

AGENDA

2016 August 11

Regular Meeting: 6 pm

Lincoln City, Council Chambers

801 SW Hwy 101, 3rd Floor



Quick Look:

- **Financial Report**
- **Committee Briefings**
- **Lake Project Updates**

Devils Lake Water Improvement District

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www.DLWID.org

I. Roll Call

II. Consent Agenda

- a) Minutes of the Previous Meetings
- a) Financial Report

III. Comments from Citizens Present on Agenda/Non-Agenda Items: *This is an opportunity for members of the audience to bring to the District's attention any item not listed on the agenda for public hearing. Comments are limited to five (5) minutes per citizen and the Board of Directors may use the light system. Speakers may not yield their times to others, and as a general rule this is not a time for exchange of questions. At the conclusion of this agenda item, a board member may discuss or raise questions regarding an item presented by a citizen. The Chair has the authority to reduce the time allowed for comment in accordance with the number of persons present and signed up to speak.*

IV. Unfinished Business.

(Agenda Support Item)

- a) Committee Briefings:
 - i. Sewer Committee
 - ii. Events and Communication
 - iii. Septic Inspection
 - iv. Save our Shoreline & Water Monitoring
 - v. Special Projects
- b) Projects:

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- i. Hostetler Park Sediment Removal
- ii. Devils Lake Aeration Project
- c) Lake Manager Recruitment:

V. New Business

(Agenda Support Item B)

VI. Non-agenda Item

VII. Additional Comments from Citizens Present on Non-Agenda Items: *This is an opportunity for members of the audience to bring to the District's attention any item not listed on the agenda for board discussion. Comments are limited to five (5) minutes per citizen, and the Board of Directors may use the light system. Speakers may not yield their times to others, and as a general rule this is not a time for exchange of questions. At the conclusion of this agenda item, a board member may discuss or raise questions regarding an item presented by a citizen. The Chair has the authority to reduce the time allowed for comment in accordance with the number of persons present and signed up to speak.*

VIII. Board Comments & Announcement

IX. Adjournment

IV. Unfinished Business

Agenda Support Item A

a. Committee Briefings.

i. Sewer Committee. Committee members and staff met with the City Manager and technical staff on July 18, 2016 to identify and discuss next steps required to move forward with an east-side lake sewer project. The City indicated without annexation, they were not inclined to fund the project and take the lead to design, construct, maintain and operate a potential new east-side lake sewer project. Another meeting will be held during late August to re-discuss this entire issue. *What follows is from Director Brian Green, "The City seemed to assume annexation was the only way to require mandatory hook up and that, without mandatory hook up, the City could be stuck with an unfunded liability for the costs of the system. So, at our next meeting, or series of meetings, we will be exploring whether there are other methods besides annexation to impose a mandatory hook up date and to otherwise finance the new sewer system in a reliable manner. I believe other methods besides annexation do exist and are feasible."*

ii. Events and Communication. Agenda for 8/9/2016 meeting (cancelled) is posted below:

(a) Programs for Fall 2016:

- Devils Lake Revival-postponed until 2017
- Christmas Parade
- Boat Races.

(b) Programs for Spring, Summer, and Fall 2016:

- Kids Fishing Derby (ODFW) 4//8/2017
- \$10,000 Fishing Derby
- Devils Lake Dash 4/2017
- Boat Safety Event
- Solar Eclipse 8/21/2017
- Boat Races (end of October)
- Christmas Parade

iii. Septic Inspection. Committee is seeking additional members and will hold a committee meeting within 30 days.

