

Land and Water

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West River Parkway Slope Repairs



On Sept. 1, 2016, more than 2 years after the initial mudslide, West River Parkway was reopened. Many lessons were learned in the design, construction and implementation of this project.

Three seconds is all it would take for 4000 cubic yards of soil to dislodge itself above West River Parkway in Minneapolis on June 19th of 2014. Known for its beauty along the Mississippi River in east Minneapolis, West River Parkway is usually a busy destination for runners, bikers, photographers, and fisherman alike. 4.2 inches of rain would thankfully keep many people away from the site on that day in June. The soil on the 1:1 slope had already received 11 inches of rain in June making it saturated and heavy. Ground water seepage compounded the issue, likely contributing to the mudslide that took place at 7 PM that evening. The Minneapolis Park and Recreation Board (MPRB) would immediately close the section of West River Parkway between 4th Street South and East 24th Street. Undenounced to them and the public, it would remain closed for more than 2 years.

Within the first week following the mudslide, debris was all cleaned up and temporary impermeable sheeting was placed over the failed slope to prevent further erosion issues. Adding to the overall concern was the infrastructure stability at the top edge of the slope. Fairview Hospitals and Clinics reside at the top edge and



4,000 cubic yards of soil was dislodged on June 19th of 2014 after 4.2 inches of rain fell on already saturated ground.

had obvious concerns about the unstable slope. The MPRB and Fairview worked together for many months to determine suitable repairs that need to take place while

keeping the hospital secure and the parkway and trails at the bottom of the slope protected. Two months after the mudslide the Federal Emergency Management

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SLOPE STABILIZATION

Agency (FEMA) added Hennepin County to Disaster #4182, which would provide the additional critical funding needed for cleanup, additional temporary protection measures needed for safety, and the permanent repairs that were needed. Barr Engineering Co. (Barr), which headquarters in Minneapolis, was hired in August of 2014 to engineer temporary and permanent solutions to the failure.

Not So Fast

FEMA geotechnical engineers were sent in to assess the damage and work with MPRB and Fairview on reimbursement costs. Ultimately the total shared cost of the entire project would be in the range of 5.6 million dollars.

Analysis began quickly. It soon became apparent that the final repairs could not take place in 2014 and winter work was not advisable. Temporary measures were put into place during the end of 2014 to protect the slope. Bidding on the project would take place in the spring of 2015, with initial project timelines eyeing an October 31, 2015 completion. Many federal regulations needed to be met and permits applied for on the project. Environmental scrutiny was high given the project's proximity to the Mississippi River, a Minnesota Pollution Control Agency (MPCA) 303(d) listed Impaired Waterway. Historical requirements also needed to be met and approval wasn't granted from the federal historical preservation regulators until April 2015.

In June of 2015 a contract was awarded to Veit & Company to begin construction in July. Design called for five separate retaining walls to be installed on the slope, not only for stability, but also to reduce the incline. Barr Engineer Michelle Kimble states that "one of the biggest challenges is designing a project so it can be easily implemented. This is done on every project, but given the location and constraints of this project....even more challenging." Access to the site was extremely tricky for the contractors. Adding to the challenges of building the walls in distinct critical order was the fact that another rainy August and September of 2015 caused several additional slope failures below where the construction was taking place. The slope was again unsafe, putting construction equipment and workers in harm's way. Equipment was removed from the operating lo-



An erosion control design plan was put into place that would address the temporary needs of the slope and maybe more importantly, the long term sustainability of vegetation on the slope.

cation and would not return until methods to control the erosion were satisfied. The subsequent delays and safety concerns for the workers pushed the project back almost three months. It was now apparent the construction timelines would not be met. The Minneapolis Park and Recreation Board had originally planned on opening West River Parkway and trails to public usage on January of 2016. After re-evaluation they determined that timelines of the project, safety of the public, site security, and seasonal construction limitations would keep the road closed.

Work on the walls proceeded slowly through the winter on 2015 and into spring of 2016. Also critical to the long term stability of the slope, ground water seepage needed to be addressed. Continual flow in multiple locations along the native limestone bedrock made this a challenge. A network of new underground drain tile to intercept and redirect the groundwater into the storm sewer system was installed, preventing the surface soils from again becoming too saturated and potentially sliding under the immense weight. New soils would be imported onto the site following the construction of the walls in early 2016.

One Chance

Adam Popenhagen of Profile Products

became involved with the surface design requirements in early 2015 when consulted by Barr. All steep slopes on poor soils are a challenge, but this had additional limitations that needed consideration, including:

- Access to the segments of the steep slope
- Shaded areas on the northeast facing slope
- Aesthetic considerations for the river, parkway, and trail users
- Overland flow from above and around sides of the site
- Time of year considerations on installation
- Sequencing issues with prime contractor and sub-contractors
- No room for error in erosion and vegetation solutions

So in the words of the great Gene Kranz of the Apollo space program (played by Ed Harris in the movie Apollo 13), "Failure is not an option!"

