PennDOT I-70 Reconstruction Project

Yukon & Madison Interchanges

The Contractor's Perspective

TRUMBULL

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Today we'll discuss the practical application and construction techniques used on the project

Want to bridge the gap between design and construction

If constructors can understand designers, and designers can think like contractors, the result is always better than the "silo'ed mentality" of stand-alone design, and stand-alone construction.

There is no such thing as "a field issue" and no such thing as "I'm only a dumb contractor."

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Key Points

Designers	Contractors
❑ Consider access	❑ Have the right gear
❑ Check neighboring areas	❑ Be flexible, react quickly
❑ Sometimes simplest is best	❑ Critical thinking benefits everyone

Project Overview

PennDOT I-70 Reconstruction Project

Yukon & Madison Interchanges

- Approx. 3.7 Miles of Roadway Reconstruction
- Just Under 900,000 total CY of Excavation
- 4 New Bridges
- 2 Box Culvert Rehabs, 1 New Box Culvert
- 1 T-wall retaining wall
- 33,000 Linear Feet of Stormwater Drainage Pipe
- 14 Jack and Bore transverse pipe crossings
- 9 Stormwater Basins
- Contract value approx. $92.5M

A few of the bigger statistics for the job to give a feel for the size. Not the biggest highway job, but definitely not the smallest.

Project Overview

Corporate Neighbors

MENASHA

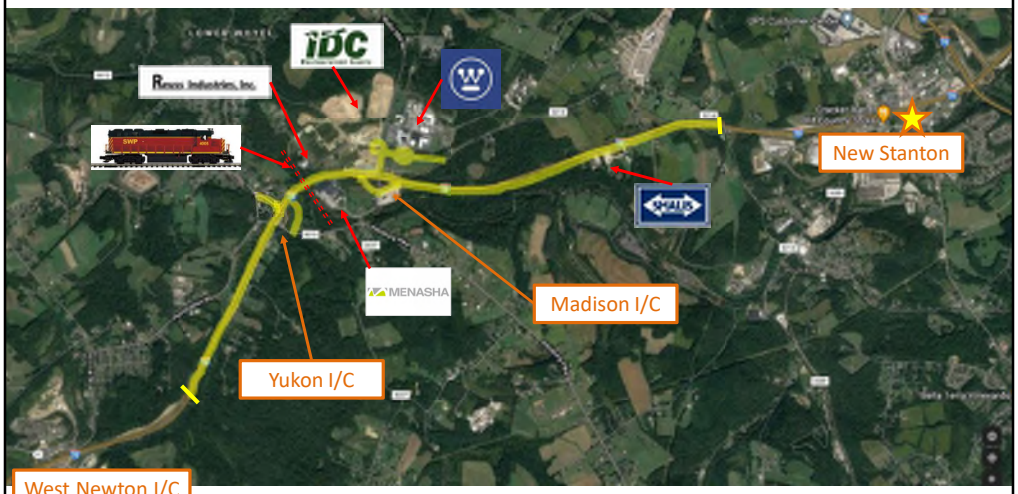
IDC
Westmoreland County

Reuss Industries, Inc.

