

Future Recommendations

The combination of Best Management Practices (BMPs) used for this project were capable of meeting and exceeding all the design criteria and constraints. However, there are many improvements and steps that can be taken to make the design more effective.

In the fall semester the team considered many different types of low impact development BMPs. The sand filter basin paired with a naturally vegetated area was an adequate fit based on the parcel of land provided and the criteria required to be met. One additional functionality that a sand filter basin has is the incorporation of an underdrain PVC piping system to help filter the water that passes through. The underdrain can tie into the surrounding stormwater system to help accommodate and treat more flow. The team was unable to access any stormwater plans for the City of Elizabethtown and thus no underdrain was used in the design. Moving forward, obtaining plans, and adding an underdrain will help the design filter more stormwater from a broader network of storm drains.

An ArcGIS delineation of the watershed was conducted and showed that an estimated 20% of the Buffalo Lake Watershed was developed (Dangermond & Dangermond; 2022). The size of the watershed is 3840 acres meaning that 760 acres of the watershed are in some form of development ranging from low to high intensity. The BMP location is a high area of concern because it is located at the start of a main drainage line that leads directly to Buffalo Lake. The design can filter the flow of 1 acre of intensely developed area. On the team's site visit many of the current BMPs within the watershed were found to be sub-optimal due to a lack of maintenance causing impaired functionality. Therefore, the majority of the city's runoff is not being filtered properly. One specific study conducted in Brazil found that 71-77% of sediment loads in the Lago Paranoa catchment came from construction sites and semi-detached residential areas (Franz, Makeschin et al, 2014). For these reasons, Elizabethtown should use low impact development BMPs in the future that require much less maintenance and are more easily accessible than the current underground designs. There are many sites throughout the watershed that could implement naturally vegetated areas. Research has shown that a well-established vegetated BMP can remove up to 70% of TSS by itself (Kentucky Transportation Cabinet, 2012). Elizabethtown is a rapidly developing area that is seeing a rapid increase in construction. To help combat the sediment transport from these sites Elizabethtown should enforce the use of silt fencing and other mitigation practices.

The least prominent, but still considerable recommendation is to not add a BMP at all. Our BMP design is limited by city owned space, cost, and current BMPs in the area. During our visit to Elizabethtown, we consulted with Rita Davis about current BMPs in the area to get a better idea of what was needed from our design. It was emphasized there was no pressing need for another BMP since the stormwater team did not have enough time or staff to monitor the current BMPs in place (personal communication, September 29, 2021). Our design also requires a large budget for funds that have not been collected or advertised. Currently we are estimating the cost of around \$30,000 with no government or local donations for funding. The benefits outweigh the risks of our design but as it stands, the future of our BMP solution is unknown.

Significant future work is needed to implement the design. Some recommendations are the installation of underdrainage piping, only using a vegetated area, and no BMP at all. Installing underdrainage piping would help filter the water passing through if there is access to stormwater plans for the City of Elizabethtown. Using a vegetated strip would allow for a lower impact design while still

removing required sediment. The last recommendation of no BMP is only advantageous if there is no future funding and an understaffed stormwater group.

References

Dangermond, J., Dangermond L. (2021) ESRI: ArcGIS [computer software] California: Redlands.

Franz, C., Makeschin, F., Weiß, H., & Lorz, C. (2014). Sediments in urban river basins: Identification of sediment sources within the Lago Paranoá catchment, Brasilia DF, Brazil – using the fingerprint approach. *Science of The Total Environment*, 466-467, 513–523.

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