An erosion control design plan was put into place that would address the temporary needs of the slope and maybe more importantly, the long term sustainability of vegetation on the slope. The imported soil was tested for deficiencies, the overland flow was addressed in the vegetated and un-vegetated states, seed specialist Ramy Turf was consulted on proper seed mixture, ero-

sion design software PS3 (profilePS3.com) was used in product determination, and sequencing was aligned with contractors. Barr took multiple factors into account when determining final erosion protection and revegetation plans. The contractor was given strict guidance to adhere to the plans and project specifications with no alternatives allowed.

All Hands On Deck

The prime contractor, Veit, installed the first phase of the surface stabilization, which was the Turf Reinforcing System, consisting of two different and compatible products. The first product specified by Bar Engineers was Futerra 7020 Turf Reinforcement Mat (TRM) for its ability to handle flow and its growth quickness, density, and uniformity. With a an open space of 95%, the permanent TRM readily accepts a hydraulic infill, captures soil and encourages vegetative growth. The second product in the System, used on the upper half of the slope for slippage concerns, was Tecco Mesh. The high-tensile steel wire system was installed over the TRM and both of the products were soil nailed together at one time. This gave the slope protection

against future subsurface slippage as well as permanent surface stabilization.

The second phase of the surface erosion installation process was handled by the erosion control sub-contractor Neaton Brothers. The experienced contractor from Mayer, MN has worked many difficult

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projects in the past, but considered this a unique challenge in its own right. Mathew Nelson of Neaton Brothers says "Between Veit, Ramy Turf Products, the engineer, Profile, Neaton Brothers and the MPRB,

working with each other to get the correct and most effective product installed on the slope was a major component to the project's success. It was refreshing to have an engineer who listened and considered the suggestions from all parties involved." Installation of this phase began on July 8, 2016. The first of two products to be installed through the turf reinforcement system was ProGanics Biotic Soil Media (BSM). Following testing of the imported topsoil material, it was identified that the organic level was still not in the acceptable range of 3-5% that would be needed for long term sustainability of the vegetation. The BSM would not only raise the organic level into the suitable range but would provide other beneficial constituents for the plant such as; biochar, seaweed extract, humic acid and endomycorrhizae. Neaton Brothers installed the product with the customized seed mix and fertilizer needs (identified also from the soil test) via the hydroseeder.

Immediately following installation of the BSM, it was time for the "cap" to protect against erosion and grow the quick vegetation needed. Since there could be no washouts and remobilizing for additional



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SLOPE STABILIZATION

repairs would be very difficult, Flexterra High Performance Flexible Growth Medium (HP-FGM) was chosen to protect the 1:1 slope. Injecting the HP-FGM into the remaining cell space of the turf reinforcing system created the Green Armor System. Together as one “system”, the BSM, FGM, and TRM gives the site the ultimate in turf reinforcement while still providing the ideal growing medium for the plant to thrive.

Again access to the site was tricky for the erosion control crew. The hydraulic infill application took only a matter of hours from start to finish. The immediate protection given by the system came just in time for subsequent rains which hit the area hard. An additional 5.1 inches of rain fell in July of 2016 with a subsequent 7.8 inches more in August. It was immediately evident that the surface slope protection was the correct one for this particular site. No sediment movement was the goal when design started in 2014, and no sediment movement was the result after application in July of 2016. Growth was seen within five days of application. The next few weeks

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would see the vegetation grow thick and uniform across the slope. The MPRB and Fairview Hospital were more than pleased with the aesthetics of the repaired slope.

Finally

On September 1, 2016, more than 2 years after the initial mudslide, West River Parkway was reopened by the MPRB. Local news channels covered the opening ceremony and the MPRB reiterated the difficulty of the project and the importance of



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The teamwork and communication throughout the project by all parties made a very difficult project an ultimate success.

a quality repair of the slope. Many lessons were learned in the design, construction and implementation phases of this project including:

- Success is not created in a vacuum, it takes a lot of people working together for one common goal
- Success comes from knowledge, experience, hard work, and thorough design
- When failure is not an option, many of the details become amplified and working together becomes increasingly important
- Spending more on the “front end” saves you exponentially more on the “back end”

The teamwork and communication throughout the project by all parties made a very difficult project an ultimate success. “The result of the open communication on the project is the success of the lush vegetation and over all slope durability. Working with Veit is always a pleasure as they always put their sub-contractors in a position to complete the project safely, and timely” says Mathew of Neaton Brothers Erosion. The West River Parkway slope repair wasn’t the largest or most expensive project, but it was critical to the Mississippi River, Fairview Hospital, and the community who enjoy its time along the banks of the river. **L&W**

*by Adam Popenhagen, CPESC,
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