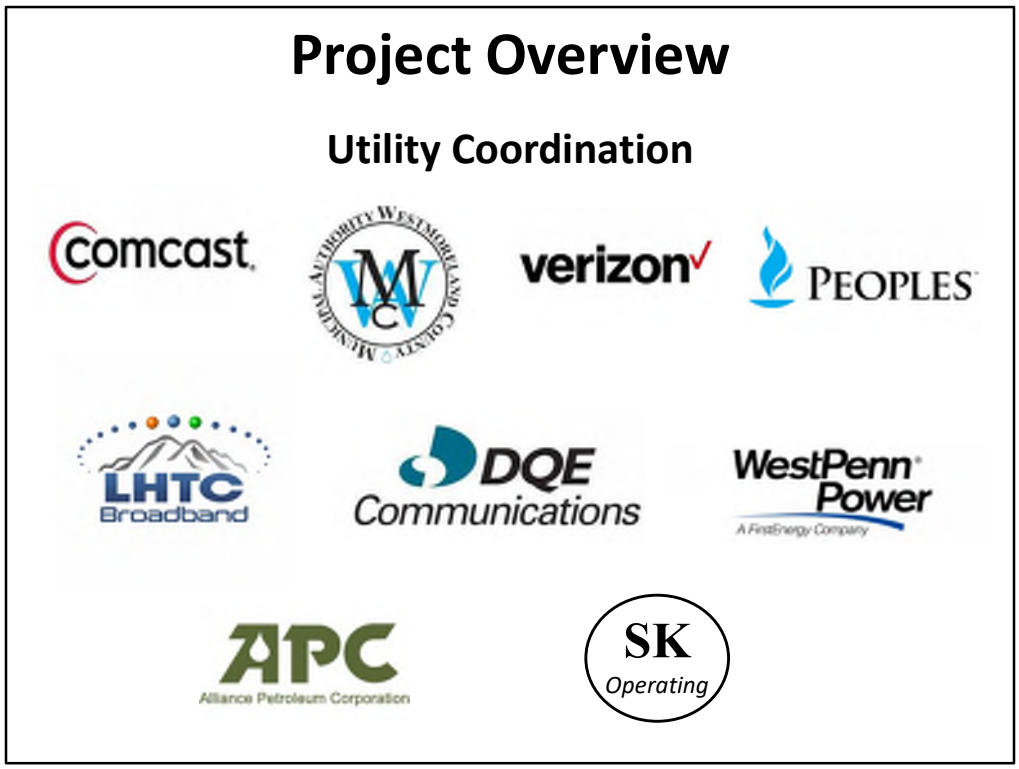
A few of the corporations directly adjacent to the Project. Our operations do affect theirs, so it is important that we keep them informed and maintain communication with them.

Project Overview

Corporate Neighbors



Here you can see just how close all those businesses are to the project.



Similar to corporations, we also have a host of utilities that run directly adjacent and through the project. There was an extensive effort during the first year of the project to get all the utilities to perform their respective relocations.

We actually had to resequence a few of our earlier operations where utilities were creating conflicts and were not relocated in time.

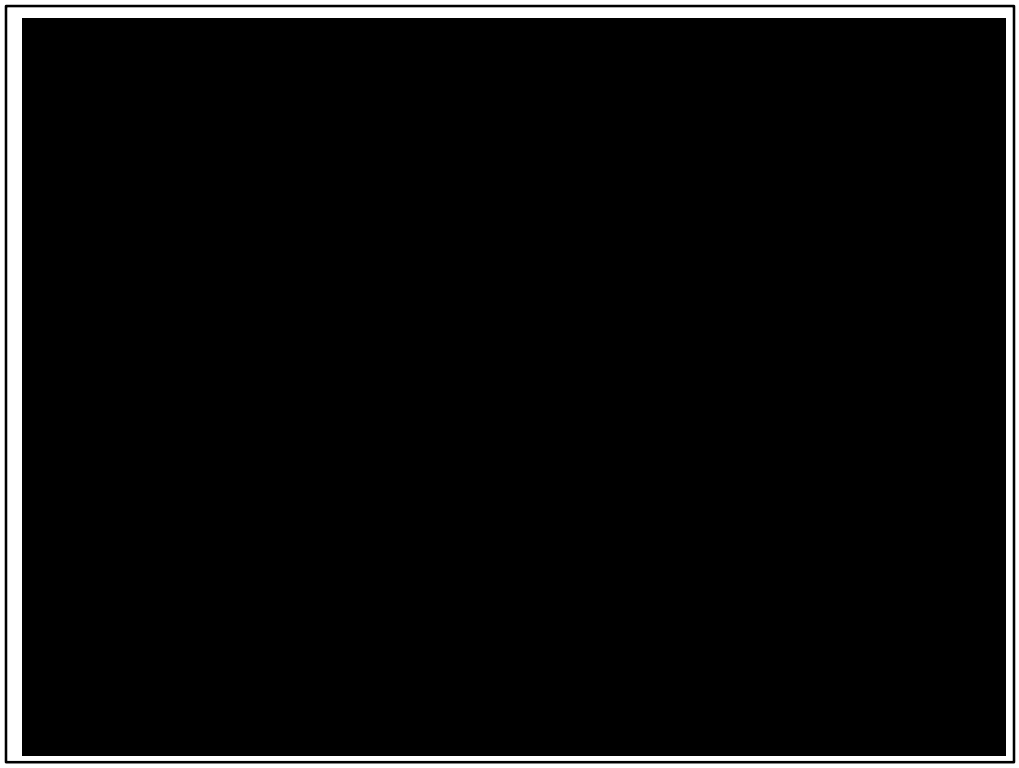
Project Overview

Community Partners

Waste Area landowners (Lewis, Fox)

