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Newark Wastewater Treatment Plant Solar Array - A Case Study

The redevelopment of 444 Hebron has the potential to create some serious beneficial impacts for the community of Heath. The site has a long history of producing manufactured goods and supporting the lives of a large workforce living in the area, but now the factory is closed and much of the land on the property has become contaminated due to the manufacturing byproducts. Figuring out an appropriate use-case for the contaminated areas of the site is imperative to the success of the redevelopment project. When looking into potential redevelopment strategies for the site at 444 Hebron, it is helpful to see how these challenges have been solved by similar sites. At the wastewater treatment facility in Newark, there is a site with many similarities to 444 Hebron that was remediated and turned into a solar array field. The remediation of contaminated areas and the installation of a solar array on the contaminated land are very similar between the sites (Lund 2018). Because of this similarity, we can use the wastewater treatment facility site as a case study to figure out the best redevelopment approach for the contaminated land at 444 Hebron.

In order to garner pertinent information from the wastewater treatment site, it is necessary to figure out the commonalities and differences between the two sites. Drawing parallels between the sites will help us pick which strategies are most effective for our redevelopment by allowing us to see what works best. The site at the Newark

wastewater treatment facility was formerly owned and operated on by the Newark Processing Company. Newark Processing was involved in the refinement and processing of aluminum byproducts and generated large quantities of aluminum dross that were deposited on the site (Figure 1). The contaminants from the dross included aluminum, aluminum oxide, ammonia, free metals, and salts which were leaching into the Licking River directly adjacent to the site and were negatively impacting the water quality and biotic community of the river (Ohio EPA[2]). After Newark Processing went bankrupt in 1997, the site essentially became a public works project to clean up the

Figure 1. Soil contaminated with aluminum dross at the Newark Processing facility prior to remediation efforts in 2004 (Sourced from Mauter 2019).

contamination. The city of Newark was then in charge of remediating the site, which involved the removal and grading of contaminated soil, the placement of a root-barrier membrane, and a 2-foot geocomposite soil cap with non-woody vegetation on top (Ohio EPA[3]). The Army Corps of Engineers was tasked with stabilizing the bank where erosion was threatening to send more contaminated materials into the Licking River. Because of the success of the remediation efforts, the City of Newark was issued a covenant not to sue under the Voluntary Action Program (VAP) of the Ohio EPA (Ohio EPA[1]).

The Newark Processing site is not only a great example of a site that is similar to 444 Hebron in terms of the site history and remediation requirements but also has a solar array that is very similar to the solar idea provided by our redevelopment proposal. 444 Hebron has contaminated soils that must be sealed off with a membrane and capped with soil, just like the Newark Processing site. Because of this facet of the VAP, any ground-mounted solar installation must not penetrate through that cap, and therefore must be mounted in a different way than a conventional ground-mounted array (Ludt 2019). At the Newark Processing site, the solar panels were mounted using concrete ballasts that sit on top of the soil, removing the chance of damage to the soil cap or membrane (Figure 2). This method of mounting the solar panels is more expensive than a traditional mounting system, but the benefits and simplicity of the system outweigh the potential cost drawbacks. At the 444 Hebron site, there are areas of the property with remarkable similarities to the remediated Newark Processing site. In our redevelopment proposal, we have allocated a large solar array to be installed on areas with contaminated soil that has been sealed and capped with soil in a very similar manner. Because of these similarities, it would be prudent to employ the concrete ballast method to mount any solar panels on the contaminated areas to eliminate the risk of damaging the membrane layer or soil cap.

Figure 2. Solar panels mounted in concrete ballasts at the former Newark Processing site.

Another facet of the wastewater treatment facility solar array is the relationship that the facility has with AEP Onsite Partners, the company that owns, operates, and

maintains the panels. The City of Newark and AEP Onsite Partners have a power purchase agreement whereby the solar panels and any electricity generated by them belongs to AEP (. AEP Onsite Partners is responsible for the maintenance of the array and keeping foliage reduced around the panels. This agreement allows the city to not be held liable for any maintenance or problems that might arise with the panels but also locks the city into a long-term agreement that poses some financial risk to the city.