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iv. Save our Shoreline and Water Monitoring. Water testing and result posting is continuing on a weekly basis. Updates are available online, through email, and at Kiosks. Algal samples have been tested this summer for HAB's with negative results. The recent testing resulted in a visible water column depth of 15 feet. As of August 8, 2016, **All water test sites for e-coli were identified as green except for one (high) site at Thompson Creek.** Please visit the website for most updated information. Staff will continue to meet with the Salmon Drift Creed Watershed Council to discuss water quality issues in tributary creeks to Devils Lake, especially Thompson Creek.

v. Special Projects. A committee meeting was held on July 31, 2016 with highlights as follows:

- (a) The annual July 4th SOLVE event was a first annual success bringing in more than 200 pounds of waste material. 23 individuals participated in this effort.
- (b) The fall cleanup event is in the planning stage, including protocol for alerting lake front residents of major storm events.
- (c) Boater safety event held a Regatta Park. Engage Barry Brewster to cover proper safety equipment needs for all applicable water craft.
- (d) Next meeting is 10/1 from 10-11am.

h. Devils Lake Dredging Project: This project has been temporarily placed on hold. The volunteer effort by a local excavation contractor and dump truck operators will not accomplish this project per permit requirements and the donated dredge option is now not available (for sale in California). Staff will continue to research all other options to accomplish this project.

i. Devils lake Aeration Project:

Staff accomplished requirements by Dr. Alex Horne as follows: Staff and Larry Rich completed a lake-wide depth survey by use of a "fish-finder", the results indicated the lake is shallower than past studies have detailed. Staff and Bill Sexton obtained a swimming marker buoy, rigged the data logger devices and installed the rigged buoy roughly 220' off of Sand Point.

Staff has had weekly conversations with Dr. Horne regarding aeration applications. These discussions prompted the below clarification and project update document:

Memo to: Tom Wood, Lake Manager, Devils Lake Water Improvement District

From: Alex Horne, Consultant to DLWID

Cc: Andrey Chernishov (HBH Consulting Engineers), Richard Steel (Laguna Science) & Ken O'Hara (Flow-thought)

Re: Update and Clarification of scope of the water quality proposal for Devils Lake "Design an aeration-mixing system to reduce blue-green algal (Cyanobacteria) blooms."

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Date: 3 August 2016

Based on regular fortnightly phone calls between Tom and Alex, this memo clarifies some aspects of the joint project between HBH Consulting Engineers, Newberg, OR and myself (Alex Horne Associates) with cooperation from Richard Steel (Laguna Science) and Dr. Ken O'Hara.

OVERALL PROPOSAL. A major purpose of the proposal is to design a system that has sufficient detail that it could go out to bid for construction with only minimal changes made by DLWID.

PHASE 1. SELECTION OF A SHORT LIST OF METHODS.

Phase 1, a small part of the overall contract, was completed and presented to the Board of Directors who accepted the overall findings. The BOD directed that the aeration-mixing-oxygen options be the main focus of Phase 2 (overall and detailed design, primarily to be carried out by the Oregon-registered firm HBH Consulting Engineers).

PHASE 2. In an attachment to the proposal for Phase 2 is a letter (dated 1/20/2016) from HBH detailing part of my proposal that states "...the aeration system is to consist of one blower housing in one building on the lake shore connected to approximately 30,000 feet of aeration piping and 300 diffusers in the lake." I need to make it clear that this is not the only option that the overall project will consider. Soon after the start of my negotiations with DLWID back in 2014 it became clear that a standard "one size fits all" aeration or aeration-mixing (VEM) or oxygenation system would not be optimal for Devils Lake. The need for HBH Consulting Engineers to design the 30,000 feet of pipe + shoreline generator shed (or enclosed oxygen storage-generation facility) is because *this was the maximum project that I could envisage at the time of the proposal* in fall 2015 after a trip on the lake and examination of many of the data files available on the DLWID web site. Other options were always on the table and are listed below.

PRELIMINARY FINAL RECOMMENDATIONS. These will likely consist of a yes/no to the use of oxygenation and a series of options on aeration-mixing with various sizes for the system depending on how much of the

Definitions

- **Aeration.** Release of compressed air from the lake bed normally restricted to the deeper water zones. It is a well-known method designed to mix oxygen from the surface to the lake bed and add a little oxygen directly from the air bubbles. The drawback is that the source of

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most oxygen is from photosynthesis of algae in the surface waters. When the algae become moribund for some reason, aeration can fail and fish kills may result.