We've also taken a lot of steps to reach out and partner with organizations in our surrounding communities.

Emergency management with the local fire departments and state police
Coordinating when traffic incidents occur
Heavy equipment operations along local roads
Permitting
Stormwater management during construction

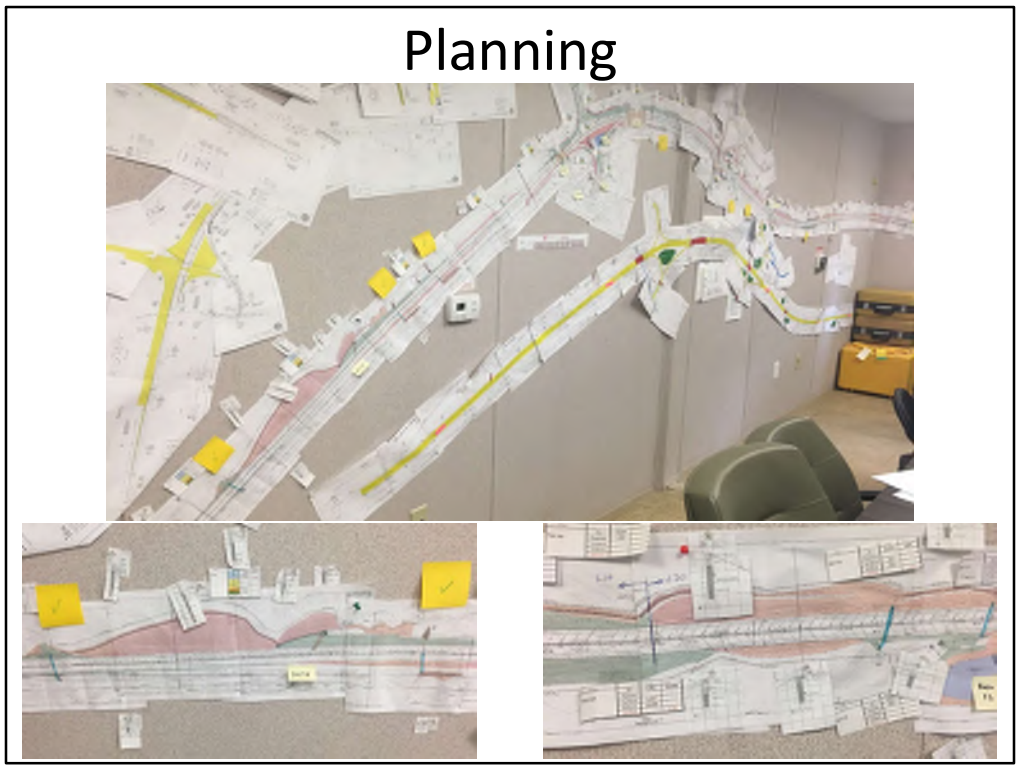


Here’s a brief fly-over video taken in November of 2020.

This video is taken traveling East from New Stanton, heading West towards the West Newton, SR 0031 Interchange

One note to keep in mind is that due to COVID-19, we really only got our start in early May of 2020… So all the work seen here was effectively done in only 6 months.

And this video is taken traveling East from the West Newton Interchange towards New Stanton



Planning is everything.

This project is broken into many small bits and pieces that all need to flow into each other. There is no way to understand the flow of the job without looking at the whole picture. This is almost 4 miles of highway shrunk down to 22 feet of wall space in our field office conference room.

