



Frequently Asked Questions (FAQs) 07-25-2022

To assist our members and community with communicating some of the questions and answers that we have been asked recently about Lake Mitchell, we have put together the following list. Hopefully, these answers will help answer some of your questions.

Answers may change as more engineering design work occurs, but these are the answers known as of July 25th, 2022.

Q: What is wrong with Lake Mitchell?

A: Over the last 90+ years, Lake Mitchell has built up Phosphorous and other nutrients that continue to generate more frequent and more intense algae blooms. The algae feed off the phosphorous which continues to grow and colonize into large clumps and surface scum until the algae have consumed more phosphorous than what remains in the lake to continue to grow at the previous rate.

Q: Shouldn't the Phosphorous all be gone then if it is consumed by the algae?

A: Unfortunately, not. There is not enough phosphorus in the water column for the bloom to continue to grow at the pace that it was growing before, so it starts to die back. The dead algae then sink to the bottom of the lake where the phosphorous either soaks into the soft sediment or remains in the water column.

Q: So, does that phosphorous just stay there?

A: Once the sediment has trapped as much phosphorous as it can, it is saturated and the phosphorous remains within the soft sediment layer, on top of the sediment, or within the water column. This phosphorous easily gets stirred up. The algae start consuming it again and the above process repeats.

Q: Can phosphorous leave the lake?

A: The only way for phosphorous to leave the lake is if the spillway has water running over it and the phosphorous in the water column goes over the spillway along with the water. The lake refills approximately 5 times a year with water from Firesteel Creek and rain events. This doesn't mean that the phosphorous is eliminated with these rain events because the majority of phosphorous in the lake is in the sediment. If you can imagine the sediment being like a dirty sponge in a kitchen sink and you add new clean water into the sink. In this example, the soiled sponge transfers dirt to the new clean water which is exactly what happens with water entering the lake where the phosphorous releases from the lake sediment into the water column for algae to consume and grow.

Q: How much phosphorous is in the Lake and how does that compare to the phosphorous coming from the watershed?

A: The EPA quantifies an endangered water body as any water body with a phosphorous level over 70 parts per billion. The lake typically averages around 800 parts per billion through the summertime. We see the lowest levels around 300 parts per billion and the highest levels exceeding 1,500 parts per billion. In dry times of the year or dryer years with less precipitation resulting in less water flow in Firesteel Creek, the watershed's phosphorous levels are usually 20% or more lower than the in-lake phosphorous levels. Approximately 48% of the lake's phosphorous issues are currently in the lake from the last 90+ years. The other 52% of the phosphorous load in the lake comes from the watershed yearly so both watershed and in-lake improvement work need to happen to greatly diminish the intensity and frequency of algae blooms in Lake Mitchell.

Q: So, what is needed to fix the lake.

A: This is a two-part solution. The city of Mitchell, along with private landowners, government agencies, and nongovernment agencies like Ducks Unlimited, Pheasants Forever, and Friends of Firesteel are working on creating land used for filtration and phosphorous absorption. This will take the form of wetlands, sediment ponds, buffer strips, no-till farming, conservation easements, and so much more. The city purchased the Kelley Property which they are using approximately 37 acres of land around the creek to turn into wetlands to help absorb the phosphorous. The wetlands can then be cut or burned periodically. **The wetland project will start construction work in 2022 and be completed in 2023.** Additionally, there is work occurring to extend wetlands further toward Lake Mitchell and even into the West end of Lake Mitchell. The in-lake work is needed to remove the phosphorous built over the past 90+ years. The sediment is at full concentration level and needs to be removed. Based on a recent study by Dakota Wesleyan University Chemistry Students, low to high functioning wetlands, along with a 50 percent removal of sediment from the lake will have a 200 to 600 parts per billion reduction on the average phosphorus level within the lake. This would bring the average phosphorous levels in the lake down to between 200 to 600 parts per billion.



Q: How will the phosphorous-laden sediment be removed from Lake Mitchell?