- **Vigorous Epilimnion Mixing (VEM).** Mixing of much of the lake volume including the shallower areas (epilimnion in many lakes and reservoirs). A fairly recent method whose main purpose is to reduce scums of blue-green algae. The drawback is that large areas of shallow water need to be mixed so cost is higher than aerating only the deep water which is usually a small percent of the lake.
- **Oxygenation.** Addition of pure oxygen usually to the bottom water as a bubble plume, a bottom water-oxygen mixture (Speece Cone) or via a U-Tube. Main reason is to prevent anoxia at the sediment-water interface and prevent the release of nutrients and toxicants from the mud. The drawback is that oxygen must be made on the shore or brought in as liquid oxygen.

OPTIONS FOR THE DESIGN AN AERATION-MIXING SYSTEM TO REDUCE BLUE-GREEN ALGAL (CYANOBACTERIA) BLOOMS

- For the final proposal it has always been the idea to give DLWID several options in terms of size and thus cost.
- **Full-scale system.** This option includes the 30,000 feet of pipe. However, the length of pipe was not finalized. I think I made this clear in my presentations but should have added a written comment to balance the HBR letter. The 30,000 feet figure was arrived at from my early estimates and should be considered the maximum. Even if the full scale system is used the total length of the pipe could much less, perhaps only 10,000 feet depending on the diameter of the pipe and the design of the side arms that bear the aerators (diffuser plates). The idea of the full-scale aeration system is to vertically mix as much of the lake surface area as possible. The volume of air needed to do this will dictate the size and length of the pipes as well as the number of diffusers.
- **Deep water-thalweg only system.** This option would aerate/mix/oxygenate only the deeper parts of the lake. These are usually found in the thalweg or old river channel. The need for this system will depend on the results of this summer-fall oxygen data loggers deployed in late July 2016. Less pipe would be needed for this option since only a relatively short and restricted part of the lake will be treated. Thalweg aeration is similar to most aeration systems. Air or oxygen can be added in the thalweg depending again on the data logger results. If the loggers show prolonged anoxia (zero dissolved oxygen, DO) or functional anoxia (< 2 mg/L DO), then pure oxygen additions (100% by volume) could be the best option. If low DO is less common or severe then air alone (20% by volume) could suffice. However, aeration-mixing of the thalweg only is unlikely to reduce blue-green algae blooms in Devils Lake since the thalweg comprises a relatively small area of the lake, leaving other areas for algae to grow undisturbed.
- **One-third or two-thirds scale system.** The cost of an aeration-mixing VEM system is mostly determined by the area of lake to be mixed. If it is assumed that the thalweg will be aerated, then the choice is how much more of the lake will be treated? The mixing ability of air is proportional to the depth of the water; deeper water is more easily mixed than shallow water. In particular, for Devils Lake large areas are 8 feet or less deep. These shallow waters would not normally be mixed using air. However, in Devils Lake these shallow waters carry most of the biomass of blue-green algae nuisance blooms which can move sideways hundreds

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of yards in an afternoon. At present the team is still working on how extensive the system would be.

- **Shoreline facilities.** Some form of enclosure on the shoreline is needed for the aeration compressors, the compressor that makes oxygen, the storage of liquid oxygen or an on-shore Speece Cone. The size (and number) of these facilities depends on how much air or oxygen is needed. Often the size and location of compressor enclosures depends on the location of power lines and also the noise. Sound baffling is common but takes up space so requires a larger building. Heat buildup is a major problem for aeration (or oxygen generation) since the compressors generate heat. Ventilation is easier if the building is larger though fans can be used to blow out excess heat. Thought the Phase 2 letter from HBR lists only one shoreline site, this is because there would be considerable increase in cost if other sites were to be selected and surveyed for suitability for noise, visuals, wildlife, power and local support. The DLWID would be at liberty to suggest more sites to potential bidders for the project construction.