We went through each plan sheet, color-coded the type of work, and taped them all together. And yes, those are post-it notes, hand-written notes, highlights, cut-and-pasted leaflets with boring information and earthwork quantities. This is another example of how sometimes the simplest method is the best method… Until 22-foot wide TV screens get a lot cheaper, anyway.

Mass Excavation




Biggest part of our strategy was focus on the areas where we knew the rock was shown higher in the borings and accessible.

We prioritized our cuts for areas that had rock in order to process it for placement in Toe Keys and Rock Blankets for the fills.

It was crucial to minimize overburden because the waste areas had not yet been permitted.

2 key considerations here are 1.) The amount of overburden waste which would be generated getting to rock. And 2.) Rock excavation will mean dealing with groundwater and areas where rain water collects.

Rock Borrow Area

206 rock was needed almost immediately at the beginning of the project to base in our toe keys and fill areas. The rock found in the cuts was obviously at the bottom of the as-designed cuts. We made the decision to forgo purchasing quarry rock and get it on Site. We set up a borrow area just North of the project's original LOD, but had to modify the existing NPDES permit for the Borrow Area and then to set up the waste areas. As a work-around for the time it takes to establish landowner agreements, survey, design, and permit the borrow and waste areas, we broke the permitting down into 2 phases: a Minor modification and a Major modification. Can you guess from the picture which permit package is the Minor and which is the Major?

In a nutshell, the agreements and design of the Minor Mod got us rolling while we finalized the waste areas and expansion of the borrow area.

It's worth mentioning how helpful Westmoreland County Conservation District was in our permit modification process. Their pre-submittal review process helped us vet out our design and ensure permit completeness. Then when we submitted the modification packages, their review of both were fast, with almost no revisions required to gain approval.

Earthwork in Low Areas

In almost all our cuts, we encountered ground water in some way. The Take-Away here is that it's imperative to manage water the entire time. Lots of time in 2020 we had clear days, no rain, but still an abundance of water in low areas. We check the weather multiple times a day, every day to make sure weather won't make any wet areas worse.

We use localized pumps, filter bags, etc, to manage water from day to day. Other scenarios we were able to pioneer with our toe keys and rock blankets from a higher, more stable place, and used that as our haul roads as well as base for our fills.

It's critical to be flexible with personnel and equipment to handle groundwater and rainwater when encountered. It's one of those things that needs to be constantly managed.

Earthwork in Low Areas

Some areas we ran into A LOT of groundwater that we simply couldn't get around. To handle these, we had to double our undercut depths and ended up putting in a 6' deep layer of 206 rock as bridging fill.

Ramp BC in Yukon, we are working through lab testing in hopes of incorporating the topsoil we had to clear for our amended soil blend to finalize our basins at the end of the project. In old creek beds and river bottoms, the soil is likely high quality and might be able to be used for amended soil. Being able to use onsite material in our amended soil blend would be a big win-win scenario for all the stakeholders on the project.

Box Culvert Rehabilitation

The drawings for this area indicated a flume concept at this location that did not end up working for the application. The box culvert was so silted in that it was impossible to insert a flume pipe, so we resorted to a diversion and bypass pumping for the duration of the rehab work.

This example drives home the points of “Sometimes Simplest is Best,” and “Be Flexible.” We adapted to field conditions, and ended up with a better result.

Box Culvert Rehabilitation



Although we rehabbed the box culvert, the channel remain heavily silted. The contract didn't call to dredge the stream for the length of it, but may have been good to do prevent future back-ups and encourage flow. This area is still an area of challenge during rain events.

Box Culvert Rehabilitation

This is a location where we had to extend an existing box culvert under I-70 prior to building fill for the realignment.

The temporary large-bore pipe flume originally called for presented a lot of challenges for removing the existing silt, tying into sound concrete, and installing the new sections of box.

We again resorted to bypass pumping to keep the culvert clear of water while we worked.

This method worked much better, and the hoses were able to be moved around day to day as we demolished old concrete, installed new box culvert sections, and installed the new rebar/formwork/and concrete for the closure pour.

The last picture in the bottom right shows the box sections complete, native streambed material placed in the box, and the last step before our closure pour and backfill.

Stream Relocations

Here is the resultant stream crossing from the box culvert extension we just looked at. The end result was really good, planted well, and should continue to develop into a really nice stream after we leave.