The treatment facility has an agreement with AEP Onsite to buy electricity generated from the panels at a fixed rate for 25 years (Although the electrons coming from the panels may or may not go to the treatment facility once they enter the grid). This agreement costs the City of Newark approximately $35,000 a month and provides about 25% of the treatment facility's electricity needs. According to Mark Mauter, the director of the Department of Development for the City of Newark, the cost of buying the electricity through this power purchase agreement is more expensive for the city than if they just paid for the electricity normally. The city views this project more as an environmental positive than an economic one, however, because this is a fixed-cost agreement, any increase in the price of electricity will make the agreement more economically favorable to the city (Mauter 2019). Since electricity costs are expected to increase, this gamble will hopefully pay off, but regardless it is an interesting strategy to try and save some money.

The capacity of the solar array is approximately 1 MW, and while that amount of energy is enough to cover the needs of the wastewater treatment plant, the panels are often not generating power at full capacity. The time of year, cloudiness, and temperature are all factors that can affect the amount of electricity generated, and therefore it is prudent to install an array that far exceeds the amount of consumption on-site if we want to produce more energy than we consume. With net metering, excess power can be sold back to the utility grid, but the grid may not be able to handle that sort of capacity, which is one of the reasons why the solar array at the treatment plant is only 1 MW (Mauter 2019). Although the generation of energy might be limited at times, it is important to consider that generation is highest during the middle of the day, which is often when electricity prices are the highest. This allows for peak shaving, which drastically decreases the electricity costs due to the savings at peak usage hours.

At the 444 Hebron site, it unclear what the energy consumption of the site will look like. It is entirely dependent on the use-case of the site and whether it is developed into some sort of industrial facility with high energy consumption or something that consumes less electricity. According to our proposal, the amount of space allocated to solar panels could generate about 10 MW which would likely more than cover the consumption of electricity on site. Although it is a former industrial site, it is unlikely that the surrounding grid has the capacity to handle such a high electricity load considering the grid around the Newark site could not handle 2 MW (Mallet 2007). Some retrofitting of the surrounding grid would be necessary in order to handle the capacity, otherwise selling the energy back to AEP might not be possible, which would seriously damage the economic viability of the system.

There are many important lessons to be learned from the remediation and conversion of the former Newark Processing site into a solar array field. It appears that the method of installation for the panels at the Newark site would work wonderfully at the 444 Hebron site. The conditions of the remediated areas are very similar between the sites, and therefore the concrete ballasts seem like the best option for supporting a ground-mounted solar array. Although the concrete ballasts are more expensive to install than a traditional ground-mounted setup, the need to maintain the integrity of the cap necessitates the use of ballasts (Ludt 2019).

A relationship with AEP Onsite Partners may be useful for a solar setup at 444 Hebron. A power purchase agreement could be a good way to reduce the upfront cost of purchasing the panels and long term costs associated with any maintenance or upkeep. However, being locked into a multi-decade agreement might not be the smartest option for a site such as the one we are proposing at 444 Hebron. Our proposed solar array would be on a completely different scale than the Newark site (approximately 10x the size), so owning the panels outright might make more economic sense than having AEP Onsite Partners own them and buying their electricity. Through the use of net metering, the panels could generate enough excess energy to pay for themselves over the next 20 to 30 years (DeVito 2007).

Overall, it seems that both the former Newark Processing site and the 444 Hebron site have many parallels and overlaps that can help inform us on the best way to design the redevelopment of 444 Hebron. The remediation strategy of the contaminated land is similar enough between sites that I would recommend the same concrete ballast setup for a ground-mounted solar array. The economic viability of a power purchase agreement with AEP Onsite Partners may make sense for the wastewater treatment facility but at the 444 Hebron site, the best option might be to own the panels outright and use the energy savings and excess power generation to pay for the panels over a period of time. This will almost guarantee that the costs are recuperated instead of gambling on increasing electricity costs in the future. Hopefully, the lessons learned from this case study will be implemented in the redevelopment of 444 Hebron.

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