the same as the infiltration beds, but covers a larger area. The land is owned by the

Department of Natural Resources (DNR) and is also the location of the State owned Wooden Frog Campground. In either alternative, the availability of land is not guaranteed.

With the recommendation of a nitrogen treatment system, the disparity between the cost of the recommended option of treatment followed by year round infiltration beds and seasonal woodland irrigation increases. Seasonal woodland irrigation raises two concerns, 1)groundwater nitrogen contamination and 2)disturbance of 10 acres instead of approximately two acres.

The use of a woodland irrigation system during summer would preclude the system from falling under the design requirements of an LSTS. However, nitrogen treatment would be addressed in the design as well as the requirement for disinfection. A maximum nitrogen uptake rate of 100 pounds per acre per year is assumed for the site based on Table 4-11 in the EPA Process Design Manual: Land Treatment of Municipal Wastewater Effluents. The woodland irrigation system would be operated three months of the year and has a potential nitrogen loading of 80 pounds per acre per year. However, an aerobic treatment system has a typical nitrogen destruction rate of greater than 50% with some systems capable of achieving up to 70% destruction. The nitrogen loading to the irrigation field will likely not exceed 40 pounds per acre per year, far below the maximum uptake rate.

The woodland irrigation system would be designed to minimize environmental disturbance. High density polyethylene (HDPE) pipe would be used and is flexible. Flexibility would allow the pipe to be routed around trees and eliminate tree removal. Laying the pipe on the ground surface or just under the ground surface further minimizes environmental impact. A woodland irrigation system typically requires trimming of trees and understory to allow sprinklers to disperse the effluent. Spacing of the pipes and sprinkler heads could be reduced to minimize trimming.

Recommendations

The recommended system includes a STEP collection, aerobic treatment, seasonal woodland irrigation with offseason infiltration beds. The recommended system is the least cost option from the PER with the exception of the aerobic treatment system. The aerobic treatment system provides more reliability during low flow freezing conditions because the system is modular, located below grade and depends on warm air from a blower for aeration. The use of the proposed site will require permission from the State and either a lease or easement.

A cost estimate for the recommended alternative was included in the PER. Estimates for the STEP collection system, aerobic treatment units, woodland irrigation system, and infiltration beds were evaluated and updated where necessary. Updated cost tables are included as attachments to this letter amendment.

Table 1 – Woodland Irrigation Alternative Cost Estimate

Item	PER Cost ($)	Updated Cost ($)
STEP Collection	$ 218,261	$ 444,700
Aerobic Treatment Units	$ 279,291	$ 279,291
Spray Irrigation	$ 320,873	$ 390,873
Infiltration Beds	$ 62,315	$ 62,315
Total	$ 880,740	$ 1,177,179

The cost for the aerobic treatment units and infiltration bed were left unchanged as shown in Table 1, where as the costs for the STEP collection system and woodland irrigation system is increased. Changes to the collection system include updated pipe costs and addition of a cost for rock removal that was not included in the PER. Bedrock is at ground surface over most of the project and will be necessary for installation of most of the pipe. Updates to the spray irrigation cost includes an increased cost for a control building and an added cost of groundwater monitoring that was not included in the PER. In total, the estimated cost increased $296,439 from the PER estimate.

An Environmental Information Worksheet (EIW) has also been prepared and included with this letter. A request has been made to the Department of Natural Resources (DNR) for a Natural Heritage Information System review of the area. Once the review has been completed, the EIW will be completed and submitted to the MPCA.

If you have any questions regarding the recommendations in this Addendum, feel free to contact me at 651-490-2140 or Dustin Maas at 651-765-2981.