Stream Relocations

This series of pictures shows just how important it is to properly manage water in a localized work area.

This is the installation of a new box culvert to carry a relocated stream, as well as carry the new ramps at that location.

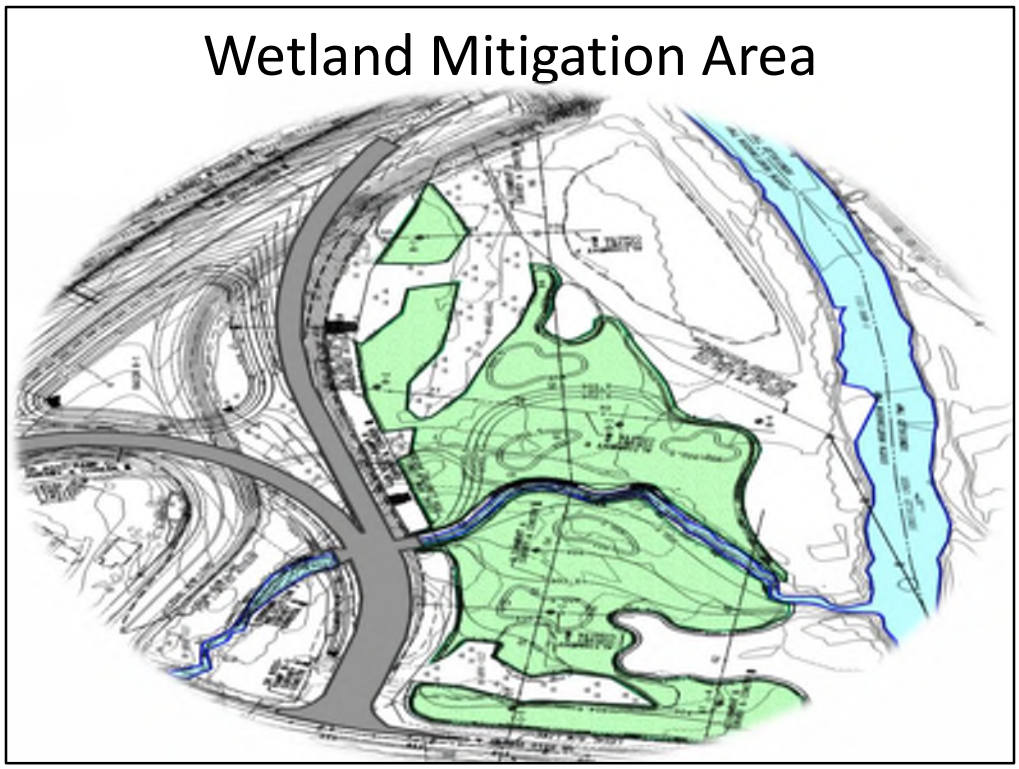
It's very important to pump the water down, and build a sump to keep the water level below your work area. Something as simple as a 2" trash pump run by a small generator works for this. Note the plastic cofferdam in the top right picture used to hold the existing stream out of the work area.

The dewatered work area allows us good, solid access to grade the bedding, build the toe walls, set the sections, and do the rest of the follow-on work. Without taking the time to manage the water in the area, this work area would be a mess, and the resultant work would be disaster.

The picture on the bottom right shows the upstream view of the box after we re-routed the stream.

Stormwater Basins

Dig Ponds first, then run the pipe to them. Trying to phase the pipes into the ponds while excavation is still in progress is asking for trouble.



This is a close-up Plan View of the Wetland Mitigation Area. The area where selective excavation, native topsoil placement, and plantings of specific wetland species was done is shown in green.

And this is the area shown in aerial photograph as we neared completion of all earth moving, and were well on our way with the plantings.

Since this area was very wet and soft year-round, we brought in a special spread of Marooka tracked vehicles and mobilized a smaller excavator and dozer to be able to perform the necessary earthwork in this area. Our typical 40T articulated haul trucks and larger excavation spread would have surely ended up stuck and would have done a lot of damage to the area trying to pull them out.

