**Study Design:** Historically, dissolved oxygen reaches critical levels under low flow and high temperature conditions. This study aims to collect data under these critical conditions. The study will include 14 instream sampling sites, 4 stationary sampling stations, 7 point sources, and 5 sediment sample locations. These sample locations account for major tributary additions. Sampling will be completed at each location 2 times during 2016 (July and September).

Instream Sampling: YSI 6920 will be used to collect continuous Temperature, DO, Conductivity, and pH data. Grab samples for each sampling effort will be tested for include Ammonia, TKN, Nitrate/Nitrite, UBOD, Chlorophyll A, Ortho-P, and Total Phosphorus. The 14 proposed locations for instream sampling are:

1. **Headwater Conditions;** just below the Wausau Dam (FERC 1999), in Lake Wausau (WBIC 1437500).
2. At the confluence of the Big Rib River (WBIC 1451800) and the Wisconsin River (WBIC 1179900) near County N/Rib Mountain Drive
3. In the Wisconsin River (WBIC 1179900) below the Wausau WWTF
4. In Lake Wausau(WBIC 1437500) just west of the Eau Claire Flowage (WBIC 1437800)
5. In the Wisconsin River (WBIC 1179900) above the Rothschild Dam.
6. In the Wisconsin River (WBIC 1179900) below the Domtar and Lignotech outfalls
7. In the Wisconsin River (WBIC 1179900) below the WPS Discharges
8. Above the Mosinee Dam in the Mosinee Flowage (WBIC 1434900)
9. Below the Expera-Mosinee Outfalls in the Wisconsin River (WBIC 1179900)
10. The Wisconsin River (WBIC 1179900) just prior to entering Lake Du Bay (WBIC 1412200)
11. Where the Big Eau Pleine Reservoir (WBIC 1427400) enters Lake Du Bay (WBIC 1412200)
12. In the mid-section of Lake Du Bay (WBIC 1412200) below Mullins Cheese
13. In the southern section of Lake Du Bay (WBIC 1412200)
14. Below the Du Bay Dam in the Wisconsin River (WBIC 1179900)

Continuous Sampling Stations: YSI 6920 probes will be deployed to collect continuous Temperature, DO, Conductivity, and pH data. This data will identify diel fluctuation of temperature, respiration, and reaeration. Alkalinity will also be tested at these stations. These probes will be deployed 2-3 days before the instream sampling events. The proposed locations are upstream of the 4 dams:

1. **Headwater Conditions;** Wausau Dam (FERC 1999). Located just south of Highway 52.
2. Rothschild Dam (FERC 2212). Located south of Highway 29
3. Mosinee Dam (FERC 2207). Located North of Highway 153
4. **Tail water Conditions\*;** Du Bay Dam (FERC 1953). Located at the southernmost portion of Lake Du Bay.

\*Note: A probe may be deployed to collet long term data in Lake Du Bay. Time budget includes a weekly probe check at this location.

Point Sources: Each point source will have their effluent sampled. The grab effluent samples will be tested for BOD5, BOD Ultimate (UBOD), Ammonia, TKN, Nitrate/Nitrite, Ortho-P and Total Phosphorus. 5 Industrial dischargers may have and additional UBOD sample taken to properly characterize the BOD:UBOD ratio for modeling. Effluent samples will also be tested for Temperature, DO, Flow, Conductivity, and pH. The affected point sources are listed below. (Note: WPS Weston 1, 2, 3 & 4 only supply a heat load for the model)

Permittee (WPDES #)

* Wausau WWTF (0025739)
* Domtar Rothschild (0026042)
* Lignotech (0003450)
* Foremost Foods (0003875)
* Rib Mountain WWTF (0035581)
* Expera-Mosinee (0003671)
* Mullins Cheese (0054127)
* Wisconsin Public Service Corp. Weston 1&2 (0003131)
* Wisconsin Public Service Corp. Weston 3&4 (0042765)

Headwater conditions: The headwater parameters necessary for the EPD-RIVE1 model that must be lab tested are UBOD, Ammonia, TKN, Nitrate/Nitrite, Chlorophyll, Ortho-O and Phosphorus. Additional data collected at the time a grab sample is collected includes Temperature, DO, flow, Conductivity, pH and algae. Headwater conditions will be collected just below the Wausau Dam (FERC 1999) in Lake Wausau (WBIC 1437500). This location will be the same as Instream Location #1 above.

Sediment: To characterize sediment oxygen demand, core samples will be collect at 5 locations. The proposed locations are within each impoundment and one river reach. 4 samples will be repeated for a total of 9 Sediment oxygen demand samples. The quoted cost for the samples is $6045 (approximately $740/sample). Additional quotes will be collected, so this would be the maximum cost. The locations may change based on data needs and budget, but preliminary locations selected are:

* The upper portion of Lake Wausau (WBIC 1437500) at the confluence of the Wisconsin River (WBIC 1179900) and the Big Rib River (WBIC 1451800). 2 samples
* The lower portion of Lake Wausau (WBIC 1437500) after the addition of the Eau Claire Flowage (WBIC 1437800). 1 sample
* In the Mosinee Flowage (WBIC 1434900). 2 samples
* In the middle section of Lake Du Bay (WBIC 1412200), just north of the Marathon-Portage county line. 2 samples.

Sampling event: Two sampling events will be required to collect the majority of the data. When low flow and high temperature conditions are identified, 3 teams (3-4 people) will be deployed. Two days before the sample event, the continuous data logs will be deployed. On the day of sampling, each team will collect data at 1/3 of the sampling locations. Similar to the original data collection efforts, composite samples will be taken and multiple depths and locations across the river to account for mixing and channel shape in the model. An additional person will work with the point source facilities to collect effluent samples. Two days after the sampling date, the continuous data logs will be removed from their locations. Central office staff assisting with data collection will deliver all samples to the state lab.

SLOH has indicated they have capacity for a batch of 20-30 UBOD samples at a time. There is space for up 100, but more lab equipment would need to be purchased. Spacing the 2 synoptic sampling events far enough apart should limit the amount of any additional lab equipment for this pilot. The preliminary dates of early July and Late September have been selected to allow for lab processing time between synoptic runs.

As mentioned above, an additional BOD5 and UBOD sample may be collected at a later date if the BOD5:UBOD ratio shows a high degree of variability.

Travel Time: We have a quote from Bill James to conduct a travel time study. The total cost would be $9,080 for dye tracing and data processing. Alternatively, if the Department were to borrow this equipment, the rental cost would be $2,415. Additionally, the Department would assume the liability of borrowing this equipment. This cost does also not include Department travel time, staff hours, boat gas, etc. that would be added for the Department to conduct the study.