RECENT DEVELOPMENTS

- **Depth survey.** A recent depth survey by Tom Wood showed that the lake overall is somewhat shallower than it was when fully surveyed in 2005 by Eilers and others. Tom did not find many areas above about 8 feet deep. However, the mean depth cannot be resolved from this data. The deepest point recorded by Tom Wood was 19 feet which is perhaps three feet less than Eilers found in 2005. The last measured rate of sedimentation was 0.64 cm/y on average so about 6.4 cm (2.5 inches) so cannot explain the observed change. It is possible that more sediment has been added recently. Fewer or shallower deep areas means that anoxia is less likely and oxygenation would be less favored. Lots of water < 6 or 8 feet would mean more diffusers would be needed to mix substantial areas of the lake.
- **Data loggers.** Tom installed two data loggers at near bottom and near surface were installed in late July. Assuming there are no hitches and a test after a few weeks shows data is being recorded, the decision on oxygenation and aeration can be made based on data.
- **Lack of obvious blue-green algae scum blooms in 2016.** Tom reports that there were no obvious blooms to date. Blue-green blooms in eutrophic lakes like Devils Lake are reasonably predictable, even though the species composition may not be. Blue-green blooms tend to be summer-fall so there may be time but Tom thinks the windy season coming up will keep them from becoming a big nuisance. One thought that comes to my mind is that the scummy blooms of the past two decades, also shown in the sediment profiles by Eilers and a study by CH2M-Hill, were not always so abundant. Both sets of authors suggest the decline in submerged aquatic vegetation (SAV) was the cause of the blue-green rise. In turn, the SAV decline was due to overstocking of grass carp that grazed the SAV almost to extinction. Now the grass carp numbers are much less (maybe almost gone) and some evidence of new SAV has been reported. It is possible that the growth of this SAV has reached a critical point where blue-greens are less favored though this seems to be too early.

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- **Use of shoreline aeration-mixers.** Tom reports that some shoreline home owners have installed a 1.5 hp version of a two propeller-driven device (airstream pro) that draws water from near the surface with one brush-type propeller that is claimed to generate bubbles and uses a second high-volume propeller to push the water over a tray to jet horizontally over the water for a claimed 100 foot or so. The manufactures claim it is good for restricted areas like channels and marina. That has been the use so far at Devils Lake. The device is very similar to that of Titus Industries in performance but Titus's DO₂E device has no moving parts and is powered by a low-energy 3 psi blower. For open lake work these devices are problematic in that the aerated water and bubbles stay at the surface and soon burst to the atmosphere. We need oxygen at the lake bed not its surface which, unlike wastewater lagoons, are well-oxygenated at the surface. My discussions with Titus three months ago suggested that a deeper pipe could be used to suck up bottom water (so long as that was not very far since the added head would require more power) and the same design alteration could presumably be made to the airstream pro. Both devices use 110-volt shore power (or could use floating generator-powered systems) so both are sensible devices unlike the under-powered devices also available from some other manufactures. I think all the team agrees that low-powered blowers or propellers are good ways to move water around though maintenance is sometimes a problem with large systems like Flyte Co. propellers. If these small aerators-water circulation devices come into use in many sheltered or enclosed channels or areas in Devils Lake where algae may accumulate, the task of the team for a whole-lake system could be made much simpler since these shallow edge areas are the costliest to treat with VEM. Ken O'Hara has already suggested using a pipe in the ground near the shore or around the lake edges on the bottom where compressed air generated at a central site could be released into the shallow water to mix or move the water. In principle that is the same as the airstream pro but on a large scale.

<http://www.dlwid.org/Projects.html#Aeration>

j. Lake Manager Search: The board continues to seek a permanent Lake Manager by working with SDAO staff. The position vacancy period was open from July 11-August 8. As of August 8, one resume was submitted and has forwarded to the board for consideration.

Position Opening: July 11-August 8, 2016

Screen Candidates: August 26, 2016

Candidate Assessment August 26, 2016

Community Meet and Greet: August 26, 2016

Board Interview/Conditional Offer: August 27, 2016

Begin Work: October 1, 2016

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