This was an interesting area to construct. Shaping the designed topography took some attention to detail. We built a digital model of this area and loaded into a dozer with GPS machine-control capability to make sure everything was graded correctly. This is our typical practice when we do roadway grading, but we adapted it for this unique scenario and it worked out very well.

Roundabouts

The Madison Interchange is where the Round-abouts will go. Just wanted to point out how much is actually going on in this picture…

- Stormwater Basin construction
- Active Haul Roads
- Active Interchange
- Temporary roads for the traveling public
- Bridge Construction over a State Route 3037
- Westinghouse facility to the North, where we had to maintain access for deliveries 24/7
- WCIDC to the West, where we could not restrict access to their construction operations

In order to make all of this work, we had to make sure we got a point of contact for each of the parties close to our work areas. We then kept them updated on our activities, how that would affect their day-to-day business, and how to avoid any inconveniences. The only way to make this go right is to reach out to your neighbors early, and keep them up to date as you progress. Most anyone is willing to work with you as long as you can keep them informed and keep their interests in mind as you progress the work.

Here is the bridge that crosses Sewickly Creek, and also conveniently crosses the Southwestern Pennsylvania Railroad. This bridge gets a lot of attention by numerous entities all the time.

(As Dave mentioned) The location of this bridge is a FEMA flood area. We wanted to show you just how close to the water elevation our work area actually is. You can see in the upper right that the bottom of our pier is at times below the creek elevation, which makes accessing our work potentially difficult. You can see again that we address this by digging a sump with a pump to keep the area dewatered. This comes back to having the right tools and equipment on hand to make adjustments day to day when water is encountered.

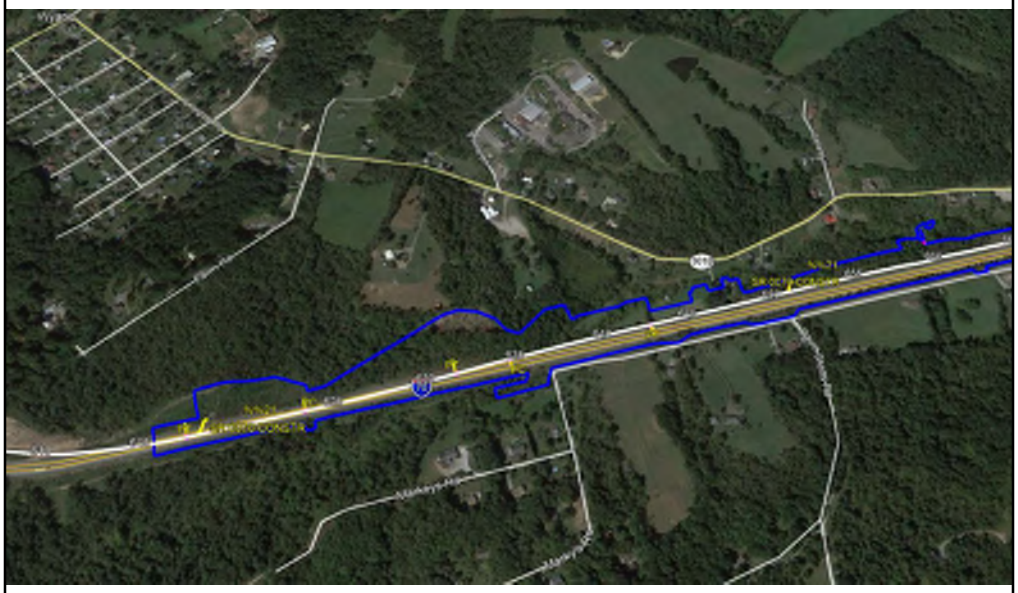
Waste Areas

3 Total Waste Areas

- Approx. ML Sta 670+00, 100’ RT
- Approx. ML Sta 726+00, 500’LT
- Approx. ML Sta 810+00, 200’LT