A: The city has hired a dredging engineering company named Barr Engineering to design a dredging plan to remove most of the phosphorous-laden sediment from the lake bottom. The type of dredging will be mechanical dredging. This type of dredging requires a water lowering device likely to be placed in the side wall of the current dam. The lower this device is on the dam, the greater the water flow will be able to move phosphorous out of the lake. The water lowering device will be used to lower the lake water level gradually so that additional core testing of the soil sediment can occur to see if there are high concentration areas of phosphorus in certain parts of the lake. If less depth of sediment is needed to remove the phosphorous, then more of the total lake phosphorous can be removed. The city is working with Barr Engineering to get an updated price for full sediment removal versus the previously quoted 50% sediment removal. The city has also contracted with Barr Engineering to create the final construction plans for the water lowering device. The project to construct such a device will likely happen in the spring or summer of 2023.

Q: Where does the dredged sediment go and how does the dredge processes work?

A: Mechanical dredging occurs by draining a portion of the lake and using scrapers, excavators, bulldozers, and dump trucks to remove and haul away phosphorous-laden sediment to a sediment site. Mechanical dredging can be more exact in the phosphorous removal and can create new opportunities for sculpting the lake bottom for increased fish and wildlife habit and breeding areas. There are several dredge sediment areas being considered around the lake. One of the areas is the 40-acre Firesteel Park on the SW corner of the lake. The closer the dredge sediment area is to the dredge work, the less cost incurred. This is all part of the design work that Barr Engineering is currently working on.

Q: Why are the 40 acres of Firesteel Park a good possible sediment area?

A: This area is close to the lake. It would be dug out first as a borrow pit for dirt that could be used for a jetty/marina around the West end boat ramp area. This reduces the cost of a possible Marina. **The city recently received a one-million-dollar matching grant from the federal government to help cover the cost of this work.** Then that dug-out area can be filled up twice as much with dredge sediment. Once the water slowly drains out of the sediment, then the sediment can be sealed with a clay layer and covered with black dirt, and seeded. The area will return to park use that possibly includes a sledding hill, hiking, biking, and cross-country trails, new trees, and so much more. The national park service along with Confluence Landscape Architects have created designs of what this park could possibly function and look like.

Q: What happens with the water that is removed with the sediment? If it drains back to the lake won't that defeat the purpose of dredging in the first place?

A: No. Though this process is still being engineered by Barr Engineering, the highest concentration of phosphorous is in the sediment. There is phosphorous in the water column already, but this is far less concentrated than what is trapped in the sediment. The sediment is what needs to be removed because it is at full concentration. Additional details will be made on this subject as Barr Engineering completes the construction design plans and specifications for the construction work. Barr Engineering has completed similar lake projects with similar solutions that have great improvements in water quality.

Q: How is the city going to pay for the dredging work and how does the public know whether they can even afford it.

A: Barr Engineering was hired in May of 2021 to design the construction plans. They have answered the below questions but are still refining their design work. Some of this information may change in the future.

1. What type of dredging will occur to remove the sediment? (A: Mechanical)
2. Where are the dredge sediment sites? (A: Firesteel Park)
3. Will there be a draw-down feature added to or near the spillway, and when can the draw-down happen? (A: Yes likely in the side wall of the spillway and drawdowns would take place typically in the fall of the year but may include the summer and winter for the full lake drawdown.)
4. How long will the dredge work take? (A: Likely the lake may be drawn down for 18 months)
5. How much will the dredging project cost? (A: Initial Estimates are between \$15 to \$23 Million)

The funding mechanism has not been fully determined yet but will likely come from a combination of low-interest loans, bonding capacity, sale of the Kelley House which has a current offer, grant funds, fundraising from Friends of the Firesteel, and more.

Q: If the project is within a budget that the city can afford, when can the dredge work begin?

A: It is possible that the in-lake project beginning with the water draw-down structure could begin in the spring of 2023. Barr Engineering would need another 8 months to complete the last portion of the dredge plans and specifications for the in-lake work and that would put the bidding process and the start of dredge work happening in the fall of 2023. The dredging work could take between 12 to 24 months to complete. This information is likely to be updated as additional details from the soil sample are determined and the mechanical dredging plans are further developed and completed.

For more watershed and lake project progress updates and lake information resources, become a Friends of the Firesteel member by visiting www.friendsofthefiresteel.org.