Sincerely,

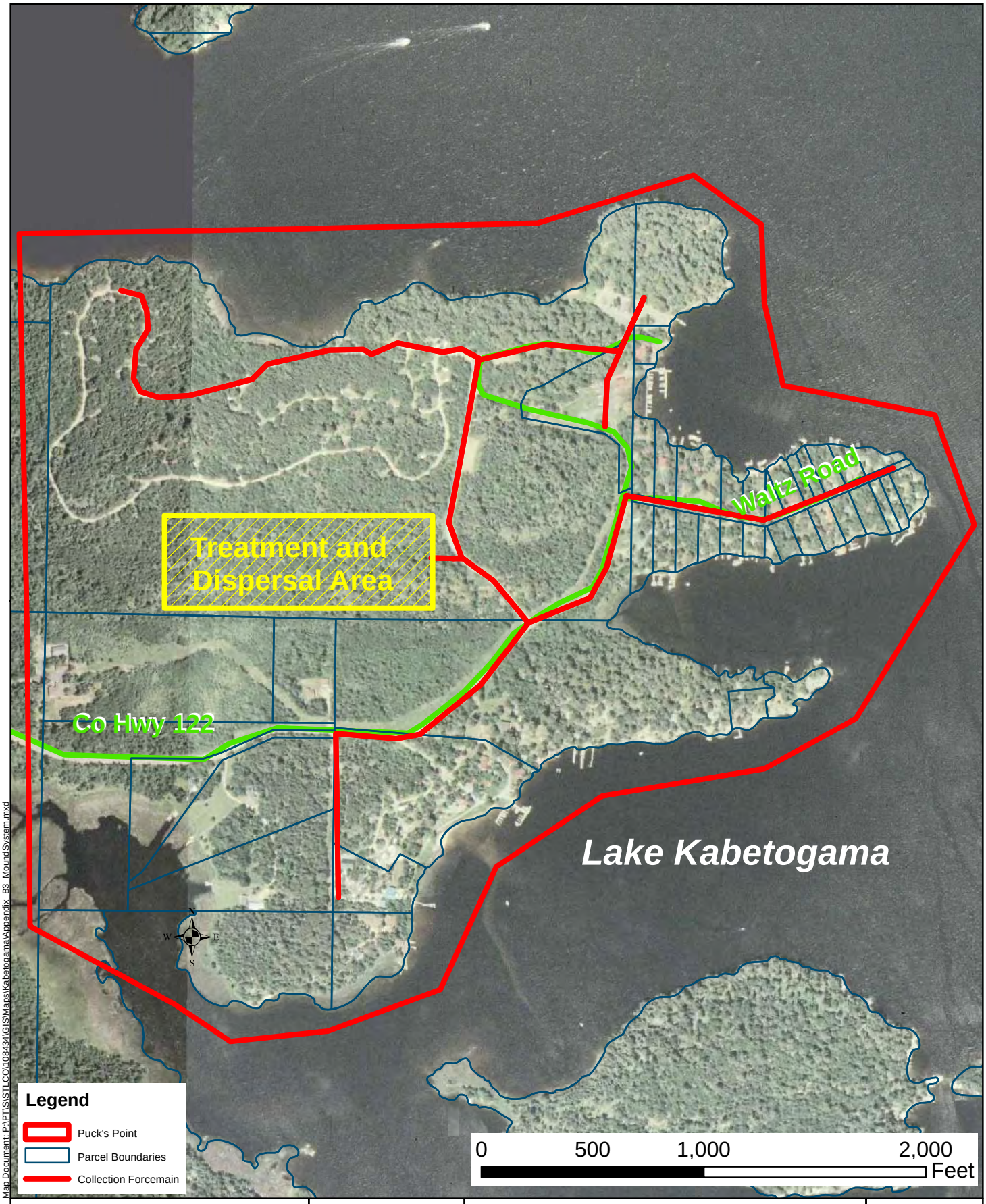
SHORT ELLIOTT HENDRICKSON INC.

John Friel
Project Manager

Dustin Maas
Project Engineer

Attachments:
Table C.3 Revised
Table E.3 Revised
Figure 1: Proposed Site Plan
Environmental Impact Worksheet

c: Jessica Werder, SEH-St. Cloud
Julie Kennedy, SEH-Grand Rapids
John Stegmeir, Minnesota DNR Forestry
Robert Nevalainen, Town of Kabetogama



Map Document: P:\PTS\STLCO\108434\GIS\Maps\Kabetogama\Appendix B3 MoundSystem.mxd

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Project: KABET 112571
Print Date: 05/19/2010