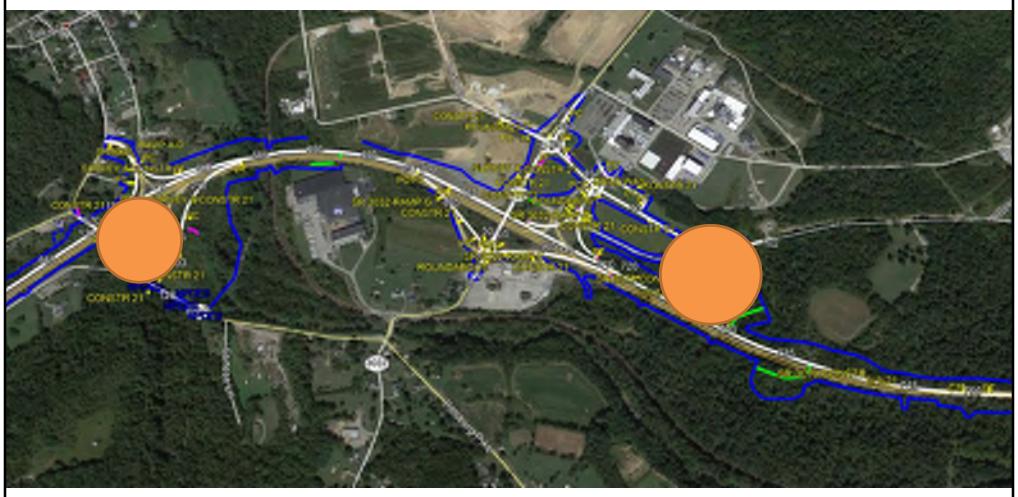
The project calls for around 900,000 CY of total excavation on the project, with only about 450,000CY of embankment. This leaves about 450,000CY of waste. Therefore, we needed to seek out, permit, and develop waste areas. We accomplished this by working with local landowners, and modifying the existing NPDES permit for the project as I mentioned before.

Waste Areas



The three waste areas are spread throughout the project, indicated by the orange circles.

Waste Areas



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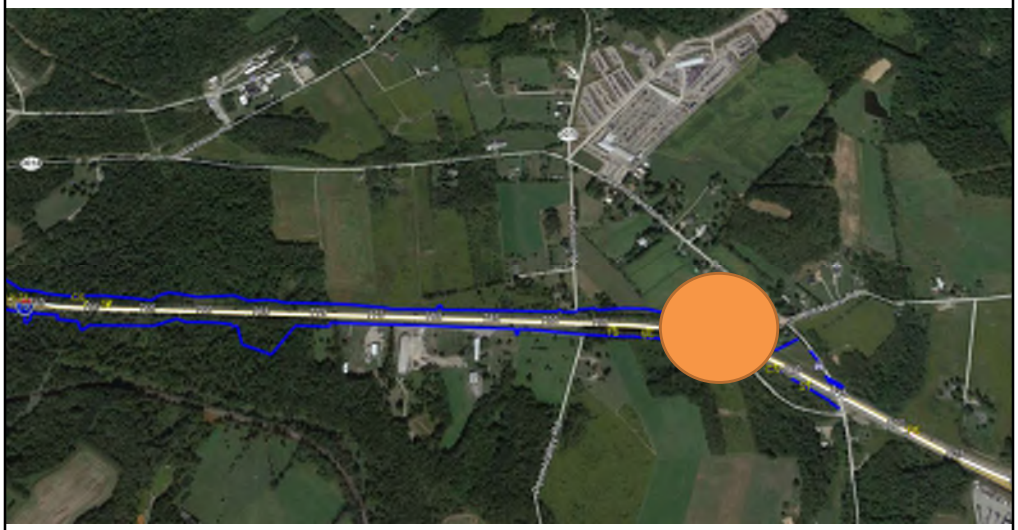
Waste Areas



The three waste areas are spread throughout the project, indicated by the orange circles.

Waste Areas

- NPDES Minor and Major Modification Process
- Normal modification to the 105/404 permits for 2 of the 3 areas

- **Unique opportunity at ML Sta 810+00, 200'LT**

Two of our three areas fell into the "normal" protocol for an NPDES modification. Our eastern-most waste area presented a unique opportunity for permitting.

