Project Design

For this project, I want to create a visualization that will allow the user/reader to have answers for multiple questions they might have. My initial design is something like in **figure 1** below where this would be a website that a user would come to and interact with. Following the visualization mantra of overview first, zoom and filter, and then details on demand. The type of data we have is various conditions from the lake water to the air above the lake.

Chart, line chart

Description automatically generated

**Figure 1:**Initial sketch of the main page for the dashboard concept. Designed using Adobe XD. The simplistic design will allow for future refinements to match up with something closer to GVSU website standards or AWRI website standards.

The great thing about this graph is there will be a drop-down selector that will change the graph visualization so that the users can interact and learn more while doing that. For this class, I will initially make the graph visualizations in Tableau this way I can get a good idea of how the data will appear before working on using the D3 javascript to have the graphs shown on the webpage. As I mentioned in the Project Proposal there is an API for obtaining the data and using that to make the initial D# visualizations will be the first step but if this were to be implemented then it would need to be reworked to use the data that gets directly sent from the buoy. I am also assuming that for visualizations on other sites hosted by GVSU they also use D3.

In this dashboard, 7 different bins are showing off information for the user. The Wind Speed and direction bin will show off the direction the wind is blowing in cardinal directions. The wind speed and background in that bin could also change color based on the intensity of the wind speed (red= high winds). The Air Temperature bin will be slightly modified based on AWRI comments after seeing this initial graph since we have learned that the buoy does not show the cloud coverage. But the initial thinking is to have a bin that shows the air conditions the buoy collects which are current air temperature, humidity, barometric pressure, and whether or not it has rained in the last hour. The bins for both chlorophyll-a and phycocyanin are more gas gauge types of visualization. This was to get across instances where there might be unsafe conditions or a high concentration of algae in the lake. This visualizing I have seen used on another page for the GVSU AWRI lake conditions monitoring, but the gauge is showing off an average for the prior year. The column bins are both for water temperature and the DO concentration at the different depths of the lake. Finally, the large bin where the graphs will go. The initial thinking is to have that bin be a placeholder to show off graphs that the people at AWRI would have in mind to show. But for this project, I have also come up with a few ideas for visualizations of what I think would be useful to see in that spot. There is also a slider function that allows the users to move backward and potentially forwards in time (predictive modeling for forwards in time) and observe how the data changes in the graphs and the other bins on the dashboard. There is also a legend to give a short description of the variables that are being graphed and a download button where users will be able to download the data and the graphs for this page.

For visualizations, I am thinking of creating, line charts, bar charts, and a combination of a line chart with an area chart. With all the charts for this project, something to keep in mind is that our x-axis will always be a time series and based on comments from AWRI they would like to see at most the bar going back to one week prior by an hourly increment. By default, I am going to have the charts only go back maybe 10 or 12 hours prior, and as the day goes on a new point is places on the right side of the graph while one on the left side drops off. Only showing max 12 hours in the day, but this might change when I go to make the visualizations. For these visualizations, the data variables that I am going to show off are air temp, wind speed and direction (small arrows for points showing cardinal direction), surface and bottom temperature as well as surface and bottom dissolved oxygen (DO), and thermocline depth.

I believe the best way to show off both temperature and the wind speed and direction variables would be with two separate line charts. This way the users can see quickly if the temperature or wind speed is going up or down and the change in direction for the wind speed over 12 hours. For the surface and bottom water variables (temperature and DO), I would use a bar chart to show the focus on the idea that the surface and the bottom of the lake have different environments and highlight the difference between the two. Lastly, the area+ line chart would be to show off the general location of the thermocline in the water column. The thermocline is a distinct layer where temperature changes more drastically with depth than the layers above or below it. The goal would be to show the temperatures at the different depths with the area plot then have one line across the chart indicating the depth for the thermocline.