Map by: naa
Projection: St Louis Coords TM96
Source: St Louis Co, NRCS, SEH

Puck's Point Site Plan

Puck's Point Facility Plan
Kabetogama, Minnesota

Figure 1

Project: Kabetogama
Flow: 22,000 gpd

Table C.3R S.T.E.P.
Collection System
Engineer's Opinion of Cost

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
Service Connections	20	units	$ 1,000.00	$ 20,000
Pressure Sewer - Noninsulated	2,899	lf	$ 20.00	$ 57,980
Pressure Sewer - Insulated	966	lf	$ 30.00	$ 28,980
Rock Removal	1,288	cy	$ 100.00	$ 128,844
Septic / Pump Tanks	80000	gallons	$ 1.50	Per Landowner
2-way Valve Stations	6	units	$ 2,500.00	$ 15,000
3-way Valve Stations	1	units	$ 3,500.00	$ 3,500
Flushing Stations	3	units	$ 1,500.00	$ 4,500
Air Relief Valve Stations	2	units	$ 2,500.00	$ 5,000
Effluent Pump Stations	20	units	$ 2,000.00	Per Landowner
Site Electric per Pump Station	20	units	$ 750.00	Per Landowner
Pavement Replacement	2000	sf	$ 5.00	$ 10,000
Sidewalk Replacement	0	sf	$ 5.00	$ -
Surface Restoration	23190	sf	$ 1.15	$ 26,669
Septic / Holding Tank Abandonment	20	units	$ 500.00	Per Landowner
Standby Generator	0	units	$ 5,000.00	$ -
Telemetry System	0	units	$ 5,000.00	$ -
CONSTRUCTION SUBTOTAL				$ 300,473
Contingency			15%	$ 45,071
Engineering, Permitting, and Bidding Services			14%	$ 42,066
Construction Observation			3%	$ 9,014
Surveying and Testing			2%	$ 6,009
Legal and Administration			10%	$ 30,047
Construction Interest			2%	$ 6,009
Bonding and Insurance			2%	$ 6,009
CAPITAL COST TOTAL				$ 444,700
Annual Service Calls	6	calls	$ 148.00	$ 888
Annual Service Provider Costs	90	hours	$ 75.00	$ 6,750
Annual Utilities	27,302	kwh	$ 0.10	$ 2,730
Septic Tank Pumping	10,000	gallons	$ 0.10	$ 1,000
ANNUAL OPERATION AND MAINTENANCE COSTS				$ 11,368
Present Worth Capital Replacement	30%		$ 300,473	$ 90,142
Present Worth of Annual O&M	30	years	4.5%	$ 185,175
TOTAL LIFE CYCLE COST				$ 720,017

Project: Kabetogama
Flow: 22,000 gpd

Table E.3R Spray Irrigation (May 15 to Aug 15)
Disposal System
Engineer's Opinion of Cost

ITEM		QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
Rotor Sprinklers		202	units	$ 100.00	$ 20,200
Satellite Controller		1	units	$ 5,000.00	$ 5,000
Remote Control Valves		22	units	$ 300.00	$ 6,600
Pumps / Controls	2	10	HP	$ 1,000.00	$ 20,000
Irrigation Storage		50,000	gallons	$ 1.50	$ 75,000
Supply Manifold		1800	lf	$ 15.00	$ 27,000
Hatches		2	units	$ 800.00	$ 1,600
Manhole Access Castings		2	units	$ 300.00	$ 600
Site Work		10.13	acres	$ 1,500.00	$ 15,195
Land Costs		11.14	acres	N./A.	N./A.
Access Control Measures		1	ls	$ 5,000.00	$ 5,000
Disinfection System		1	ls	$ 50,000.00	$ 50,000
Site Electric		4	units	$ 750.00	$ 3,000
Monitoring Wells		1	ls	$ 25,000.00	$ 25,000
Control Building		1	ls	$ 25,000.00	$ 25,000
CONSTRUCTION SUBTOTAL					$ 279,195
Contingency				15%	$ 41,879
Engineering, Permitting, and Bidding Services				14%	$ 39,087
Construction Observation				3%	$ 8,376
Hydrogeological Investigation		0	ls	$ 10,000	$ -
Surveying and Testing				2%	$ 5,584
Legal and Administration				2%	$ 5,584
Construction Interest				2%	$ 5,584
Bonding and Insurance				2%	$ 5,584
CAPITAL COST TOTAL					$ 390,873
Annual Service Calls		3	calls	$ 443.00	$ 1,329
Annual Service Provider Costs		108	hours	$ 75.00	$ 8,100
Annual Utilities		10,216	kwh	$ 0.10	$ 1,022
ANNUAL OPERATION AND MAINTENANCE COSTS					$ 10,451
Present Worth Capital Replacement		35%		$ 279,195	$ 97,718
Present Worth of Annual O&M		30	years	4.5%	$ 170,229
TOTAL LIFE CYCLE COST					$ 658,820