Waste Areas

Unique opportunity at ML Sta 810+00, 200'LT

- Historical and Future Agricultural Use
- USDA/NRCS regulatory precedence
- We sought a formal agricultural use determination
- Our case: "Nonwetland" determination was made

The "normal" protocol for NPDES permit modification is guided by the DEP Chapter 105 and USACoE Section 404 permitting regulations. However, there are provisions for land which has been used solely for agriculture, and will be used solely for agriculture after the project is complete.

These provisions give USDA/NRCS regulatory jurisdiction over such agricultural lands, change how the land is designated, how permits are obtained, and what modifications can be done to the land.

We wanted to make sure that all parts of our planned waste area were free of wetland impacts, and could be utilized for the project, so we sought a formal determination from USDA/NRCS.

The determination we got from USDA/NRCS was "Nonwetland" and we had no restrictions for use. After we are done on the project, we will be reinstating the field to a condition which can be used for agriculture well into the future.

Our two main challenges thus far on the project have been Access and Water.

Starting with Access:

The picture on the top left shows a small stream crossing that we installed on our own, which wasn't originally planned in the contract. There was a temporary construction easement planned, but no way to use the area for a crossing. We worked the Conservation District to permit this crossing, and will leave it for the landowner after we are done. The access point to this entire work area shown in the plans was a construction entrance right off of I-70. Partnering with the landowner here to add this entrance from a local road reduced countless triaxle loads of pipe, stone, concrete, and other materials, which greatly reducing the impact to the traveling public on I-70. This was also much safer for our workers, so it was a win-win for everyone.

The picture on the top right shows a railroad crossing which we permitted and had installed in order to access the area between Sewickley Creek and the Yukon Interchange. Again, having this crossing installed allowed us to perform the necessary earthwork and structure work completely offline. The alternative would have been to perform some of the work from the lanes of I-70, while setting up construction entrances directly off the highway to access the rest of the work. Pursuing this rail crossing once again saved the traveling public impact from our work, and kept our workforce much safer.

The bottom picture shows one of our lowest elevation jack-and-bore pipes. The end of the

jack and bore was shown on the plans, but there was no provisions to get there. It was initially planned to access this bore pit from I-70. We pioneered access to this location so that our equipment and workers could access the work without impacting traffic on the highway. The elevation of the bore pit – being a natural low spot - presented occasional water problems along the access road, which we handled as we described before. In locations such as this, it is definitely the right thing to avoid accessing it from the highway. In these scenarios, it's even better if the contract includes offline access to these locations.

The other constantly reoccurring challenge on this project is Water. Each picture shows active operations which had to be put on hold due to the need to handle water.

The top left picture shows an area directly adjacent to the Wetland Mitigation Area that was flooding as we were excavating for our rock blanket and toe keys.

The top right picture was right after a rain event which ended up flooding our temporary cofferdam and the drilling operation for our biggest bridge's drilled shafts. This actually ended up shutting this operation down for 2 days until we could re-establish and restart the operation.

The lower left is our Box Culvert Extension, where just a small rain event caused groundwater to pool in the our structural excavation. We had to setup a pump and filter bag to drain the area before we proceeded.

Lastly, the excavator in the lower right picture almost got buried in the loose, soggy soils we had to excavate through. Luckily we had a good operator running this machine, who recognized he was becoming dirt-bound, and was able to get himself out before it became more of a problem.

Take-aways

(… through the eyes of a contractor…)

Designers	**Contractors**
✓ Consider access	✓ Have the right gear
✓ Check neighboring areas	✓ Be flexible, react quickly
✓ Sometimes simplest is best	✓ Critical thinking benefits everyone

•Design should consider access to the work, especially in low, wet areas
•Design should also consider surrounding areas, especially lower elevations directly adjacent to the project. We might end up flooding out our neighbors!!
•On this project, the fix for our bypass scenarios was simply a hose and a pump. Many of the proposed flumes and diversions did not work as intended and we resorted to bypass pumping anyway.
•Contractors need to be equipped to properly handle water not just during rain events, but every day
•Contractors need to be flexible and react quickly to ensure water is managed properly
•Build the design correctly, but always be looking to improve what's on paper. It never hurts to propose ideas to the designers and work together to get the best solution for managing E&S, stormwater, and groundwater. The result is always better when everyone is on board and involved in solutions that help make the project delivery a success.